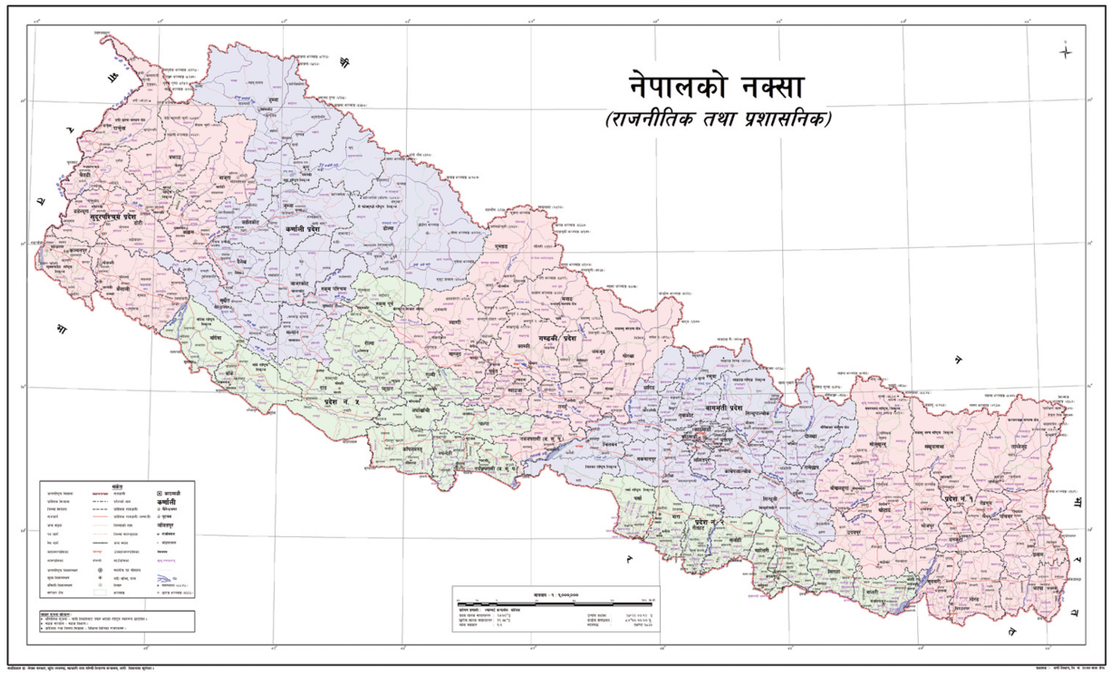

Small Ruminant Production & Management

Government of Nepal
Ministry of Education, Science and Technology
Curriculum Development Centre
Sanothimi, Bhaktapur
Phone : 5639122/6634373/6635046/6630088
Website : www.moecdc.gov.np

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Technical and Vocational Stream
Learning Resource Material

Small Ruminant Production & Management

(Grade 10)

Secondary Level
Animal Science

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

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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. Krishna Kafle, Shambhu Shah, Dr. Hari prasad Panta, Dr. Amod Thapa Magar, Dr. Raj Kumar Yadav, Dr. Suraj Gurung, Dr. Ganesh Gautam is highly acknowledged. The book is written by Dr. Binod 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

Ministry of Education, Science and Technology
Curriculum Development Centre

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Unit 1
Introduction

A. Objectives

- To know about sheep and goat population in Nepal and their distribution.
- To able to scope and importance of small ruminant farming in Nepal.

B. Contents

1. Sheep and Goat Population in Nepal and their distribution.
2. Importance of small ruminant farming in Nepal

1.1 Learning process

Goat and sheep are multi functional animals. These animals play a significant role in the economy of small and marginal farmers in the country. Goat rearing is an enterprise which has been practiced by a large section of the population in rural areas. In our country goats are raised mainly for meat. They are also used for carrying some load in the mountain regions. In addition to this, goats have religious and ritualistic importance in our society, and are also used in ceremonial feastings.

Sheep rearing is mostly done in the hills and mountain regions and in smaller numbers in the Terai region of the country. Sheep are mainly raised for meat, wool and for work especially in the high altitudes of Nepal.

1.2 Sheep and Goat Population in Nepal and their distribution

Distribution of goat and sheep and their contribution to the GDP in Nepal

Population of sheep and goat population and their distribution (2070/71)

Development Regions	**Sheep**	**Goat**	**Ecological Regions**	**Sheep**	**Goat**
Eastern	1,07,122	2688051			
Central	89,284	2763013	Mountain	3,37,139	1361814
Western	1,48,007	1900551	Hills	3,52,473	5150028
Mid Western	3,63,561	1842532	Terai	1,11,759	3665589
Far Western	93,397	983384			
Total	801371	10177531		8,01,371	10177531

Source: Minister of Agricultural Development (MOLD), Statistical data-2070/71)

Meat production and its distribution (2070/71) (Metric tons)

Meat type	Mutton (Metric tons)	Chevon (Metric tons)
Eastern		14572
Central		14393
Western		10602
Mid western		14285
Far western		5201
Total		59053

Source: Ministry of Agricultural Development (MOLD), Statistical data-2070/71)

Wool production and its distribution (2008/09)

Development Regions	Wool production (Kg)	Ecological Regions	Wool production (Kg)
Eastern	80,323		
Central	63,855	Mountain	2,51,229
Western	1,05,047	Hills	2,53,150
Mid Western	2,66,409	Terai	78,069
Far Western	66,814		
Total			5,82,447

Source: Minister of Agricultural Development (MOLD), Statistical data-2008/09)

1.2 Importance of small ruminant farming in Nepal

The importance of sheep and goat farming are:

- Both sheep and goat are multipurpose animals. Though goats are primarily raised for meat, different breeds of goat produce significant amounts of milk. Similarly sheep produce meat as well as wool.
- These animals do not need expensive buildings for housing and the cost of animals is also low. Thus the initial investment needed for sheep and goat farming is low.
- Sheep and goat farming start giving returns early because these animals achieve

sexual maturity, breed and produce kids/lambs at early age than other kinds of livestock.

- Unlike large animals in commercial farm conditions both male and female animals have more or less equal value.
- Sheep and goats can thrive well on wide variety of thorny bushes, weeds, crop residues and agricultural byproducts unsuitable for human consumption. Sheep and goats are economical converter of grass into wool and meat. Where there is availability of sufficient pasture these animals can be raised without providing concentrate mixtures, thus reducing the cost of production.
- Sheep and goat dung are valuable fertilizer to the soil.
- No religious taboo against sheep and goat slaughter and meat consumption is highly preferred than meat of other animals in our country.
- The demand of goat meat is higher than domestic production. So there is ample opportunity of profitable goat farming in Nepal.
- Sheep and goat farming creates employment to the rural poor besides effectively utilizing unpaid family labor. Sheep and goat farming do not require high technical knowledge and skills and can be adopted by general people.
- Skins of these animals can be used to manufacture leather.

Advantages of sheep farming

- Easy to manage and require less labor.
- Do not need expensive building for housing.
- Possess ability to thrive on natural grasses except during certain physiological stages of life.
- Economic converter of grass into meat & wool.
- Unlike goats, sheep hardly damage any tree.
- Lips structure of sheep helps them to clean grains lost at harvest time, and thus convert waste feed into profitable products.
- Provide three different sources of income by production of wool, lamb, meat & manure.
- They are highly prolific and multiplied rapidly. Foundation stock is relatively cheap.

- There is no prejudice by any community towards mutton.
- Sheep dung is only means of fertilizer for sub marginal lands where sheep drops its feaces during grazing.

Advantages of Goat farming

- Poor man's cow:
- Contribution to the poor people's economy.
- Supplies nutritious and easily digestible milk.
- Additional income for poor and landless or marginal farmer.
- Being small sized animal, easily managed by women and children.
- Cost of feeding is very low.
- Five goats can be maintained as cheaply as one cow.
- No market problem and can be sell whenever people have money problem.
- Provide meat, milk, skin and manure and also used as pack animal.
- Do not need expensive building for housing.
- Can be survive in extreme condition.
- Resist to diseases, especially tuberculosis.
- Goat milk has less allergic problem.
- Due to the small-sized fat globules, and the soft curd, it is easily digested.
- Goat is called "Foster mother of man" as milk is considered better in human nutrition.
- Excreta and urine of the goat is richer in Nitrogen, potash and phosphorus than cow dung.
- They are highly prolific and multiplied rapidly.
- There is no prejudice by any community towards mutton.
- Buck has special preference for religious purpose.

C. Assessment

A. Very short Answer Question

1. Why Goat is called poor man cow?
2. Why Goat milk is called Foster mother of man

B. Short Answer Question

1. Describe or, list out the advantages of sheep farming.
2. Describe or list out the advantages of goat farming.

C. Long Answer Question

1. Describe the importance of sheep and goat farming.
2. Details about the sheep and goat population and their distribution in Nepal.

Glossary

Chevon- Goat meat

Faeces- Dung

GDP- Gross Domestic Product

Kg- kilogram

Mutton –Sheep maet

MOLD- Minister of Livestock Development

Mt- Mectic tons

Unit 2
Breed of Sheep

A. Objectives

- To be able to know about native or indigenous breeds of sheep and their characteristics.
- To be able to know about exotic breeds of sheep and their characteristics

B. Contents

1. Natives breeds of sheep and their characteristics.
2. Exotic breeds of sheep and their characteristics.

Learning process

Sheep farming is the raising and breeding of domestic sheep. It is a branch of animal husbandry. Sheep are raised principally for their meat (lamb and mutton), milk (sheep's milk), and fiber (wool). They also yield sheepskin and parchment.

Sheep can be raised in range of temperate climates, including arid zones. Farmers build fences, housing, shearing sheds and other facilities on their property, such as for water, feed, transport and pest control. Most farms are managed so sheep can graze pastures, sometimes under the control of a shepherd or sheep dog.

Zoological classification of sheep

Kingdom- Animal

Kingdom- Animal

Phylum- Chordata (With back bone)

Class- Mammalia (Cuckle their young)

Order- Artiodactyla (Even toed hoofed)

Family- Bovidae (Presence of rumen, gall bladder)

Genus- Ovis

Species- *Ovis aries*

2.1 Natives breeds of sheep and their characteristics

Breed	% population (of Indigenous Breeds)	Location	Altitude(M)
Bhyanglung	4	Mountain	2500-4000
Baruwal	63(highest population)	High hill	1500-2500
Kage	21	Mid hill	300-1500
Lampuchhre	12	Terai	300

Note: Indigenous breed population is about 95% while remaining 5% of total population is of exotic breeds.

Brief description of breeds of sheep

1. Bhyanglung

- Originated in Tibet.
- Available at an altitude of 2500 to 4000 meters in northern part of Nepal.
- Commonly found in Manang, Mustang, dolpa and Jumla district.
- Is strong and stout with short legs weighing about 25-35 kg.
- Maintained under transhumance system according to the season.
- Wool of this breed seems fine and soft in caparison to other Nepalese breeds.

Bhyanglung sheep (source- http://1.bp.blogspot.com/-Mq4ndJSXVdE/VYUDgsceLiI/AAAAAAAAA3M/RYZZwFhisuk/s1600/bhyanglung.png)

- Average annual wool production is **750 gms to 1.0 kgs** (two shearing).
- **Carpets** are being prepared from this breed wool.

1. Baruwal

- Highest population.
- Largest body size among indigenous breeds.
- They are found in the high hills of Nepal. Found in Jumla, Mugu, Kalikot, Mugu, Dolpa, Gorkha, Rasuwa, Solukhumbu etc district.
- Raised usually in transhumance system in north part of Nepal.
- The average weight of male is 30-40kg and female is 30-35 kg.
- The horns of the males are almost similar to Merino while those of female are short and usually polled.
- Usually the animals are black haired from the half of the body to the head. The remaining posterior half is usually covered with white wool. Completely black color is also found while complete white is rare.
- The ears are very small (rudimentary) to medium in size but the nose is very prominent (Roman nose) in male.
- Average wool production is 750 gm annually.
- Produce coarse type wool so used in carpet industry.
- This breed is also used for transportation.
- This bred is tried to be upgraded with polyworth, Rambouillet, and Merino at Gouthichaur sheep farm, Jumla and Pansayakhola Sheep Farm, Nuwakot

Baruwal sheep (source- http://1.bp.blogspot.com/-ut2kHUz2e9A/VYo_j3E2qhI/AAAAAAAAA6A/YSIPu6sUxzQ/s1600/baruwal.png

1. Kage

- This is the considered to be the **purest Nepalese breed**
- Generally found in the valley of Kathmandu, Banke, Makwanpur, Lumjung, Parwat, Kaski and Nuwakot district.
- Average body weight is **22 kg** (M: 20-30 kg & F: 15-25).
- They are **usually white in color** but black and white or black or white with red patches are also prevalent. They have **erect ears.**

Kage sheep (source- http://2.bp.blogspot.com/-2Fj2ql_SKXU/VYUDv9uOf-I/AAAAAAAAA3k/7Tmees9yC-4/s1600/kaage.png)

- They are highly prolific; twining is quite common and the percentage of live lambs in this breed is comparatively very high.
- They give 3 lambing per two years.
- They are reared both for wool and meat purposes.
- They produce 500 gm wool per year with two shearing. The wool is very coarse.

2. Lampuchhre

- This breed is reared in the Terai region only because of their extreme heat tolerance capacity.
- The body characteristics are similar to Kage but the length of the tail ranges from 10-13 inch. Due to presence of long tail it is named as "Lampuchhre".
- Average body weight of ram is 30-35 kg while ewe average weight is 20-25 kg.
- Body colour: White, black & brown.
- Wool of very inferior quality and the production is 500-750 gm annually.

Lampuchhre sheep (source- http://4.bp.blogspot.com/-bedPWKuZf78/VYUD6Jbv5hI/AAAAAAAAA3s/TiL165Ya6FY/s1600/laam.png)

2.2 Exotic Breeds of Sheep and Their Characteristics

1. Merino

- Most popular fine wool -breed of the world.
- Known as golden- footed sheep.
- Originated in Spain.
- Extremely hardy and can survive under extreme weather as well as poor grazing condition.

Merino sheep (source- http://s.amazonaws.com//Merino-Sheep5-600x450-300x225.jpg)

- Breeds are medium sized. Average body weight; Ram=90kg & Ewe=70kg.
- The head of Merino sheep is of medium size, and fairly well covered with wool.
- Generally white in colour.
- Ram are with spirally twisted horns while ewes are polled.
- Folds in the skin of shoulder and neck.
- Average wool production is 4-5kg annually.
- Fine wool quality, staple length 5-10cm and fibre diameter is 17-24 micrometer.

2. Rambouillet

- Improved & developed at Rambouillet in France but its ancestor are of Merino breed from Spain.
- The breed is the largest of fine wool breeds.
- They are hardy and excellent grazers on poor pasture.
- They have large head with white hair around the nose and ears.
- The rams may have horns or polled but ewes are polled.

Rambullet sheep (source- https://2.bp.blogspot.com/-Ea02-Zve65g/WL-xkgKMb3I/AAAAAAAAD18/Sclpk8oUQg44lT0E4j9SL6xa85fh2DYdwCLcB/s600/Rambouillet%2BSheep.jpg

- Heavy dense wool extends over the face below eyes and over entire body of the animal.
- Rambouillet has the best mutton conformation of any of the fine-wool breeds.
- The fleece is heavy, close, compact, covering most of the body including face and legs.
- The breed is large, with mature rams averaging about 120 kg and ewes weigh 90 kg.
- Average fleece production is 4 -5 kg annually (Fibre diameter 17-24 micrometer).

3. Corriedale

- This breed is comparatively new.
- Dual Purpose breed.
- This breed developed in New Zealand (corriedale is named after corriedale estate of otago, where it developed).
- It was developed by the cross of a Lincoln ram on Merino ewes with the aim of producing a class of sheep that would be suitable for range conditions and at the same time would produce reasonably good mutton and wool.

Corriedae sheep (source- https://media1.britannica.com/eb-media/34/534-004-C3F42744.jpg)

- Average weight of ram is 90 kg & ewe is 70 kg.
- The face, ears and legs of these animals are covered with white hair, although black spots are sometimes present.
- Both sexes are polled, although rams sometimes have horns.
- Average wool production is 5-6 kg annually (fiber diameter is 24.95-27.84μ).
- Corriedales are outstanding for their efficiency. They produce more kgs of lamb and wool per kg of body weight than other range breeds.
- The ewes are considered fair in prolificacy and milking ability.

4. Polworth

- Originated & developed in Victoria province of Australia.
- Mating first between Lincoln rams & Merino ewes and then cross between 1st generation ewes with Merino rams, eventually the Polworth breed was established.
- The animals resemble a plan bodied, extra-longstapled wool Merino.

Polworth sheep (source-
http://www.nzsheep.co.nz/uploads/images/breeds/polwarth/polwarth1.jpg)

- Average body weight, Ram = 75kg & Ewe = 55kg.
- They may be horned or polled.
- Although the animals are bulky in appearance yet they are neat and have symmetrical lines.
- Their fleece is of fine wool type. The staple length is not less than 10cm. The value of the fleece runs very close to Merino.
- They produce mutton of a most desirable quality.

Assessment

A. Very short Answer Question

1. List out the native breed of sheep
2. List out the Exotic breed of sheep.

B. Short Answer Question

1. Details about the native breed of sheep and their characteristics.
2. Details about exotic breed of sheep and their characteristics

C. Long Answer Question

1. Describe native and exotic breeds of sheep and its character.

Unit 3
Breeds of goats

A. Objectives

- To be able to know about native or indigenous breeds of sheep and their characteristics.
- To be able to know about exotic breeds of sheep and their characteristics

B. Contents

1. Natives breeds of goats and their characteristics
2. Exotic breeds of goats and their characteristics

Learning process

- The goat is the most popular species among the domesticated animals; Even landless and non agricultural household are also rearing goats as a source of meat & cash generation.
- The goat farming is widely practical as a means for poverty alleviation.
- Goats are used as meat, pack, manure & milk animal.
- About five(5) lakhs of goats are imported from India annually in Nepal.
- More than 20 tonn of chevon is consumed per day only in kathmandu.
- In Nepal annual meat demand of goat is 27% where as production is only 1.3%.

Zoological classification of sheep

Kingdom- Animal

Phylum- Chordata (With back bone)

Class- Mammalia (Cuckle their young)

Order- Artiodactyla (Even toed hoofed)

Family- Bovidae (Presence of rumen, gall bladder)

Genus- Capra

Species- *Capra hircus*

Breed of Goats

Broadly goat breed can be classified into meat purpose, milk purpose and dual purpose breed according to their use. Bengal is meat purpose breed, Saanen is milk purpose breed and Jamunapari is dual purpose breed. Some times chyangra like breed are also classified as fur type breed. According to origin, it can be classified as indigenous and exotic breed.

Breed	%population (of indigenous breed)	Location	Altitude (feet)*	Remarks
Chyangra	1	Mountain	Above 9000	Pashmina production, Transportation
Sinhal	16	High hill	7000-9000	Hair production, Transportation
Khari	56	Mid hill	1000-7000	
Terai	27	Terai	Up to 1000	

2.1 Native Breeds of goats and Their Characteristics

1. Chyangra

- Originated in Tibet and Mostly found in the higher hills of the Himalayan ranges.
- Maintained under transhumance system according to the season.
- The average adult body weight is 35 – 40 kg and 27 – 30 kg for male and female respectively. The average wither height is 62 cm in female goats.
- The information on reproductive parameters of these goats has been reported that they are late maturing and produce the first kid by the age of 2 years
- Kidding generally takes place during spring season and produce single kid once in a year.
- The average birth weight of the kids was found to be 1.71 kg
- The whole body is covered with long hairs to protect them from the cold weather in the higher hills (12000ft to 14000ft). Mostly they are black in color and brown and gray are not uncommon.

Chyangra goat

(Source-http://4.bp.blogspot.com/-GzoWYPSdfcg/VYUDTFVdirI/AAAAAAAAA28/29fp49YojTc/s320/chyang.jpg)

- They are famous for meat as well as Mohair (Pashmina), which is grown on either side of the shoulder and sides under the long haired coats. The long hairs are used for making ropes and rugs.
- Average Pashmina production ranges from 50 to 200 gram annually.
- Horns are long, curved, twisted backward and upward and thick.
- Ist kidding at around 2 yrs, one kid is produced in a year although twining occurs sometimes.
- They are used as pack at higher hills of Far-Western and Mid-Western Development region of Nepal.

2. Sinhal

- Sinhal are the high hill goats found on the southern flank of the high Himalayan mountain region between the elevations of 7000 to 9000 feet.
- Maintained under **transhumance system** according to the season.

Sinhal Goat

(source-http://2.bp.blogspot.com/-1edv4Kzzu1o/VYUD_kXZhDI/AAAAAAAAA38/6qrTi_7Rfhg/s1600/sinhal.png

- Average body weight is 30-45 kg, highest among the indigenous breeds.
- They are generally black in color but with white and brown patches. It may be creamy with darker heads and gray or pale are not uncommon.
- Body is covered with long, coarse hairs.
- The estrus behavior is seasonal and generally one kid is produced in a year although twining occurs sometimes.
- The hair produced by this breed is devoided of Pashmina and is about 1kg per female or 2.5 kg per male. Sometimes the females are milked.
- They preferred to graze in the flock of Bhyanglung and Baruwal breed of sheep.

3. Khari/pahadi

- This breed of goats is found in the Mahabharat, the mid hill range of Nepal.
- They are small with low height, weighing about 25 kg for the adult females and 35 kg for the adult males.
- The head is small and ears are erect.
- The color is white, black and gray but red are not uncommon.

Khari Goat

(source-http://1.bp.blogspot.com/-Vq2Qr-_l7T4/VYpAxPeALBI/AAAAAAAAA6M/srpTal5V7dU/s1600/khari.png)

- The age at first kidding is 16 months. They generally produce twins three times in two year.
- They are meat purpose goats but produce 0.64 liter of milk per day and 68.1 liters of milk during a lactation period of 206 days. The milk contains 3.5% fat.
- Kid mortality is very low.

4. Terai

- Found in Terai areas of Nepal.
- It is not as pure bred and considered as cross breed of Jamunapari.
- Presence of roman nosed and pendulous ears.
- Medium sized, different colour, commonly brown colour with white stripe.
- Average body weight is 18-35kg.
- Dual purpose breeds.
- First kidding @ 15 month.
- Breeding capacity similar to khari.

Terai Goat

(source-http://4.bp.blogspot.com/-anJ7JVdleh0/VYUD91LttuI/AAAAAAAAA30/7AnzcooowCU/s400/terai.jpg

Breed characteristics of indigenous Nepalese goat breeds

Breeds	Adult body size (kg)	Body length (cm)	Wither height (cm)	Chest girth (cm)	Horn length (cm)
Chyngra	Male: 35-40 Female: 27-30	62.4±0.4	62.4±0.2	71.4±0.4	22.4±0.1
Sinhal	Male:42.0 Female: 34.8	68.8±0.4	67.0±0.4	77.76±0.5	18.7±0.3
Khari	Male: 28-40 Female: 17-26	63.2±0.4	55.9±0.3	65.5±0.4	10.7±0.2
Khari	Pooled: 31.9	66.6	63.1	67.1	12.4
Terai[a]	Male: 30-35 Female: 18-32	58.1±0.4	57.9±0.3	65.2±0.4	8.1±0.2

(Joshi, B. R and Shrestha, B. S. (2003). The Goats. TheirProduction and Health Management.

3.2 Exotic Breeds of goats and Their Characteristics

1. Jamunapari

- Its home lying between the Ganges, Jamuna, and Chambal River.
- These are dual-pupose goats, combining milk and meat qualities.
- The Jamunapari are probably the most handsome of the Indian breeds.
- They are generally white or yellowish fan with light brown spots on the neck and face, and occasionally patches of fan or black are found on the body.
- They have long folded pendulous ears and a prominent Roman nose resembling the Nubian goats.

Jamunapari Goat (source- http://goatfarming.in/wp-content/uploads/2016/05/Jamunapari-Goat-1.jpg?x55897

- The Jamunapari is large-sized, tall and has rather long legs. The hand quarters have long thick hair. They are said to be thrive best under village conditions and rough terrain.
- The Jamunapari are hardy and very active.
- The average weight of full-grown buck varies between 60 to 90 kg and the female weighs 50 to 60 kg.
- The best milking goat of this breed has yielded 5.4 kg of milk a day, but the average production is likely to be near two to three kg.
- Usually the Jamunapari doe kids once in year, giving birth to single kids but twins are not rare.

2. Barbari

- The barbari breed is a dairy type goat that is said to have originated in the city of Berberi in British Somaland in East Africa.

- The goats have short legs, short hairs, and straight facial line and prick ear.
- The goats are preferably white with fawn or tan spots but some time black spots are found.
- The barbari goat is suitable as a family goat for it is a good milker. The breed has good dairy conformation.
- Average weight of the male is 40 to 50 kg and that of female 30 to 40 kg.
- Looks like deer.
- Reared in urban and semi-urban areas in stall feeding. They are not interested in grazing.
- It is prolific and may kid twice in a 12-15 month period (3 kidding in 2 years)
- They produce more milk, if they are bred only once a year. Some of the goats in this breed have given 4 kg of milk yield.
- Can breed at any time of the year.

Barbari Goat

(source-https://5.imimg.com/data5/QO/LH/MY-9714600/barbari-goat-500x500.jpg

3. Saanen

- World popular Dairy breed.
- Originated in Saanen valley of Switzerland.
- White cream colored.
- Medium sized, Average body weight: M-95kg & F-65kg.
- Ear erect and large udder.
- Milk=2-4 kg per day.
- Generally polled.

Saanen goat

(source-

https://www.nationalsaanenbreeders.com/nationalshows/2016/GRAND%20CHAMPION.jpg

4. Beetal

- This breed is commonly found in Punjab and Rajisthan of India.
- They have no standard color or markings but generally they are black, tan white, brown, often heavily spotted on white.
- The head resembles that of Jamunapari with a Roman nose and long pendulous ears, but the ears are not so long, curved or prominent as in the Jamunapari.
- The breed has curved horns sloping backwards and the males have beards, but not the females.

Beetal Goat

(source- https://4.imimg.com/data4/BO/BB/MY-10786044/beetal-goat-500x500.jpg

- The average male goat weighs about 60 kg and the female 40 kg.
- The goats are prolific. They yield 2 to 3 kg of milk a day but the average milk yield during a lactation period of 133 days is 161.8 kg with butter fat content of 4.5 %.

- Does usually kid for the first time when they are 22 month old.
- Generally 2 kidding in three years.

4. Black Bengal

- Black Bengal is found in West Bengal, Assam and in the adjoining areas.
- They are dark black in color or sometimes white or spotted.
- The skin is comparatively superior to other breeds.
- They are prolific breeders and commonly have twins. Two kidding are possible in a year.
- The milk production capacity is poor and sometimes kids may require additional milk supply during early stages of growth.
- They are short-legged, compact animals with a deep body and wide chest and a straight back. The body weight of adult buck varies from 19 to 30kg and that of doe 13 to 22 kg.

Black bangal goat

(source- https://i.ytimg.com/vi/gkT_Usf6zUM/maxresdefault.jpg

Assessment

A. Very short Answer Question

1. List out the native breed of goat
2. List out the Exotic breed of goat.
3. What do you means by Mohair or pasmina**.**

B. Short Answer Question

1. Details about the native breed of goat and their characteristics.
2. Details about exotic breed of goat and their characteristics.

Unit 4

Terminology used in small ruminants

A. Objectives

- To know about different terminology used small ruminants.
- To able to different terminology used in sheep and goat farming.

B. Contents

1. Ram, ewe, wither, lamb, lambing, buck, doe, kid, kidding etc
2. Castration, disbudding, shearing, docking, growing, tagging, flushing etc.

Learning Process

4.1 Ram, ewe, wither, lamb, lambing, buck, doe, kid, kidding etc

Ram- Adult male sheep

Ewe- Adult female sheep

Wither- Castrated male sheep

Lamb- New born baby

Lambing- Act of parturition

Buck- Adult male goat

Doe- Adult female goat

Kid- New born born of goat

Kidding- Act of parturition

4.2 Castration, disbudding, shearing, docking, growing, tagging, flushing etc.

Castration- To remove the testis (Sterilization of male-sheep or goat)

Disbudding- Remove the horn

Shearing- The process by which the woollen fleece of a *sheep* is cut off.

Docking- Removal of tail

Growing- Brushing

Tagging- Identification of sheep and goat.

Flushing- Feeding extra grain 2-3 wks prior to the breeding season for the purpose of increasing the incidence of twinning.

- Some Important terminology

Terminology about Goat farming

Creep Ration: System of feeding of young animals prior to weaning.
FCR (Feed conversion ratio): Number of kg of food consumed by an animal required to produce a live weight gain of 1 kg.

Full mouthed: Condition in which complete set of permanent teeth have grown i.e. 4 yrs in sheep & goat.

Mohair: The covering of Angora goat.

Pica: Depraved appetite. It is often the result of a deficiency in the diet such as lack of fibre or salt or inadequate trace elements such as phosphorus or copper.
Ottorrhoea: Discharge from ear.

Nymphomania: Prolonged or constant estrus causing excessive sexual desire in female.
Red Meat: Meat that is red when raw. It includes beef, veal, pork, mutton and lamb.

Group of Goat: Flock/ Band

Act of mating: Serving

Act of parturition : Kidding

Castrated male: wether / wether

New-born: Kid

Castrated female: Spayed

Young male: Buckling

Female with it's offsprings: Suckling

Young female: Goatling

Pregnancy: Gestation

Adult male: Buck/Billy

Sound Produced: Bleating

Adult female: Doe/Nanny

Length of Estrus cycle : 19 days

Length of estrus: 48hrs

Type of estrus : Seasonal Polyestrus

Volume of Semen per ejaculation: 1ml

Sperm per ml : 3000 million

Gestation Period: 5month and 5 days

Puberty: 4-12 month

Temperature:101.5-103.5˚F

Heart rate: 70-90 / min

Respiration rate: 20-30 / min

Meat: Chevon

Chromosome No. 60(2n)

Age of weaning: 16wks

Castration age:4wks(Add 2wks in sheep)

Age of docking : 10 days

Dental formula: Temporary 0030/4030 Permanent 0033/403

Terminology related to sheep

Flushing: Feeding extra grains or lush pasture 2-3 wks prior to the breeding season for the purpose of increasing the incidence of twinning (generally 250 gm grains daily fed).

Steaming up: Feeding of extra grains of 250-300 gms having about 25% DCP and 75% TDN to meet heavy demands of unborn lambs.

Clip: Removal of wool / hair.

Tagging: Shearing of the locks of wool & dirt from the docks of the ewes, thus facilitating mating by the ram.

Eyeing: Shearing/clipping of excess wool around the eyes to prevent wool blindness.

Ringing: Shearing of wool from the body of ram, especially in the neck, belly & sheath region prior to the breeding season.

Crutching: Shearing of wool around tail.

Cling: diarrhea in Sheep.

Cast ewe: An aged ewe culled from breeding flock.

Teaser Ram: A sexually active vasectomized ram but absence of fertile services.

Group of sheep: Flock, hurtle

Act of mating: Tupping

Act of parturition : Lambing Castrated

male: wether / wedder

New-born: Lamb

Castrated female: Spayed

Young male: Ram lamb/Tup lamb

Female with it's offsprings: Suckling

Young female: Ewe lamb/ Gimmer lamb

Pregnancy: Gestation

Adult male: Ram/Tup

Sound Produced: Bleating

Adult female: Ewe

Length of Estrus cycle : 17 days

Length of estrus: 36 hrs

Type of estrus : Seasonal Polyestrus

Volume of Semen per ejaculation: 1ml

Sperm per ml : 2000 million

Gestation Period: 5month minus 5 days

Puberty: 4-12 month

Temperature : 102-104˚F

Heart rate: 70-90 / min

Respiration rate: 20-30 / min

Meat: Mutton

Dressing % : 45-55

Age of weaning: 14wks

Castration age : 2wks

Age of docking : 10 days

Dental formula: Temporary 0030/4030

Permanent 0033/4033

Chromosome No. 54

Assessment

A. Very short Answer Question

1. Define some terminology (any two)

   a. Castration b. kidding c. Lamb d. Lambing

2. Meaning about (any two)

   a. Flushing b. Disbudding c. Shearing d. Growing

3. What do you mean by Ram, Ewe, Wither

Unit 5
Farming systems of small ruminants

A. Objectives

- To be able to know about farming systems of small ruminants.
- To be able to know about different types of farming system of small ruminants.
- To able the advantages and disadvantages of different farming system of small ruminants**.**

B. Contents

1. Transhumance, migratory, sedentary and stall-feeding system.
2. Advantages and disadvantages of different systems

Learning process

5.1 Transhumance, migratory, sedentary and stall-feeding system

Transhumance system

This system is adopted in high Himalayan areas where herds of yaks, chauries (Yak cattle cross), cattle, sheep, goats and horses migrate from one place to another throughout the year. Livestock move together in an annual cycle according to their requirement and grazing availability at different altitudes. Yaks occupy an ecological niche at high altitudes (3000-5000 m), Chauries move between 1500 and 4000 m. plant growth is limited by cold weather and a short growing season. Barely, buckwheat and potato are the major crops. Crop production is less efficient due to the long time required for crops to mature. Vegetation at higher altitude is only accessible for grazing in summer (July- September). There after herds are moves to lower areas for winter (December- March), however Yak are adapted only to cold climates and are seldom below 2500 m.

Migratory system

This system utilizes forage resources from the alpine pastures during the monsoon and crop stubble and fallow land in winter. During upward and downward migrations undergrowth in the forest region is the major forage sources. Livestock provides milk and fibre and their dried manure is a major source of energy for

cooking. Crossbreed males are used for local transport and also supply meat. Goats and sheep supply meat and fibre. The use of mules, sheep and goats for trading and transport of basic inputs provides an important source of income.

Sedentary system

In this system livestock make grazing during days and return to shelter in the evening. The main grazing areas in summer are scrubland and community grazing land around the village. The sedentary population consists of work oxen, dry buffaloes, and a small number of cattle. This system prevails in the lower altitudes of the hills (900-1000 m) and utilizes all the available forage in and around villages. Cattle, buffalo and goats are main grazing livestock. Forages include grazing in the forest on cultivated land after harvest and fallow land, also crop residue from paddy, maize, millet, wheat, mustard, soybean, and vegetables, grass gathered from terraces and forests, as well as tree fodder gathered from farmer-owned trees and forest trees. The grazing area is usually degraded and gully formation and soil erosion evident. Animals spend more than half their grazing, but most of the feed is crop by products and tree fodder in winter and grasses and weeds from crop land in summer which is offered evening and morning.

Stall feed system

This is mainly found in Terai and low hills (900m) and peri-urban areas with milking buffalo and exotic or crossbreed cattle. It is governed both by the availability of community grazing land and the steepness of the terrain, which may mean that other classes of livestock are also kept under stall feeding. The system prevails in areas of intensive cultivation (Three crop sites), where the availability of crop by-product is adequate to feed the animals in winter. In addition to crop by-products, tree fodder, grasses and weeds from land are an important forage source.

5.2 Advantages and disadvantages of different systems

Stall feed system

Advantages-

- Minimize aggression and injury among sows
- Reduce competition for resources

- Allow individual feeding
- Assist in the control of body condition sow sows and goat to not become too thin or too fat
- Provide for the safety of the worker

Disadvantages-

- Restriction of movement and exercise
- Restricts ability to perform foraging behaviors
- Sows and goats have limited social interaction

Group grazing system

Advantages-

- Freedom of movement and exercise
- social interaction

Disadvantages-

- Aggression and injury
- Uneven body conditions

Assessment

A. Very short Answer Question

1. Meaning about transhumance system
2. Meaning about stall-feeding system

B. Short Answer Question

1. Details about the farming system of small ruminants
2. Describe the advantages and disadvantages of different farming system

Glossary-

m- Meter

Unit 6
Housing

A. Objectives

- To know about housing system
- To be able to know about site select site for sheep and goat farm
- To be able to know about housing requirement for sheep and goats
- To able to design sheep and goats sheds.

B. Contents

- Site selection for sheep and goat farm
- Housing requirement for sheep and goats.
- Designs for sheep and goat sheds.

Leaning process

Housing in tropical and semi-tropical regions should be kept to a minimum except for the more intensive systems of production. In the arid tropics no protection other than natural shade is required. In humid climates a simple thatched shelter will provide shade and protection from excessive rain. Sheep and goats do not tolerate mud well; therefore yards and shelters should be built only on well drained ground.

6.1. Site Selection for sheep and goat farm

A. Selection of farm site

The following factors should be considered in deciding about the location of farm shed.

1. Market

Farms should be located near to the market so that whatever is produced should reach at the earliest for consumption. Hence, there will be lesser transportation charges and spoilage.

2. Water

There should be assured water supply in the farm.

3. Drainage

There should be proper sanitation and drainage facility in the farm. This will keep goats healthy.

4. Size and slope of area

The area for the farm should be of adequate size usually from one to two hectares and nearly square in shape. One should avoid having farm shed on both sides of a road or rail track.

5. Sun exposure and wind protection

The farmstead should be located t0 get maximum sun exposure in the north-side and the minimum in the south. A site with many trees around is ideal as it will stop strong prevailing winds while acting as wind breaks and also will provide natural shade.

6. Miscellaneous points

The farmstead should be located preferably nearer to an all weather road. There should be round the clock supply of electricity to the farm. Other facilities like availability of telephone. School for children pf farm workers, post office, shopping center and entertainment has also to be considered.

6.2. Housing requirement for sheep and goats

A. Construction of floors

The floors shall be hard impervious to water and easy to clean. The floor may be of (1) cement concrete or pared with cement concrete, (2) stone slab flooring, (3) brick on-edge flooring and 4) morum or kankar flooring. The best but costliest floors are of cement concrete which may be made only in milking barns, stores, etc. where strength, cleanliness and imperviousness of floors are important. Generally floors may be made of stone slabs or brick on edge linings. Moorum or kanker floors are cheapest but are messy and require construction maintenance. Moorum floors are suitable for goat. Wooden floors are also warm and can be tried in temperate Himalayan regions. The floors shall have a gradient of one in 40 to one in 60 towards the drains so that water can drain easily. Special care should be taken to make he surface of floors rough and non-slippery in milking barns, passages leading

to milking barns-pens etc. The surface of cement floors can be roughened by imprinting the impression of a piece of expanded metal or suitable wire mesh on the surface while the concrete is still moist.

Bedding for goat

Deep, clean dry straw can provide an ideal bed for weaners and growers during cool period, but a thin layer of straw is likely to be more suitatble during warm or hot weather conditions. Perforated or slolted floors are almost certain to be drier and more hygienic than solid floors with minimum bedding to make it more suitable for humid and high rainfall weather housing. The type of floor which provides both comfort and cleanliness with minimal risk of injury should be given preference. The optimum floor space requirement to provide healthy and clean micro environment have been recommended in table I on the basis of scattered information.

Table 1: Optimum floor space requirement per goat

Sl.No	Category of goat	Floor space requirement (sq.m)
1	Adult goats	1.25 to 1.5
2	Bucks	2
3	Lactating & pregnant goats	2
4	Kids 7 to 90 days	0.5 to 0.6
5	3 to 6 months	0.7 to 0.9
6	6 to 12 months	1

B. Rooting materials

There are two types of roofs -sloping and flat. Flat roofs are preferred in low rainfall areas while sloping roofs are desirable in medium to heavy rainfall areas. There are several materials available for roofing the farm building including tiles, slates, asbestos and aluminum sheets, wood, thatch, bamboo etc. Asbestos and aluminum sheets have many advantages. These being light materials do not acquire heavy roof supporting structures.

Wood makes the most comfortable roof, being a good insulator but liable to fire risks and is quite costly. Tiles and slates are cumbersome to fix and require heavy supporting structures.

Thatch and bamboo are most readily available and cheap materials. These are good insulators and can be put over rough and cheap trusses. Though initial investment on thatch roofs is small they are costly in the long run due to high cost of maintenance and frequent replacements. However, these are unhygienic especially during monsoon and harbour insects, flies, cobwebs and vermin and are highly prone to fire hazard. The slope of a roof is expressed as its pitch angle of slope with the horizontal level. The pitch should be 35^{o} for thatched roof, 25^{o} to 30^{o} for a tile roof and 12^{o} to 18^{o} for a sheet roof. The pitch angle should not exceed 45^{o} at any rate.

In loose house the roof are mostly supported on pillars. Pillars may be built either of stones, columns of bricks 1aid in cement mortar, cast iron pipes or hard wooden posts. Each of them shall be placed at an interval of two to three metres depending on the span and type of roof. The approximate width or diameters of pillars made are as given below.

- Brick 45x35 cm or (2 lengths and 3 widths of 9"x4.5" bricks).
- Timber 10xlO cm (rectangular pillars) 15 cm diameter (round poles)
- Stone 10xl0 cm or 8x15 cm
- Iron pipes 10 cm diameter

In hot regions a ceiling of wooden planks, stout country cloth, old gunny bags, tarpaulin, compressed or loose straw or wooden planks should be fixed to the underside of the roof for heat insulation. For similar reason, the upper surface of roof may be painted white (which reflects back radiation) while the under surface is painted with dark colors. It is preferable to fit all the roofs at their eves with a 15 cm half galvanized sheet gutter to convey and discharge rain water at a suitable spot for easy drainage. In dry regions, the water can be diverted and stored in tanks for future use.

C. Height and shape of roof

The height of the roof at centre in 'A shaped' should vary between 3-3.5 metres. A height of less than three metre interferes with proper ventilation resulting in reduced heat loss from animals.

In temperate and hot humid climate, where more height does not prove any additional benefit, a height of three metre will be appropriate. A shaped roof is definitely better for hot climatic regions. In the hot weather one side of 'A shaped' roof saves the other half from, direct solar radiation by casting its shadow. This helps in cutting down heat gain from the roof of the shelter. Double roof with both roofs of same or different materials are effective in reducing the heating of shed in hot weather conditions.

D. Ventilation

Ventilation in animal houses serves to remove heal, moisture, carbon di-oxide, dust, noxious gases and microbes and replace them with a supply of fresh air. Hot humid weather conditions during certain part of the year are considered to be more critical for goat housing. In both north-south and east-west oriented sheds ten per cent ventilation space provided more protection from cold by keeping the minimum temperature higher than that with 25% ventilation space.

E. Walls

The walls may be constructed of Stone, bricks, mud or bamboo or any other material suitable for the locality and climate. Stone or brick walls are costly but durable and hygienic. Bamboo and mud walls are economical and useful but are temporary and are difficult to keep hygienic. Concrete walls are 10-12 cm thick and reinforced with steel bars along with their length and height are strongest and best but are very expensive. Walls supporting the roof and wall portions with which farm animals come in direct contact must be robust. Materials such as brick, stone, or cement concrete may be best at least for the lower parts of the walls.

For ordinary walls, should not exceed 35 cm thickness. Partition walls and walls lining the open area should be 22.5 cm thick. Height of walls shall be two to 2.5 m for houses with sloping roofs. Walls and partition can also be made of galvanized corrugated iron or asbestos sheets by fixing to posts. 2.5 to 3 m apart, usually the inner face of walls is plastered and the outer one is painted.

F. Foot bath and spray race

These are important in protecting animals from contagious diseases and pests. A

foot bath is a lank measuring 6x3 m at the bottom, 12 mx4m on top and 0.3 m deep and is constructed near the entrance. This tank is filled with a germicidal solution. Animals and carts entering and leaving the farm walk through this solution and in the process, the animal's feet or the wheels of vehicles get disinfected. Thus, no disease producing vehicles get disinfected. Thus, no disease producing germs will be brought into the farm through in coming vehicles and animals.

Spray races are for spraying insecticide solutions on animals for controlling insect pests. A spray race is a 2.5x1.8 m passage with a slope of one in 40 towards one end. Showers or sprayer nozzles are fixed overhead at a height of two metres above tI1e platform and along the sides. The surface of the platform is kept rough to prevent the animals from slipping. Animals are taken on to the platform one by one along an enclosed passage and sprayed with insecticides or bactericides to protect them from flies, insect and bacteria. The excess liquid spray straining out of the platform can be collected in a tank and can be reused.

G. Farm fences

A farm fence locates the boundary and protects the animals. It serves a shelter and improves the attractiveness and value of the farm. The fence must be light, strong and durable. On farm fences are required for enclosing the farm premises, fields and pastures. Also, fences can be used instead of walls to enclose the open lots of animal sheds. Barbed wire fences are necessary for enclosing farm area. For enclosing open lots of animal sheds, fences can be made of iron or wooden rails, wooden poles, metal tubing. Wooden boards or plain woven wire strands. Live thorny hedges can also be used as farm fences in dry areas. A wooden fence can be put up in areas where timber is cheap. It occupies less space and can easily be created and removed. Wooden fences are good for enclosing open lots of animal sheds. Electric fences can be dangerous to men and animals. Fence controllers, wires, switches etc. should be purchased from standard firms and got installed by experts. Men working on farms and people around should be educated about the wire fence and necessary safety precautions against accidents to both men and animals should be taken.

6.3. Designs for sheep and goat sheds.

Floor

- The flooring may be either of moorum or of strong wooden battens and, where the rainfall is quite heavy; the latter type of flooring may be preferred.
- In the case of wooden-batten flooring, the width of each plank shall vary from 7.5 to 10.0 cm and the thickness between 2.5 cm and 4.0 cm.
- The sides of the planks shall be well rounded and the clearance between two planks shall range between 1.0 cm and 1.5 cm to facilitate the disposal of dung and urine.
- The wooden-batten flooring shall be constructed at a height of at least one metre above the ground level.
- In this case, a suitable ramp or steps of wooden planks shall be provided.
- In the case of moorum flooring, a plinth wall between 15 cm and 30 cm in height shall be provided.
- For the shearing and store room and shepherd's house, the flooring may be of moorum or brick in cement mortar, and the floor shall be levelled properly.

Roof

- The roof may be made gabled.
- The roofing material may be either plain or corrugated galvanized steel sheets or asbestos cement sheets and where the rainfall is not heavy, it may be of thatch.


Gate

- Each shed may be provided with one or more gates either on the long or broad sides of the sheds depending upon the dimensions of the shed.
- The dimensions of each gate may be 0.8 m broad and one metre high. The gate leaf and frame may be made of wooden battens. It shall fit the entrance closely.


Manger

- The manger may be either of cement concrete or of wood with two compartments for providing feed and hay.
- A separate hay rack may also be provided by fixing at level or slightly below the heads of the animals.
- With the help of clamps, the manger may be raised within the height ranging between 450 and 600 mm from the ground.
- The water trough may be of cement concrete or galvanized steel pails or buckets and may be fixed or hung from a hook fixed to the walls.
- The manger may also be of portable type. The number of mangers and water

troughs in each shed may vary according to the number of animals.

Manger and water trough

Manger and water trough

Manager and Water trough

Manager and Water trough

Dipping tank

- To protect the animals from infection a dipping tank may be made either of galvanized steel sheets or constructed of stone or brick in cement mortar, whichever is likely to prove economical, according to local conditions.
- If a galvanized steel tank is used, it shall be well bedded down and the soil rammed tight against it to prevent the sides of the bath from bulging when it is filled.
- If the base of the soil is unstable, the tank may be bedded in cement concrete.
- The dipping tank may be at one side of the yard.

Dipping tanks

Source: www.agritech.tnau.ac.in/expert_system/sheepgoat/Housing%20of%20sheep%20and%20goats.html

Footbath

- A footbath made of galvanized steel sheets or brick in cement mortar shall be provided at the entrance to the yard to protect the animals.
- These baths may be embedded in the soil suitably**.**

Assessment

A. Very short Answer Question

1. Define housing?
2. List out the housing requirement of sheep and goat farming.

B. Short Answer Question

1. Point wise listing on site selection in details.
2. Layout design for sheep and goat sheds.

C. Long Answer Question

1. Define housing? Describe the site selection for goat and sheep farming.
2. Describe the housing requirement for sheep and goat.
3. List and describe the requirement for sheep and goat housing system.

Glossary

cm- Centimeter

m- Meter

Unit 7

Digestive Physiology of Small Ruminant

A. Objectives

- To study about to digestive organs of small ruminants.
- To demonstrate functions of different part of digestive system.
- To know mechanism of digestion in sheep and goats.

B. Contents

1. The digestive organs of small ruminants.
2. Function of different parts of digestive system.
3. Mechanism of digestion in sheep and goats.

Learning process

1. The digestive organs of small ruminants
2. Function of different parts of digestive system

Introduction

Mature goats are herbivorous ruminant animals. Their digestive tracts, which are similar to those of cattle, sheep, deer, elk, bison, and giraffes, consist of the mouth, esophagus, four stomach compartments, small intestine, caecum, and large intestine. A brief description of the anatomy and physiology of the mouth and the stomach compartments of goats are as follows.

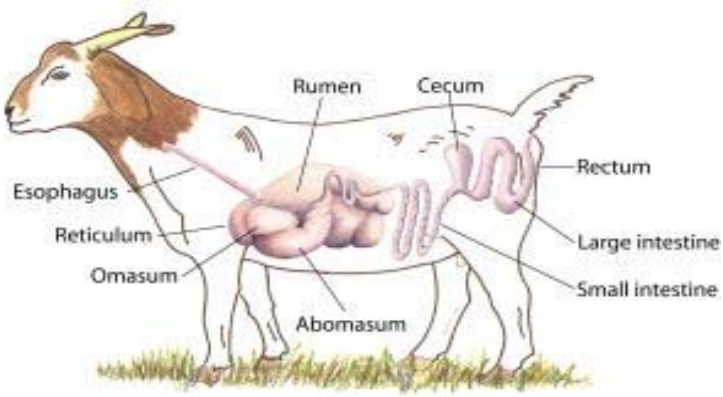


Fig. Digestive system of Goat (source-article.extension.org/pages/19363/goat-nutrition-gi-tract)

Mouth

Like other ruminant animals, goats have no upper incisor or canine teeth. They depend on the rigid dental pad in front of the hard palate, the lower incisor teeth, the lips, and the tongue to take food into their mouth.

Esophagus

This is a tube like passage from the mouth to the stomach. The esophagus, which opens into the stomach at the junction of the rumen and reticulum, helps transport both gases and cud.

Rumen

This is the largest of the four stomach compartments of ruminant animals. The capacity of the rumen of goats ranges from 3 to 6 gallons depending on the type of feed. It is lined with small finger like projections called papillae, which increase the absorptive surface of the rumen. This compartment, also known as the paunch, contains many microorganisms, such as bacteria and protozoa that supply enzymes to break down fiber and other feed parts. Microbiological activities in the rumen result in the conversion of the starch and fiber of feeds to the volatile fatty acids acetic, propionic, and butyric acids. These volatile fatty acids are absorbed through the rumen wall and provide as much as 80 percent of the animal's total energy requirements. Microbial digestion in the rumen is the reason that ruminant animals effectively use fibrous feeds and are maintained primarily on roughages.

Rumen microorganisms also convert components of the feed to useful products such as essential amino acids, B-complex vitamins, and vitamin K. Afterward, the micro-organisms themselves are digested in the small intestine to free up these nutrients for the ruminant animal's use. In the process of digesting feeds, rumen microorganisms also produce large amounts of gases, primarily methane and carbon dioxide. The animal normally eliminates these gases by eructation (belching). When the gases are produced faster than the animal can eliminate them, a potentially lethal condition known as bloat can result. This condition is often associated with the rapid consumption of large amounts of leguminous vegetation.

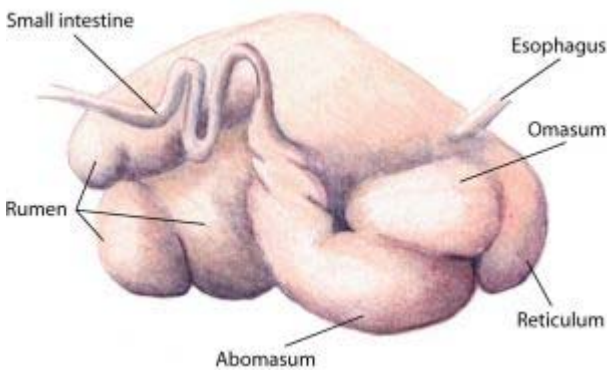


Fig- Four stomach of goat (source-article.extension.org/pages/19363/goat-nutrition-gi-tract)

Reticulum

This compartment, also known as the honeycomb or hardware stomach, is located just below the entrance of the esophagus into the stomach. When goats swallow foreign objects such as wire, nails, and screws, these objects can become lodged in the reticulum, potentially causing serious injury. The reticulum is part of the rumen separated only by an overflow connection, the rumino-reticular fold. Therefore, microbial action also takes place in this compartment. The capacity of the reticulum of goats ranges from ¼ to ½ gallon.

Omasum

This compartment, also known as the many plies, consists of many folds or layers of tissue that grind up feed ingesta and squeeze some of the water from the feed. The capacity of the omasum of goats is approximately 1/4 gallon.

Abomasum

This compartment is often considered the true stomach of ruminant animals. It functions similarly to human stomachs. The mucosa of the fundus contains parietal cells, which secrete hydrochloric acid, and chief cells, which secrete the enzyme pepsin. This enzyme is secreted in an inactive form (pepsinogen), which is then activated by hydrochloric acid. Pepsin is responsible for breaking down feed proteins before they enter the small intestine. The pylorus, which is the terminal portion of the abomasum, is characterized by secretions that are largely mucous. The capacity of the abomasum of goats is approximately 1 gallon.

Small Intestine

As partially digested feed enters the duodenum, the fist part of the small intestine, the enzymes produced and secreted by the pancreas and the Brunner's glands of the duodenum further break down feed nutrients into simple compounds. These compounds are absorbed into the bloodstream or lymph by an active process carried on largely in the jejunum and ileum (second and third part of the small intestine, respectively). The small intestinal wall is lined with many small figerlike projections called villi, which increase the absorption area of the small intestine. The capacity of the small intestine of goats is approximately 2 ½ gallons.

Cecum

This simple tubular structure, also known as the blind gut, is located at the junction of the small and large intestines. Feed materials entering this compartment are digested by inhabiting microorganisms. The capacity of the cecum of goats is approximately 1/4 gallon.

Large Intestine

Undigested feed and unabsorbed nutrients leaving the small intestine pass into this compartment. The functions of the large intestine include water absorption and further digestion of feed materials by microorganisms. The large intestine is comprised of the colon and rectum. Fecal pellets are formed in the end portion of the spiral colon. The capacity of the large intestine of goats ranges from 1 ¼ to 1 ½ gallons.

Accessory Glands

The salivary glands, liver, and pancreas contribute to digestion. Saliva secreted by the salivary glands is important in the chewing of the cud. Bile produced by the liver, and stored and secreted by the gall bladder, helps emulsify fat in preparation for digestion. Enzymes secreted by the pancreas are important in the small intestinal digestion of carbohydrates, proteins, and fats

1.3 Mechanisms of digestion of sheep and goat

Digestion of the Various Foods by Hydrolysis

Hydrolysis of Carbohydrates. Almost all the carbohydrates of the diet are either large polysaccharides or disaccharides, which are combinations of monosaccharides bound to one another by condensation. This means that a hydrogen ion (H+) has been removed from one of the monosaccharides, and a hydroxyl ion (-OH) has been removed from the next one. The two monosaccharides then combine with each other at these sites of removal, and the hydrogen and

hydroxyl ions combine to form water (H2O). When carbohydrates are digested, the above process is reversed and the carbohydrates are converted into monosaccharides. Specific enzymes in the digestive juices of the gastrointestinal tract return the hydrogen and hydroxyl ions from water to the polysaccharides and thereby separate the monosaccharides from each other. This process, called hydrolysis.

Actually, the digestion of carbohydrates initiates from the mouth cavity. Carbohydrates are attacked by a number of amylase present in the saliva of mouth cavity. In stomach, HCL also aids in the hydrolysis of polysaccharides but most of the hydrolysis is due to the pancreatic and intestinal amylase. Disaccharides are digested into their monosaccharides byu respective disaccharides.

Salivary amylase

Starch + Glycogen ⟶ Maltase + Isomaltose

Hydrolysis, HCl Pancreatic and intestinal amylase

Intestinal maltose

Maltose + Isomaltose ⟶ Glucose + Glucose

Isomaltose

Intestinal Sucrose

Sucrose ⟶ Glucose + Fructose

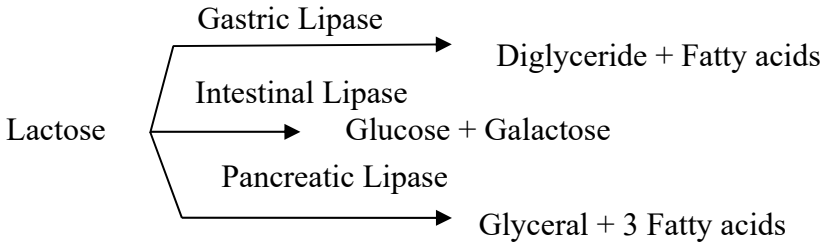
Intestinal Lactose

Lactose ⟶ Glucose + Galactose

Hydrolysis of Fats

Almost the entire fat portion of the diet consists of triglycerides (neutral fats), which are combinations of three fatty acid molecules condensed with a single glycerol molecule. During condensation, three molecules of water are removed. Digestion of the triglycerides consists of the reverse process: the fat digesting enzymes return three molecules of water to the triglyceride molecule and thereby split the fatty acid molecules away from the glycerol. Here again, the digestive process is one of hydrolysis.

Emulsification of fats initiates due to secretion of bile salts from the gall bladder. Fat must be emulsified to provide sufficient surface area for efficient digestion of triglycerides. Bile salts serve to keep the cholesterol in solution. Decreased ration of bile salts to cholesterol may lead to the formation of gall stones. In the intestine, the triglycerides is converted into glycerides and free fatty acids by the action of lipase. Gastric, intestinal and pancreatic lipase aids in the digestion. The pancreatic lipase is most important three. Any disturbance in pancreas can result in fat mal absorption.



Hydrolysis of Proteins

Proteins are formed from multiple amino acids that are bound together by peptide linkages. At each linkage, a hydroxyl ion has been removed from one amino acid and a hydrogen ion has been removed from the succeeding one; thus, the successive amino acids in the protein chain are also bound together by condensation, and digestion occurs by the reverse effect hydrolysis. That is, the proteolytic enzymes return hydrogen and hydroxyl ions from water molecules to the protein molecules to split them into their constituent amino acids. Therefore, the chemistry of digestion is simple because, in the case of all three major types of food, the same

basic process of hydrolysis is involved. The only difference lies in the types of enzymes required to promote the hydrolysis reactions for each type of food. All the digestive enzymes are proteins. The digestion of protein starts from stomach. Mainly, gastric and pancreatic enzymes are involved in the digestion of protein. These enzymes are started and secreted in an inactive form. There are a number of pepsinogens which act in different physiological conditions. But the most important pepsinogen in believed to be the pepsinogen secreted by gastric mucosa. The enzymes pepsin converts protein into proteoses, peptones and polypeptides.

$$\text{Protein} \xrightarrow{\text{Pepsin}} \text{Proteoses + Peptones + Polypeptides}$$

The inactive forms of enzymes are activated by other enzymes at the time of digestion. Trypsinogen is converted into trypsin by the activation of enterokinase, secreted by intestinal mucosa. In turn, trypsin activates other pancreatic proenzymes. The pancreatic endopeptidases reduce protein and large molecules enzymes on different substrates convert protein into aminoacids.

$$\text{Trypsinogen} \xrightarrow{\text{Enterokinase}} \text{Trypsin}$$

$$\text{Chymotrypsinogen} \xrightarrow{\text{Trypsin}} \text{Chymotrypsin}$$

$$\text{Protein + Large molecule} \xrightarrow[\text{(proteoses,Peptones)}]{\text{Pancreatic endopeptidases}} \text{Peptides}$$

Absorption of digested food stuffs

In simple stomach, absorption is very limited under normal conditions. Proteins are partially degraded, fats are hydrolyzed only to some extent and carbohydrates are not absorbed in sufficient amount. The small intestine is the chief site of absorption. The mucus membrane of small intestine consists of numerous tiny finger like projection known as villi. The villi may differ in form and length in different species. Highly developed system of villi provides a greater surface area for absorption. The luminal side of the epithelial cells of villus is covered with finger

like projections called microvilli.

Monosaccharides are absorbed for the most part in the portal blood and are carried to the liver. Disaccharides do not enter the blood due to presence of their respective disaccharides in the brush border of the mucosa. For absorption, the disaccharides must be converted into monosaccharides. The free amino acids are mainly absorbed in small intestine by an active, energy requiring system. Absorbed amino acids enter the circulation almost exclusively absorbed by passive diffusion and mostly enter the mesenteric venous blood. Na, Cl, K ions are absorbed in the intensive but Na ion play important role. Other minerals, salts (organic / inroganic) vitamins etc. are also absorbed from the intestine. Therefore, the end products of digestion are absorbed into the blood or lymph.

Stomach Movement

Stomach movement in simple stomach (non-ruminants)

The stomach is chiefly composed of smooth muscles. Relaxation of cardia is essential for food to enter the stomach. In simple stomach, the 1st food consumed when the stomach is empty travels to the pyloric end of the stomach. Foods subsequently swallowed tend to become stratified (form layers) as stomach fills. Movements in the stomach are controlled by the autonomic nervous system which is increased by parasympathetic stimulation and inhibited by the sympathetic activity. The gastric movements are of 3 main types: they are hunger contraction, filling and emptying of these, filling and emptying are important from digestion point of view.

1. **Filling:** The muscles of the stomach wall progressively relax as more and more food enters it and as a result the stomach gets expanded. When food is present the stomach muscles bring about vigorous movements facilitating thorough mixing of food with digestive juices.
2. **Emptying:** The peristaltic waves in the stomach propel the food towards the pyloric sphincter. However, the emptying of materials across the pylorus depends upon the relative pressures in the stomach and duodenum, the opening of the pyloric sphincter and the fluidity of gastric contents.

a. Hunger Contractions. Besides the peristaltic contractions that occur when food is present in the stomach, another type of intense contractions, called hunger contractions, often occurs when the stomach has been empty for several hours or more. They are rhythmical peristaltic contractions in the body of the stomach. When the successive contractions become extremely strong, they often fuse to cause a continuing titanic contraction that sometimes lasts for 2 to 3 minutes. Hunger contractions are most intense in young, healthy people who have high degrees of gastrointestinal tonus; they are also greatly increased by the person's having lower than normal levels of blood sugar. When hunger contractions occur in the stomach, the person sometimes experiences mild pain in the pit of the stomach, called hunger pangs. Hunger pangs usually do not begin until 12 to 24 hours after the last ingestion of food; in starvation, they reach their greatest intensity in 3 to 4 days and gradually weaken in succeeding days.

Development of the four stomach compartments

When a goat kid is born, the rumen is small and the abomasum is the largest of the four stomach compartments. The rumen of a goat kid is about 30 percent of the total stomach area, while the abomasum is about 70 percent. Hence, digestion in the goat kid is like that of a monogastric animal. In the suckling goat kid, closure of the esophageal groove ensures that milk is channeled directly to the abomasum instead of going through the rumen, reticulum, and omasum. Peptic cells in the abomasum of young milk-fed ruminants secrete, in addition to pepsin, the enzyme rennin. This enzyme is responsible for forming milk curdles and digesting milk protein. When the suckling goat kid starts to eat vegetation during the fist or second week after birth, the rumen, reticulum, and omasum gradually develop in size and function. After approximately two months, the four stomach compartments reach their relative adult proportions

Rumination

Rumination is defined as the regurgitation, rechewing, and reswallowing of rumen ingesta. During resting, animals with four stomach compartments regurgitate ball-like masses of firous and coarse feeds called bolus or the cud. The regurgitated cud

is chewed thoroughly for about one minute then swallowed again. Ruminant animals may spend up to 8 hours per day in rumination, depending on the type of feed. This phenomenon affects the amount of feed the goat can eat. Reducing the particle size of the feed through rechewing allows the material to be easily accessible to the microorganisms and to pass out of the rumen.

Summary

Digestion in ruminant animals is accomplished via microbial breakdown of feed parts in the rumen and reticulum, enzymatic activity in the abomasum and small intestine, and microbial breakdown in the cecum and large intestine. The simple compounds derived from the digestion of carbohydrates, proteins, and fats are absorbed mainly from the forestomach and small intestine.

Assortment

A. Very short Answer Question.

1. List out the part of digestive system of small ruminants.
2. What do you mean by digestive physiology of small ruminants?
3. List out the part of small ruminant's stomach.

B. Short Answer Question.

1. Describe and well label diagram of digestive system of small ruminants.
2. Details about ruminants stomach with diagram.

C. Long Answer question.

1. Describe the function of different parts of digestive system of small ruminants.
2. Describe the mechanism of digestion in sheep and goat.

Unit 8

Reproductive Physiology of Small Ruminant

A. Objective

- To demonstrate structure of male and female reproductive organs.
- To study about function of male and female reproductive organs/ system.
- To study about to hormonal control of male and female reproduction.
- To study about sexual cycle, detection of heat and gestation period of sheep and goat.

B. Contents

1. Structure and function of male and female reproductive organs
2. Hormonal control of male and female reproduction.
3. The sexual cycle, detection of heat and gestation.

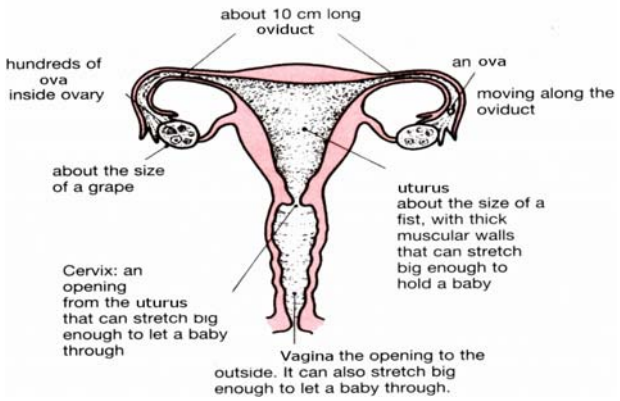
Learning process

8.1 Structure and function of male and female reproductive organs

Female reproductive system

The reproductive tract of ewes and does is similar. The female reproductive tract consists of the vulva labia, vagina (copulatory organ), cervix, body of the uterus, uterine horns, oviduct (also called Fallopian tube) and the ovary.

1. **Ovaries:** The ovaries contain the ova (eggs), and secrete female reproductive hormones (progesterone and estrogens).



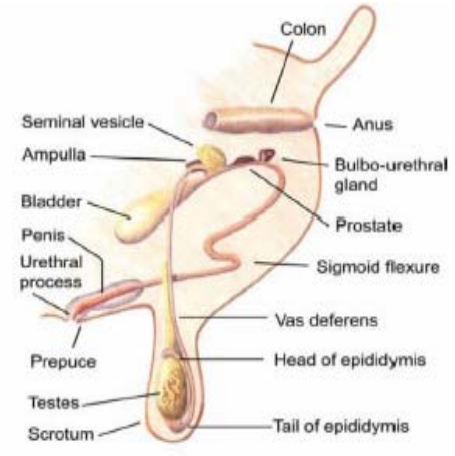
Female reproductive organ

(source-http://vikaspedia.in/agriculture/livestock/sheep-and-goat-farming/castration-of-ruminants-1

2. **Oviduct:** The oviduct opens like a funnel (the infundibulum) near the ovary. The infundibulum receives ova released from the ovary and transports them to the site of fertilization in the oviduct. The oviduct is involved in sperm transport to the site of fertilization, provides a proper environment for ova and sperm fertilization, and transports the subsequent embryo to the uterus.
3. **Uterus:** The uterus consists of two separate horns (coruna)**.** In animals with multiple births, each horn can contain one or more fetuses. The uterus provides a proper environment for embryo development, supports development of the fetus (supplying nutrients, removing waste, and protecting the fetus), and transports the fetus out of the maternal body during birth.
4. **Cervix:** The cervix is the gateway to the uterus and is a muscular canal consisting of several folds of tissue referred to as "rings." The cervix has relatively little smooth musculature. It participates in sperm transport, and during pregnancy, blocks bacterial invasion. The mucus produced during pregnancy (also during the luteal phase) forms a plug that makes the opening through the cervix impermeable for micro-organisms and spermatozoa.
5. **Vagina:** This is the exterior portion of the female reproductive tract and is the site of semen deposition during natural mating.
6. **Vulva:** barrier for preventing external contamination of the female reproductive tract.

Male reproductive system

The male reproductive system consists of testicles, which produce sperm and sex hormones, a duct system for sperm transport, accessory sex glands, and the penis, or male organ of copulation, which deposits semen in the female.



Male reproductive system

(source-http://vikaspedia.in/agriculture/livestock/sheep-and-goat-farming/castration-of-ruminants-1

1. **Testes:** The testes are paired organs which descend from the abdominal cavity during fetal development to lie in the scrotum. They produce the male gametes (spermatozoa) and secrete the male sex hormone, testosterone. Testosterone is essential for the development of male characteristics, maintaining normal sexual behavior and sperm production.
2. **Scrotum:** The scrotum is a muscular sac containing the testes. It supports and protects the testes and also plays a major role in temperature regulation. It maintains the temperature 3 to 5 C below body temperature for optimal function.
3. **Single versus split scrotum:** This could be breed-specific as in Somali goats. Some breeders consider the split scrotum as an undesirable trait and select against it. However, the important thing is to check if equalsized testicles are present and sperm production is normal.

Scrotum types - Single scrotum Partially split scrotum Split scrotum

Source- http://vikaspedia.in/agriculture/livestock/sheep-and-goat-farming/castration-of-ruminants-1

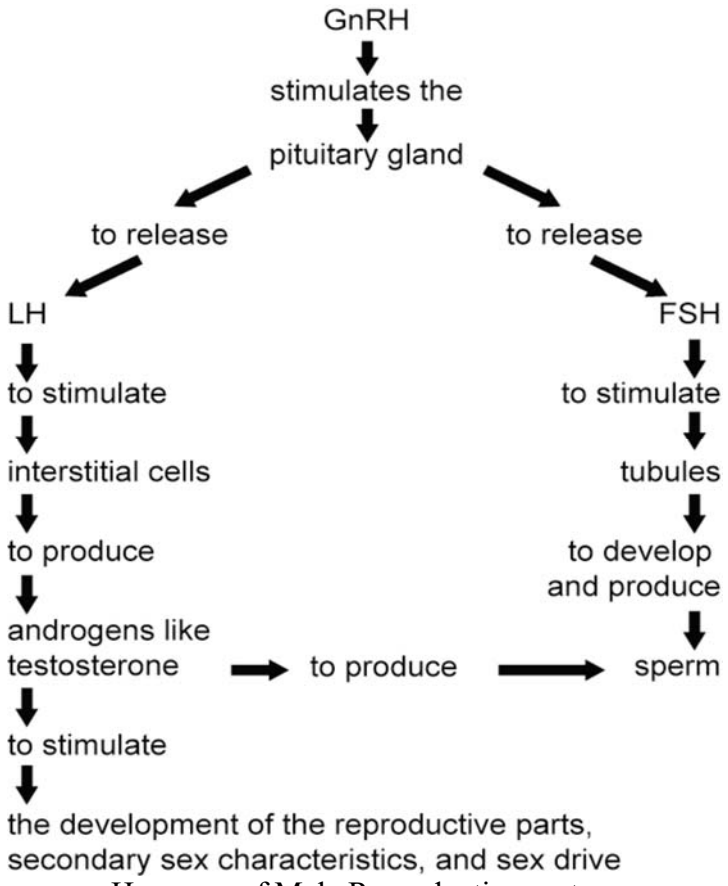
1. **Vas deferens:** The vas deferens is the duct that rises from the tail of the epididymis into the abdomen, where it joins the urethra at the neck of the bladder. It is often referred to as the 'spermatic cord.' Removal of a section of the vas deferens in each testis is known as a vasectomy, preventing passage of sperm from the epididymis.
2. **Accessory sex glands:** The accessory sex glands include the bulbo-urethral, prostate, and seminal vesicle glands and the ampulla. Accessory glands secrete additional fluids, which when combined with the sperm and other secretions from the epididymis, form the semen. Some of the secretions contain nutrients like fructose while others produce alkali secretion to raise the pH of the ejaculate. These secretions are added quickly and forcibly during the mating to propel sperm into the urethra.
3. **Penis:** This is the final part of the male reproductive tract and its function is to deposit semen into the vaginal tract of the female. At the end of the penis is a narrow tube called the urethral process (or 'worm') that sprays the semen in and around the cervix of the ewe/doe. The preputial sheath protects the penis, except during mating

8.2 Hormonal control of male and female reproduction

Male Hormones

A hormone is a chemical substance secreted by an organ of the body. When released into the bloodstream, it triggers a specific response in another organ. Reproductive

hormones affect the activity of the parts of the reproductive system. Gonadotrophin releasing hormone (GnRH) is a reproductive hormone produced by the hypothalamus gland, which is found in the brain; GnRH is not present in fowl. The anterior lobe of the pituitary gland secretes follicle stimulating hormone (FSH) as well as luteinizing hormone (LH). LH is also sometimes referred to as interstitial cell stimulating hormone (ICSH). The sex hormones that control male reproductive development and behavior are collectively called androgens. The androgen testosterone is produced in the testicles of all the species except rabbits, which produce another androgen.



Hormone of Male Reproductive system

Source- https://dese.mo.gov/sites/default/files/aged-Animal-Repro-Student-Ref..pdf

The Role of Male Sex Hormones

Hormones play an important role in reproduction. A delicate balance exists among the various hormones. Figure shows the connections between the different reproductive hormones and parts in mammals.

In mammals, GnRH stimulates the anterior pituitary gland in the brain to release both FSH and LH, which are essential to reproduction. In fowl, the release of FSH from the pituitary is stimulated by increased light. FSH affects the tubules in the testicles, causing them to produce sperm. LH causes the interstitial cells in the testicles to secrete androgens.

Androgens like testosterone stimulate the development, growth, and activity of reproductive parts. The production of androgens triggers a maturing stage called puberty, in which the reproductive parts mature as the ideal hormone level is reached. Testosterone and other androgens also trigger the development of male secondary sex characteristics. These characteristics may include a deep voice, heavy muscling, and aggressiveness. Sex drive, which is the desire and ability to mate, is similarly stimulated by androgens. They also function in the production of sperm.

Female Hormones

Hormones are vital to reproduction. They cause the organs of the reproductive system to develop and prepare the body of the female for producing offspring.

Some of the hormones produced by females are also found in males. For example, as in the male, gonadotrophin releasing hormone (GnRH) is produced by the hypothalamus. Follicle stimulating hormone (FSH) and luteinizing hormone (LH) are also secreted from the anterior pituitary gland. Other hormones, however, are unique to the female, such as estrogen, which is secreted by the follicles in the ovary. Another hormone produced in the ovary is progesterone, which is secreted by the corpus luteum, a body that develops from a follicle that has released an ovum. The hormone prostaglandin is released by the uterus.

Fowl differ not only in the parts of the reproductive system but also in the number of hormones produced. Their bodies secrete only four major sex hormones. FSH

and LH are released by the anterior pituitary gland, and estrogen and progesterone are secreted by the ovary. While these hormones are found in the other species, their functions differ in fowl.

The Role of Female Sex Hormones

Hormones regulate and develop the reproductive system. The hormones must interact in a balanced manner to ensure the proper development and functioning of the reproductive system. Figure graphically illustrates the female hormone cycle.

As it does in the male, GnRH stimulates the pituitary to release FSH and LH. In the female, FSH stimulates the follicles in the ovaries to develop a mature ovum. FSH also triggers the secretion of estrogen.

Estrogen causes the sex organs and secondary sex characteristics to develop and stimulates a desire to mate. Estrogen has an effect on other hormones as well; when estrogen is released, it suppresses the production of FSH and encourages the production of LH by the pituitary. Estrogen also causes uterine contractions that aid in transporting sperm to the oviduct to fertilize the egg.

LH causes the follicle to release the egg, a process referred to as ovulation. In addition, this hormone develops the corpus luteum, also known as the yellow body, from the follicle after the egg is released.

The hormone progesterone, secreted by the corpus luteum, stops the production of FSH and LH. It thus prevents follicle development and the secretion of estrogen.

The hormones then play different roles depending on whether the egg is fertilized or not. If the egg is fertilized, the corpus luteum stays in place, and progesterone is produced to maintain the pregnancy by preventing uterine contractions and triggering the release of secretions to nourish the fertilized egg. Progesterone also blocks ovarian activity by inhibiting the secretion of GnRH. If the egg is not fertilized, the corpus luteum deteriorates due to the secretion of prostaglandin in the uterus, ending progesterone production. When progesterone levels are low, GnRH is released and the cycle starts again.

8.3 The sexual cycle, detection of heat and gestation

Reproductive rate is defined as the number of live lambs born per ewe exposed for

breeding. Optimal reproductive rates are essential to profitable sheep production. Optimal reproductive rate varies by farm, production system, and geographic area.

The estrus cycle

Reproduction in non-human mammals is regulated by an estrus cycle. In sheep, the length of the estrus cycle ranges from 13 to 19 days and averages 17 days. The phases of the estrous cycle are proestrus, estrus, metestrus, and diestrus. Estrus is the period of time when the ewe is receptive to the ram and will stand for mating. It lasts approximately 24 to 36 hours.

Ovulation (release of eggs by the ovary) occurs in mid to late-estrus. Metestrus begins with the cessation of estrus and lasts for about 3 days. Primarily it is the period of the formation of corpus luteum (CL). The corpus luteum produces progesterone and maintains pregnancy in the ewe. Diestrus is the period of the estrus cycle when the CL is fully functional.

Proestrus begins with the regression of the CL and drop in progesterone and extends to the start of estrus. Rapid follicular growth is occuring during this period. It usually extends from day 4 to day 13-15 of the cycle. Anestrus refers to a state where the normal cycle stops.

Estrous cycles are usually affected by the seasons. The number of hours daily that light enters the eye of the animal affects the brain, which governs the release of certain precursors and hormones. Most sheep are seasonally polyestrus and short-day breeders. They will begin to exhibit estrus when length of day begins decreasing. They will come into heat every 16 to 17 days until they are bred or return to anestrus.

Some sheep breeds are less seasonal. They breed almost year-round or have an extended breeding season. The less seasonal breeds include Dorset, Rambouillet, Merino, Finnsheep, Romanov, Karakul, and hair sheep. The most seasonal breeds are the British long wool and meat breeds. The closer the flock is located to the equator, the longer the breeding season and the less complete and shorter will be the seasonal anestrus.

Signs of estrus in the ewe are much less pronounced than in the cow or doe and can

usually not be detected unless a ram is present. When mature ewes are in heat, they will seek out the ram and stand still for him to mount them. Sometimes they wag their tails vigorously. They may nuzzle the ram around the belly or scrotum and even try to mount the ram. Young ewes rarely exhibit these behaviors. There is evidence to suggest that rams and ewes prefer to mate with their own breed, but when there is no option ewes will mate with almost any breed of ram.

Reproductive characteristics of ewes

Characteristic	Average	Range
Age of puberty	5 -12 months	5-12 month
Length of estrus cycle (day)	17	13-19
Duration of estrus (hours)	30	18-48
Timing of ovulation	20-30 hours after start of estrus	
Gestation period (days)	146-147	138-149

Estrus sign of sheep and goat

Source-
http://www.agritech.tnau.ac.in/expert_system/sheepgoat/Breeding%20Management%20of%20Sheep%20and%20Goat.htm

- Redden of the vulva and discharge from vulva
- Tail wagging
- Mounting other animal
- Seeking male
- Frequent bleating
- Push her back

- Standing for mating (standing reflex

Conception and Early Pregnancy

When a ewe or a doe is successfully bred to a fertile ram or buck, sperm cells meet the eggs in the oviduct. One sperm cell enters the egg and conception occurs. Maternal recognition of pregnancy in sheep occurs by day 13 and in goats by day 15 following conception. In sheep, embryonic implantation occurs by day 21 after conception. In goats, the fertilized embryo becomes firmly attached to the uterine walls by day 52. Implantation allows nutrient exchange and hormonal communication between the developing embryo and uterus.

Gestation (Pregnancy)

The average gestation length in sheep varies from 142 to 152 days. The average is 147 days. Individual pregnancies may vary from 138 to 159 days. There are breed differences in gestation length. The earlier maturing breeds (e.g. Finnsheep) tend to have shorter pregnancies than the late maturing breeds (e.g. Rambouillet). Ewes carrying multiple births tend to have shorter gestations. Male lambs and heavy birth weight lambs are usually carried longer than female lambs.

The period of early gestation most critical to success during the lambing season is the first 30 days after fertilization. The first 21 to 30 days after breeding is when embryonic implantation occurs. This first 30 days is when most embryonic mortality occurs. Thus, anything that can be done to reduce embryonic mortality and should result in more lambs born.

Shearing, vaccinating, working ewes, pronounced changes in feeding practices should be avoided during the first 30 days of gestation. Ultrasonic pregnancy scanning can be done on ewes from 35 to 60 days after breeding, depending on equipment used and operator skill. Nutrition during early gestation is quite simple. Ewes need only slightly above maintenance levels of nutrition for the first 15 weeks of pregnancy.

Late gestation (last 4 to 6 weeks) is a critical period for ewe reproduction. This is when the majority of fetal growth is occurring, placing increasing nutritional demands on the ewe. Ewes consuming inadequate diets are prone to pregnancy

toxemia and milk fever. Nutrition in late-pregnancy affects the size and vigor of lambs and the milk producing ability of the ewe

Estrus (heat) detection

Accurate detection of estrus is important for high reproduction rates. The external signs of estrus in sow include:

- Marked enlargement of vulva 2 to 8 days before the onset of estrus.
- Reddening and swelling of vulva is sometimes associated with mucous discharge.
- Behavioural changes including restlessness, mounting over other animals, both male and female and allowing mounting by other swine.
- Assumption of mating stance and standing rigidly when pressure is applied to the back.

Fertilization

The process involves penetration comparatively large eggs by a small motile spermatozoon, completion of the maturation process of ovum and fusion of the nuclei to form a zygote nucleus. Spermatozoa must transverse both male and female reproductive tracts to unite with oocytes in the ampulla of the oviduct for fertilization. In most mammals fertilization begins after the first polar body has been extruded, so that the sperm penetrates the ovum while the second reduction division is in progress. The process of fertilization may be described under the following-

The mating of spermatozoa into the egg- The arrival of spermatozoa at the site of fertilization before the egg suggest that sperm must be exposed for at least 1.5 hours to tubal, uterine or vaginal secretion before penetration the cumulus oophorus and xona pellucida of the eggs in the case of sheep and goat. This phenomenon is known as ***capacitation*.** Although the total number of sperm in an ejaculate is measured in hundreds or thousands of millions the number travelling as far as the ampulla is relatively small i.e. not more than 1000 in any animal. There is evidence that the meeting between spermatozoa and eggs is not entirely random in some circumstances and that selective fertilization can occurs, eggs of one type often involved than those of other. The mass of cumulus cells might be facilitating contact

bby trapping sperm in the neighbourhood of the ovum.

The entry of sperm into ovum- To enter the ovum the sperm has first to penetrate 1) the cumulus mass 2) the zona pellucida and 3) the vitelline membrane.

The sperm makes its way through the cumulus mass due to its own motility. Cumulus oophors consists of large number of follicle cells embedded in a jelly-like matrix composed of a hyaluronic acid protein complex. The spermatozoa carries in the acrosome an enzyme, hyaluronidase capable of depolymerising the hyaluronic acid matrix of the cumulus oophorus. Spermatozoa thus make entry by dissolving a tunnel through the hyaluronic acid matrix reach upto zona pellucid-which is the next obstacle to sperm entry. The ovum is said to produce a substance *fertilizin*, which reacts with the sperm and specifically agglutinates it. Sperm cells also carries another enzyme known as "*Zona lysin*", that acts upon the substance of the zona, permitting the spermatozoa to make its way through. Thus by the action of sperm motility and enzymatic reaction sperm enters through cumulus oophorus and zona pellucida and makes contact with the surface vitellus. The last stage in the penetration of ovum involves the attachment of the sperm head to the surface of vitellus. It is this time when activation of the egg occurs. The ovum awakes from its dormancy and development begins. The sperm head with its tail then enters the vitellus. Then fertilization process complete after that baby formation process is started.

Assessment

A. Very short Answer Question

1. What do you mean by reproductive physiology of small ruminants?
2. List out the male reproductive organ.
3. List out the female reproductive organ.
4. Meaning about sexual cycle.
5. List out the sigh of estrus.

B. Short Answer Question

1. Describe the structure and function of male reproductive organ.

2. Describe the structure and function of female reproductive organ
3. Details about estrus or sexual cycle of small ruminants.
4. Meaning about fertilization and its process.

C. Long Answer Question

1. Describe the structure and function of male and female reproductive organ.
2. Describe the role of hormone in male and female reproductive organ.

Glossary

CL- Corpus Luteum

FSH- Follicle stimulating hormone

GnRh- Gonadotrophin releasing hormone.

ICSH- Interstitial cell stimulating hormone

LH- Lluteinizing hormone

Unit 9
Breeding Management

Objectives

- To study about different types of breeding management.
- To study about selective breeding and productive enhancement.
- To study about to in-breeding selection and its consequences.

Contents

- Types of breeding and seasonality of breeding pattern.
- Selective breeding and productive enhancement.
- In-breeding, negative selection and its consequences

Learning process

Introduction

Animal breeding is a branch of animal science that addresses the evaluation of the genetic value of domestic livestock. A breed is a group of domestic animals with a homogeneous appearance, behavior, and other characteristics that distinguish it from other animals

9.1 Types of breeding and seasonality of breeding pattern

General breeding management

- The male female ratio is 1:20.
- Young males can be put in to experienced older ewes and older rams to younger ewes will help in better mating.
- Inbreeding should be avoided.
- The males should be replaced or exchanged once in two years to avoid inbreeding.
- Breeding ewe of indigenous breeds should be 18to 24 months depending upon their body condition.
- Breeding too young ewes result in more weakling and thus results in higher lamb loss.
- Body weight of ewe at breeding should normally be less than the adult body

weight of that breed.

- Estrous detection of all female goats above 1 year should be done either with approved or vasectomized buck both in morning or evening during breeding season.
- The normal breeding season is Sept to Oct, Feb to March and May to June.
- In order to synchronize them improved hormonal technology may be used or buck may be in a partitioned corral of woven-wire net so that the does and the buck may have full view of each other. This may be done a week or two before or during the breeding season.
- A 90% conception rate in does may be ensured if one buck with one doe or more does (not exceeding 2 to 3) in heat are allowed to remain together for a whole day or whole night provided it is followed over period of 3 cycles.
- If 2 services at an interval of 8 to 12 hrs is practiced, improvement in conception may be achieved.
- Goats which do not return to estrus after 2 cycles are considered as pregnant and should be separated from the dry, non pregnant flock. They should be kept in a group of not more than 15 to 20 does to avoid infighting.
- If they have no kidding for complete one, year they should be removed from flock.
- Efforts should always be made to avoid kidding during the peak winter season which can be practically achieved by a planned breeding avoiding summer season within a specified period between 15th may to 15th June. This will save the kids from cold susceptibility and resultant pneumonic death during winter.
- Avoid starvation of goat since even two days starvation period early in pregnancy can cause a high percentage of shed embryos to be absorbed.

Types of breeding

It have been broadly divided into two

A. Inbreeding

B. Out breeding

Inbreeding

It is the mating of more closely related individuals than the average of the

population. Inbreeding further divided into following groups

1. Close breeding
2. Line breeding

1. **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

2. **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 selections.

B. Out Breeding

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

1. Out crossing/ breeding
2. Cross 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.

Seasonality of breeding

Unlike other farm animals, ewes in general do not come in heat at regular intervals throughout the year but are seasonally polyestrus. The breeding season is followed

by a long period of anoestrus. The length of breeding season appears to be related to the climatic conditions under which the breed developed. In the Nepalese context there are three breeding seasons, viz. summer (March to April), monsoon (June to July) and autumn (September to October). In general the fertility is high during autumn in the plains whereas in hilly areas good fertility is observed in summer).

- Estrus cycles in does occur throughout the year. However, the incidence of estrus is highest during the autumn season (August to October).

9.2 Selective breeding and productive enhancement

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.

D. 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

E. Good proven sires are often available to artificial insemination

9.3 In-breeding, negative selection and its consequences

In-breeding means the mating of related individuals. Each animal has two parents, four grandparents, eight great grandparents biologically and so on. Inbreeding involves the mating of related individuals within 4-6 generations. It has also been defined as the mating of the more closely related individuals that the average of the population,

In-breeding mainly divided to two-

Close breeding- Sire to daughter, son to dam, full brother and sister etc

Line breeding – Half brother and sister or, mating of animals more distantly related eg. Cousin mating

Consequences of inbreeding

The effect of both close breeding and line breeding are similar. The only difference is in the degree of their intensity. They are more intense in close breeding and less so in line breeding. These may be describe a follows-

1. It increases homozygosity (like alleles) and degreases hererozygosity (dissimilar genes) and hence favours the development of genetic uniformity amongst the animals.
2. It is the best method of true strains from unknown stocks as it sorts out the character in the homozygous condition and thus helps in the selection of the desirable and culling of the undesirable individuals. Strains which breed true are not obtained in animals, however and in plants are obtained only when close inbreeding is accompanied by intense selection.

3. The outward effects of inbreeding may include the following-

- Effect on growth rate
- Effect on reproductive performance
- Effect on vigour
- Effect on production
- Appearance of lethal and abnormalities

Assessment

A. Very short Answer Question

1. What do you mean by breeding?
2. What do you mean by inbreeding?
3. What do you mean by cross breeding?

B. Long Answer Question

1. What do you mean by breeding? Describe the types of breeding and seasonality of breeding pattern.
2. How to select the selective breeding and productivity enhancement.
3. Details about inbreeding and its consequences.
4. Details about inbreeding and out breeding and its advantages and disadvantages.

Glossary

Alleles- Blood group

Dam – female anima

Homozygosity- Same blood group or alleles

Heterozygosity- Different blood group or alleles

Progeny testing- Baby performance

Sire- Male animal

Vigour- Death rate among the inbreed

Unit 10
Feeding Management of Sheep and Goats

Objectives

- To know about feeding requirement of breeding buck and doe.
- To know about feeding requirement of breeding ram and ewe.
- To be able to prepare of homemade balanced ration of feed
- To study about to eating behavior of sheep and goat and their grazing management.

Contents

- Feeding requirement of breeding buck and doe.
- Feeding requirement of breeding ram and ewe.
- Preparation of homemade balanced feed
- Eating behavior of sheep and goat and grazing management

Learning process

10.1. Feeding requirements of breeding Buck and Doe

Feeding of Pregnant Goats

High quality roughages provide the basic nutrients needed during the last 6 to 8 weeks of gestation when 70 to 80% gain in fetus mass is made. Therefore, liberal feeding of quality leguminous fodder and concentrate having 25% protein should be offered between 400 to 500 g depending upon the condition of doe should be fed.

A free choice lick of mineral mixture will take care for the calcium and phosphorus requirement of dam and fetus. Allow good grazing if available and make sure that does get plenty of exercise.

Feeding of Lactating Goats

Nutrient requirements are higher during lactation. The ration for lactating does should contain high quality roughages like Lucerne, berseem, and other cereal grass that can supply mineral, vitamins, and protein and also the bulk needed for volatile fatty acid, viz., acetic acid, propionic acid, butyric acid needed for high milk

production. To supplement more nutrients particularly of energy, cereal grains at the rate of 350 gram for each liter of milk must be provided.

Concentrate feed need to prepare adding 1% trace mineralized salt and 1 % calcium – phosphorus mineral mixture to concentrate mixture. Molasses of 5 to 7 % of concentrate mixture can be used to increase palatability and reduce dustiness of feed.

Keep a clean, fresh supply of water available at all time. After 2 weeks gradually increase the concentrate level to that suggested by the milk yield.

Feeding Breeding Bucks

During the non-breeding season, the buck does not require additional grain if the buck is under good pasture. During the breeding season, concentrate used to feed to the does can be fed @ 450-900 g (depending on the body weight). Care must be taken not to allow the buck to get too fat. Buck needs to have plenty of exercise.

Adult Sheep

- Free choice maintenance quality fodders like oat hay, dub grass, maize, etc plus 100 concentrate mixtures may be fed. If leguminous roughage offered (like cow pea, lucerne, berseem etc) in sufficient amounts, the feeding of concentrate may be stopped for non – productive stock. Little straw may be provided with such roughage as to prevent digestive disorders. It is better to feed with them hays of these fodders.
- Absence of good quality fodders/hay, straws and stovers may fed ad lib. along with 400 g of concentrate mixture.

10.2 Feeding requirements of breeding Ram and Ewe

Breeding Rams

Generally rams are maintained on the same feeding system as ewe. In case they are over fat, they should be thinned by gradual reduction in feed. Forage feeds to be fed ad lib. During lean period 150 g of concentrate mixture can be fed with the mineral mixture. At the mating time 250 g to 500 g of concentrate needs to be fed.

Lactating

- First 10 days: Legume hay ad lib. and recommended level of concentrate.

- 10^{th} day of weaning: Feed200 g of concentrate mixture in addition to ad lib legumes hay up to two and half month after maintenance allowances is adequate.

Flushing

About weeks before the rams are let loose with sheep, 200 g of concentrate mixture plus good quality roughage can be given.

10.4 Eating Behavior of Sheep and Goats

Eating Habits of Sheep

Bell 1978 found that sheep grazing rangelands spent 60 % of their time grazing grass, 30 % selecting forbs, and 10% eating brows. Sheep generally prefer to graze in the early morning and late in the afternoon. Generally sheep are good grazer and will adapt too many types of management system, feed resources, and environmental condition.

Eating Habits of Goats

It is important to understand the feeding habits of goats, so that their natural habit can be copied as closely as possible. The goat, being a ruminant, is able to live and be productive on fibrous vegetation of relatively poor quality. The goat is a natural browser, feeding by preference on tree leaves, flowers, and seed pods. Goats are able to eat quite woody stems of trees and bushes. They are very active when they eat, moving rapidly around a tree, picking off the best parts, and quick moving to the next tree or bush. Goats naturally prefer to eat at a height 20 -120 cm above the ground. Goats do not eat if the feed stuffs are dropped on the ground.

Grazing/feeding nature of sheep and goat

Sheep

Sheep possess a unique ability to survive on natural grasses, shrubs and farm waste production like residues of the fields/agricultural waste. With their small muzzles and split upper lips, they can nibble tiny blades of vegetation which cannot be eaten by bigger animals.

Goat

- By mean of their mobile upper lips and very prehensile tongue, goats are able

to graze on very short grass and to browse on foliage.

- Goats have fastidious eating habits. In general goat will refuse any kind of feed which have been soiled either by himself or by other animal.
- Goats consume wide varieties of feed and vegetation than either sheep or cattle.

Assessment

A. Very short Answer Question

1. Define feeding management.
2. Define grazing.
3. Define concentrate.

B. Short Answer Questions

1. Details about feeding requirement of breeding buck and doe.
2. Details about feeding requirement of breeding ram and ewe.
3. Describe the eating behavior of sheep and goat.
4. Describe the grazing management or system for sheep and goat

Glossary

Concentrate – Feed

Unit -11

Care and Management of Small Ruminants

Objectives

- To study about care and management of breeding male sheep and goat.
- To study about care and management of pregnant female sheep and goat.
- To study about care and management of newly born kid or lamb.
- To study about colostrums feeding and its advantages.

Contents

- Care and management of breeding male sheep and goat.
- Care and management of pregnant female sheep and goat.
- Care and management of newly born kid or lamb.
- Colostrum feeding and its advantages.

Learning process

a. Care and management of breeding male sheep and goat.

Different Management Practices of Goat

Care of breeding buck

- Buck is half of the band therefore select pure bred buck of good breeding ability.
- Breeding males should not be tethered.
- Bucks should be housed separately to have enough movement and exercise. A single stall measuring 2.5X2 m with usual fittings for food and water is suitable for the buck.
- Two bucks should not be kept together, particularly during breeding season because they may fight causing injury to each other.
- Buck should be taken to does for breeding only when needed.
- Ensure proper nutrition for bucks especially during breeding season.
- Give enough exercise to prevent them becoming sluggish.
- Buck should neither be overfed nor underfed; otherwise health break down may occur. Good pasture alone will maintain them healthy. Also provide enough salt, minerals and vitamins in diet.

- Cleanliness and feeding plenty of greens will help to reduce "goaty smell". Average
  green fodder per buck/day is 7 to 8 kg.
- Carry out grooming/ brushing every day to keep them clean, free of parasites and to make them docile.
- Young buck up to 1 year age be used for not more than 25-30 does, but those of age 18-24 months may be used for 50 does.
- Periodical trimming of hoofs to prevent lameness and drenching with vermifuge be carried out to keep them free of parasites.

11.2 Care and management of pregnant female sheep and goat.

- Do not handle pregnant animal roughly
- 6-8 weeks before kidding, female should be dried off for the development of healthy baby, to keep good health of mother and maintain high milk yield during lactation.
- Feed laxative, leguminous and nutritious ration along with 450g concentrate daily.
- If the animals are reared in free grazing system than separate pasture should be made.
- Avoid over and under feeding and sudden change in feed should be avoided
- Water should be made available all the time
- Light exercise should be given to the animal
- Pregnant animals should be kept in separate pen for better care and safeguard
- Delivery pen should be clean and bedding should be soft
- Shift the mother in delivery pen 15 days before parturition.
- Avoid dipping in advance pregnancy
- Reduce the concentration mixture for animals @100gm/day in last week of gestation.

11.3 Care and management of newly born kid or lamb

Care at lambing/kidding

- Do not disturb animal at delivery
- Consult veterinarian in case of difficulty in parturition
- After lambing as soon as lamb is breathing cut the naval cord with sterile

instrument and wash with tincture of iodine.

- Mucous from mouth and nostril should be removed
- If the lamb do not suckle the milk, then help to find and suckle the teeth
- Clean the area, disinfect and properly dispose the placenta
- Wash the hindquarters of mother with antiseptic solution
- Protect mother and child against inclement weather

1. Care of lambs/kids

- Ensure proper suckling by the kids
- If more than one kid is born than help the younger one to get its share.
- Take regular care of mother as well as kids
- Provide creep feed
- Tagging, docking and castration should be done at proper time

2. Care of young stock

- Provide with concentrate @450gm/day
- Provided feed should contain high amount of protein
- Stall fed or grazing can be done
- Water should be provided adlib.
- Provide treatment and medication as per required

Care of new born lamb

- Ensure that nose and mouth are free membranes and mucoid fluid immediately after birth.
- Place the lamb in a clean and sheltered place.
- Clean the mucus from the body of lamb and make it dry.
- Let the ewe also lick her lamb for:
- Cleaning and removal of mucus from lamb's body.
- Establishing the affinity between lamb and ewe.
- Leaving 3 cm from the body cut the navel cord with sterilized scissors and treat with tincture iodine.
- Mark the lamb and give permanent number and record age and number or ewe, sex of lamb, date horn.

- Weight the lamb and record it (normal birth weight varies from 2.5 to 3.5 kg in Indian sheep).
- Help the lamb to reach the teats of ewe for suckling.
- Makes sure that lamb gets first milk.
- Protected the lamb getting chill by wrapping in jute/ blanket.

Care of ewe after lambing:

- Dispose placenta thrown by ewe.
- Sealed orifices of teats are cleared by removing greasy plug by hand.
- Provide separate clean area in night enclosure.
- Feed lightly on hay or fresh forages with little amount of grains.
- Provide free access to water at all times.

11.3 Colostrums feeding and its advantages

Colostrums

Colostrums are the first milk produced after parturition. Colostrums is that latter contains a large proportion of albumin, globulins and minerals. Colostrums is richer than normal milk in most nutrient (including vitamins (vitamin A is large number)), apart from lactose and fat. However its major effect is to confer passive resistance on the new born against pathogenic microorganism. Immunoglobulins present in colostrums are absorbed intact by pinocytosis, passing through the mucosa of the gut into the lymphatic system and reach the circulation through the thoracic duct. The capacity of the new bborn to absorb the antibodies intact from the gut contents declines rapidly and last for only about 12-24 hours after birth. Since placental transfer of antibodies to foetal tissues does not occur in ruminants, their neonates depends on colostrums as a source of antibodies this passive immunity is necessary for the young until they develop active immunity. The colostrums of ruminants contains a trypsin inhibitor which protects the immunoglobulins from digestion. The globulin fraction colostrums declines quite rapidly with successive milking. Within three to four days after parturition milk losses its colostral properties and becomes normal.

Composition of colostrums milk

Components	Goat	Sheep
Water	81.2	58.8
Fat	8.2	17.7
Lactose	3.4	2.2
Protein	5.7	20.1
Ash	0.0	1.0

Source:Textbook of animal husbandry

Assessment

A. Very short Answer Question

1. Meaning about colostrums?
2. Meaning about kid/ lamb?
3. What do you mean by care and management?

B. Long Answer Question

1. Describe the care and management of breeding male sheep and goat.
2. Describe the care and management of breeding female sheep and goat
3. How to maintain the care and management of new bon kid/ lamb.
4. What is colostrums feeding and describe its advantages for new born kid/lamb.

Glossary

Buck- Adult male goat

Doe- Adult female goat

Ewe- Adult female sheep

Ram- Adult male sheep

Kid- New born baby of goat

Lamb- New born baby of sheep

Lambing- Act of parturition of sheep

Kidding- Act of parturition of goat

Unit 12
Health Management of Small Ruminants

Objective

- To study about health management of small ruminants.
- To study about endo-parasite and their control of sheep and goat.
- To study about ecto-parasite and their control of sheep and goat.
- To study about common bacterial and viral diseases and control of sheep and goat.
- To study about to vaccination schedule of sheep and goat.

B. Contents

- Introduction on common endo-parasite of sheep and goats and their control.
- Introduction on common ecto-parasite of sheep and goats and their control.
- Drenching schedule for sheep and goats.
- Common bacterial diseases of sheep and goats.
- Common viral diseases of sheep and goats.
- Symptoms, treatment and control of different viral disease.
- Measure to keep the flock healthy.
- Vaccination schedule

Learning Process

Introduction

A parasite is an organism that lives on or in a host organism and gets its food from or at the expense of its host. There are three main classes of parasites that can cause disease in Animal or livestock like Protozoa, Helminthes (endo-parasite) and ecto-parasites.

12.1 Introduction on common endo-parasite of sheep and goats and their control

Parasites commonly found in sheep and goats can be divided into two general categories: external (skin) and internal (organ) parasites. Because **internal parasites tend to prefer a specific organ**, there are multiple types. The most

common internal parasites in sheep and goats are: lung worms (*Dictyocaulus* spp. or *Muellerius capillaris*); stomach worms (*Haemonchus contortus*, commonly called barber pole worm); liver flukes (*Fasciola hepatica*); and intestinal parasites, the most common of which are coccidia (*Eimeria* or *Isospora*).

How do sheep and goats get infested with parasites?

When animals "get" parasites, we refer to it as an infestation and not an infection, which is caused by bacteria and viruses.

Parasites grow and reproduce in certain environments. Sheep and goats that live in those environments are at high risk of becoming infested.

- Lung worms and liver flukes grow and reproduce inside snails, which live in stagnant water. Sheep and goats that have access to stagnant water are at risk of being infested by these parasites.
- The eggs and larvae of stomach worms are commonly found on wet vegetation, like dewy grass. Larvae can move up the grass where they are eaten by sheep or goats.
- Coccidia mostly affect young animals because they have not yet developed their immune defenses. Coccidia commonly live on the ground but are usually not a problem unless there is overcrowding of animals.

How do parasites cause disease?

Most of the damage caused by parasites is due to mechanical irritation of the tissues they affect and the obstruction of an organ when there are too many worms.

Lung worms

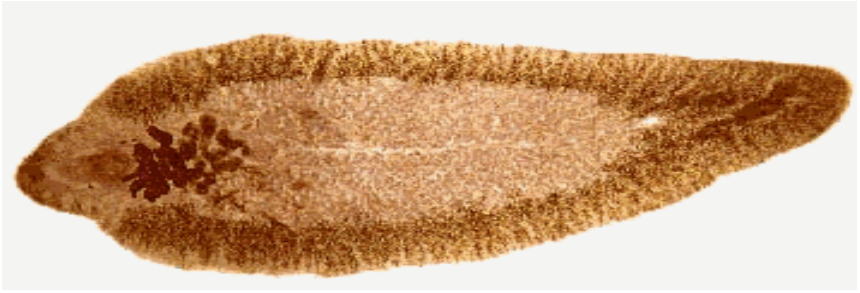
Lung worms irritate the bronchioles inside the lung and cause a local reaction with mucus and white blood cells (phlegm) that are trying to get rid of the parasites. The irritation and pain causes the animal to cough.

Stomach worms

Stomach worms are voracious bloodsuckers and will destroy the lining of the stomach to access the bloodstream. The destruction of the lining of the stomach can cause colic (abdominal pain), diarrhea, anemia, and weight loss due to the animal's inability to digest feed completely.

Liver flukes

Liver flukes burrow tunnels in the liver, causing scarring as the body tries to repair the damage. Because scar tissue is not functional, the liver loses part of its normal function, which includes filtering the blood of toxins and waste products. The accumulation of these toxins in the animal's blood can severely damage other organs, including the brain. Therefore, a common sign of liver fluke infestation is depression or stupor.



Lifer fluke

Coccidia

Coccidia live in the lining of the intestines and destroy the crypts that the animals need to absorb nutrients. Therefore, the most common sign of coccidian infestation is diarrhea (detected by dirty hind ends), and failure to thrive or weight loss.

What are typical signs of parasite infection?

- Weight loss—Animals don't get all the nutrients they need.
- Diarrhea—Detected by dirty tail and hind end.
- Rough hair coat—When nutrients are insufficient, the animals' hair loses its luster.
- Depression—Animals keep their head and ears down and are not willing to stand for long periods of time.
- Weakness—Animals are easier to catch or unstable when walking.
- Anemia—Animals' gums, perineum, and eyes appear white due to blood loss.
- Fever or, in the late stages of disease, cold extremities (e.g., ears and legs).
- Fast breathing (lung worms)—Animals try to get oxygen into their damaged

lungs.

- Coughing (lung worms)—Animals cough from the irritation of their damaged lungs.
- Bottle jaw (stomach worms and liver flukes)— Animals have fluctuant swelling under the jaw from the accumulation of fluid (submandibular edema). Sometimes it can spread to under the abdomen.

Parasites testing protocol

The standard method to test for parasites is to look under the microscope for parasite eggs in the feces of the animals—even for lung worms. When animals cough up lung worms, they will sometimes swallow some of the worms, which then enter the intestinal tract and lay eggs. Thus, lung worm eggs can also be found in feces. The various parasite families have different egg shapes, which helps in identifying them. However, to determine the specific parasite, other tests may be needed.

Testing strategies

Group testing is less expensive but less specific. If the sample is positive for parasites, it will not be possible to know which animals are infested and which are not and therefore all animals in the group will have to be treated.

Procedure: Take approximately 10 fecal pellets from 3 to 5 animals and place them into a ziplock bag. Make sure to mix the pellets well

Testing individual animals is more specific because you can establish the parasite burden in each animal and the effect of the treatment. After treating individual animals, separate them from those that are not treated.

Procedure: Take approximately 20 fecal pellets from each animal and place them in individual ziplock bags identified with the animal's name or ID number.

When to treat parasitism?

Treatment recommendations have changed over the years. The current recommendation is to treat only when necessary and only the animals that need it. This implies the need for testing (as explained above).

Common times to test include before lambing/kidding and at weaning.

Finding parasite eggs under the microscope does not necessarily warrant treatment of infested animals. For example, lung worms and liver flukes should be treated any time eggs are found, but for stomach worms and coccidia, it is recommended to only treat when high burdens are observed (see Table). The reason for this is that treating low burdens of stomach worms and coccidia can increase the chance of parasites developing drug resistance. Having susceptible worms in the environment helps control the population of resistant parasites because they mate with susceptible worms.

For stomach worms (*Haemonchus contortus*, commonly called barber pole worm), a simple visual inspection of the eyes can determine if animals are infested with a high burden of parasites. Animals that are losing a lot of blood due to the bloodsucking parasites show pale mucosae in some areas of the body such as the gums, the perineum, and under the eyelids. Sheep and goats should have pink mucosae. If these tissues are pale, it is likely because of blood loss. Colored charts are available on the Internet to categorize the color of the inside of the eyelids using.

Commonly used limit to establish treatment against parasite

Liver flukes	Any number of egg found in feces.
Lung worm	Any number of egg found in feces.
Barber pole worm	>5oo eggs/g feces
Coccidia	>1000 oocysts/ g feces

Treatment of parasite infection

Food and Drug Administration and have a specified withdrawal time for meat and milk (if applicable, for dairy sheep and goats). Using a drug in any way other than that listed in the drug pamphlet is considered extralabel drug use and can only be done by veterinary prescription.

Below the Table lists the dewormers currently approved for use in sheep and goats and the parasites they are effective against. It is very important to notice that all dewormers are not effective against all parasites. In addition, some dewormers that used to be effective against a specific parasite are no longer effective, due to the development of resistance in some worms. Therefore, just because you apply a

dewormer doesn't mean you've killed the worms; you have to be sure to use the right dewormer for your specific situation. Sheep and goats have a much higher metabolism rate than cattle. Therefore, drug dosages will likely be higher than those listed for cattle.

Current drugs approved for use in sheep and goat

Medicine	Liver fluke	Lung worm	Barber pole worm	Coccidia
Albendazole	X	X	X	-
Ivermectin	-	X	X	-
Levamizole	-	X	X	-
Moxidetin	-	-	X	-
Laslocoid	-	-	-	X

X not effective, - Effective

Treatment should be adjusted to the worm burden. When the burden is very high, killing all parasites atonce can create more problems, such as plugging the digestive tract with dead worms. In these cases, it may be preferable to treat with lower doses at frequent intervals. Consult with your veterinarian about the best option for your specific circumstances. As indicated above, most of these treatments will require veterinary prescription.

Some dewormers can be given orally or be injected subcutaneously (under the skin). Generally speaking, injected dewormers intended for treating gastrointestinal parasites take longer to take effect than oral medications and last longer at low concentrations. This long action at low concentrations is considered to induce resistance. However, given your specific circumstances, your animals may respond better to injectable rather than oral dewormers.

Affected animals should be separated from unaffected animals at the time of treatment. Treated animals should be moved into an area that can be easily cleaned and disinfected.

After treating affected animals, wait 3 to 4 weeks and retest to determine the effectiveness of the treatment. Animals that still have high burdens after treatment should be retreated and then retested 3 to 4 weeks later. Animals that still have high burdens after a second treatment are likely to be very susceptible and can act as

carriers for parasites, infecting other animals in the flock. These animals should be culled from the flock to decrease the burden of parasites in the entire flock and to increase the susceptibility of parasites in the flock to dewormers. This action can prevent animals' reinfestation and need for treatment.

Treatment of parasitism should include eliminating risk factors that will contribute to future reinfestation, as well as selecting animals that are resistant to parasite infestation.

Prevent and control

The best prevention is to reduce your animals' exposure to parasites by providing a clean environment—beginning at birth—and avoiding overcrowding of pens or premises. Balanced nutrition is very important to keep animals healthy and help them develop appropriate resistance to external pathogens, especially for dams before and after lambing/kidding.

Other important preventive actions are to:

- Avoid pasturing in damp areas and during early morning and evening hours, when there is dew on the pasture.
- Rotate pastures to avoid high burdens of parasites.
- Select animals from bloodlines that show low worm burdens

12.2 Introduction on common ecto-parasite of sheep and goats and their control

Ectoparasites of sheep and goats do not generally cause heavy mortalities unless the infection is extreme, bbut they will cause unthriftness and loss of production if not controlled. Animals in poor health or low level of nutrition are more likely to be affected and young animals are more susceptible.

The main external parasites found in sheep and goats are-

- Ticks
- Mites
- Fleas and lice
- Nasal worm (estrus ovis)

Ticks

Ticks are more commonly found on goats and unwooled sheep. They can cause anemia resulting from blood loss, especially in lamb and kids and open sores which then becomes a site for screw-worm infection.

Ticks also transmit disease- the most common in Zimbabwe being heartwater. They also cause tick toxicosis (sweating sickness) and tick paralysis (also known as karoo paralysis). These both affect young animals and may be fetal. Tick paralysis may also affect man.

Control

To control ticks, sheep and goats must be dipped regularly with an approved acaracide. Most acricides registered for sheep will control ticks, mites and lice.

Mites

There are many species of mites, but most are harmless. The two economically important conditions caused by mites are sheep scar and mange

Mange is caused by several different species but the most important are *Sarcoptes spp*. which causes Sarcoptic mange. This is a contagious condition more common in goats then sheep. And rarely seen in wooly sheep. The mites bburrow into the skin of the animal causing thickening and wrinkling of the skin with thick crust formation. Other mites include *Psoroptes caprae* found in the ears of goats, which can result in deafness if not diagnosed and treated. Chorioptes spp are found on the legs of goats and horses. It causes extreme itchiness and the affected animal will often stamp its legs continually.

Sheep scab is a scheduled disease, luckily not common commonly found in Zimbabwe. It is caused by mite Psoroptes ovis and is highly contagious. It is found only in sheep and the mite does not live anywhere but on the sheep. The life cycle is 10 days in optimum condition so the spread of disease can be extremely rapid. The mite bites into the skin, feeding on lymph and causing inflammation and irritation. Lymph flows out of the bite wounds, forming thick scabs and causing the wool to drop out. It causes extreme itchiness and distress to affected animals.

Control- Dectomax injectable control sarcoptic mange, mite.

Fleas and lice

These are found where animals are kept in close confinement, over-crowed and where the environment is warm and humid. Infestation cause anemaia, especially in young animals and damage to the skin leading to losses on hides and wool.

Control

Control is by dipping, avoiding over-crowing, regular cleaning of houses or farm and changing of bedding if this is used.

Nasal bots (estrus ovis)

The fly deposits its larvae at the nostrils of sheep. The larvae or maggots crawl up the nasal passage into the frontal sinuses. The worm grow rapidly in the sinuses, particularly in warm weather and may be fully grown in a month. It has two strong hooks at the front end and is covered in small spines. This obviously causes extreme irritation to the sheep and results in sneezing, head shaking, respiratory distress syndromes and copious nasal discharge. It may also cause secondary bacterial infection. Although the bot does not cause too much damage to the sheep, a heavy infestation causes such irritation that the sheep will feed poorly and less condition.

Control- Dectomax injectable is affective against nasal bots.

12.3 Drenching schedule for sheep and goats.

The term 'drenching' can have various meanings, in livestock management it's used to mean the 'administering of drug to an animal, usually by force'. Drenching can be applied to most farm animals; it's not exclusive to sheep. You can buy commercial drenches for cows, calf's, horses, dogs and other animals.

Types of Drench

Drenches come in two main types: broad spectrum and narrow spectrum.

Broad spectrum drenches are designed to treat a wide range of internal parasites in sheep and lambs. A narrow spectrum drench will treat a restricted range of internal parasite types.

Before you buy your drench, you should conduct a thorough examination of your

flock to decide the most suitable drench for your situation.

The time of year, seasons and the condition of your land will also be a factor in your choice as some parasites may be more abundant during certain times of the year.

You might wonder why you might want to use a narrow spectrum drench over a broad spectrum drench that treats many different parasites. Well, there are five good reasons switching to a narrow spectrum drench might be a good idea, they are:

1. To treat a parasite that's more common during specific times of the year. (i.e. Liver fluke during the wetter parts of the year).
2. It might prove more effective and reduce stress on the animal.
3. It can help combat drench resistance (this is covered later in the article).
4. A drench that targets a single parasite may be far more effective at its job. This can be desirable when you have a bad infestation of a particular parasite.
5. It might have a shorter withdrawal period.

Sheep Drenching, How it works, how it's done?

To administer a drench we would use a 'drench gun' and give the required dose orally to the sheep or lamb.

This is done forcibly by restraining the sheep and its head, you then place the 'drench gun nozzle' into the mouth and dose the sheep.

Depending on the size of your flock, the size of the sheep you are handling and how wild (easy or hard to handle) your sheep are, this might be a job for two people.

You will need to restrain your sheep when performing this task, it might be a good idea to move your animals into a small pen, barn, or a collecting yard.

Weighing of sheep and goat before drenching

It's important that you weigh your sheep and lambs and calculate the correct dosage.

The dosage should be worked out using the heaviest sheep or lamb in your flock. Giving the wrong dose to the animal can cause problems: too large a dose could potentially kill the animal, too small a dose can encourage drench resistance.

If you are a small flock owner, weighing your animals could be difficult, you might

not have access to a set of sheep weighing scales like the one pictured.

I would recommend that you try to either borrow some scales from a local farm, or you build some.

You could try picking up your animals and standing on a set of human scales, this could be difficult if you own larger sheep breed or older animals.

If the weights in your flock differ greatly, split your flock into several weight categories, giving each category its required dosage.

12.4 Common bacterial diseases of sheep and goats

Bacteria are prokaryotic, unicellular organisms containing DNA and ribosomes. Bacteria are divided into two major groups: Gram positive and Gram negative

Common bacterial diseases sheep and goat include:

- Black quarter
- Braxy
- Enterotoxaemia
- Foot rot
- Paratuberculosis
- Listeriosis
- Joint ill
- Brucellosis

Black quarter

Synonyms: Black leg, Quarter ill

It is an acute infectious and highly fatal disease of cattle, buffalo, sheep and goats are also affected. The disease is characterized by development of focal gangrenous and emphysematous myositis. This gives rise to crepitation and sero haemorrhagic swelling in the heavy muscles like gluteal muscle. The disease produce severe toxaemia with a very rapid course and high mortality. It is soil borne infection which generally occurs during rainy season.

Etiology- It is caused by Clostridium Chauvoei, a gram positive, rod shaped, spore

forming toxin producing anaerobic bacteria.

Transmission

- The disease spread from contaminated soil.
- The disease spread from contaminated feed
- The disease spread from contamination of wounds.

Symptoms

- Fever (106-105°F)
- Loss of appetite
- Depression and dullness
- Suspended rumination
- Rapid pulse and heart rates
- Difficult breathing (Dysponia)
- Lameness in affected legs
- Crepitation swelling over hip, back and sholder.
- Swelling is hot and painful in early stages where cold and painless latter stage
- Recumbency (prostration) followed by death within 12-48 hrs.

Diagnosis

- History of age, body condition and season.
- Symptoms taking .
- P.M. findings- dark colored muscles with gaseous infiltration.
- Examination of smear made from affected animal site (tissues, fluid from swelling).
- Isolation of the organism.

Treatment

- Penicillin @ 10000 units/ Kg body weight IM and locally daily for 5-7 days
- Ocyteracycline in high dose @ 5-10mg/Kg body weight IM or IV
- Indcse the swelling and drain off
- B.Q antiserum in large dose if available
- Injection. Avil/ Cadistin @ 5-10 ml IM

Prevention and control-

- The young animals should be kept out of such area.
- The dead body should be burnt or buried.
- The dead body should not be allowed to skin.
- The calf and sheep should be allowed to graze in endemic pasture.
- All the animals of the endemic zones should be vaccinated with suitable vaccine.
- Hogerth-Scott et al. (1980) recommended the use of polyvalent vaccine and anthelmintic combination to control the black quarter in a flock of sheep.

Braxy

Synonym- Brad sot

It is a disease of weaner lamb (4to 5 month old and yearling) characterized by gastrointestinal involvement, toxemia and sudden death.

Etiology-It is caused by *Clostridium septicum*

Susceptible hosts- Lambs are most susceptible.

Transmission

It is soil borne disease. The organism gain access through ingestion of spores.

Symptoms

- There may be sudden death without showing any premonitory sign
- Lams may be found dead in the morning while they were ill in the previous night
- Lamb stop eating, leave the flock, go down, grind their teeth, becomes comatosed and finally die.
- The disease usually strikes the healthy lambs

P.M. Lesions

- The typical lesions appear in the abomasum.
- Abomasum shows reddening with haemorrhages and slight necrosis on the surface.
- The wall is greatly thickened by edema, kidney and liver show haemorrhagic

changes.

- Pericardial and peritoneal cavities contain excess of fluid. There may be sub epicardial haemorrhage.

Diagnosis

- Diagnosis of ailing animal is a difficult task.
- Abnormal changes are very specific for disease.
- Bacteriological culture of the abomasal wall or heart blood may help in diagnosis.
- The disease has to be differentiated from infectious necrotic hepatitis.

Treatment

No satisfactory treatment is available.

Control

- The feeding of sheep flock should be monitored properly. Sharp grass may injure the intestinal wall and permit invasion of the organism.
- Vaccine may be given. Formalized culture of *Clostridium septicum* is used. Two injections at two weeks intervals are recommended**.**

Enterotoxaemia

Synonym- Pulpy Kidney disease

This is primarily an infectious disease of ruminants that result due to absorption of certain bacterial toxin which is beings formed in the intestine

Enterotoxaemia also known as overeating or pulpy kidney disease, is a condition caused by *clostridium perfringens* type D. these bacteria are normally found in the soil and as part of the normal microflora in the gastrointestinal tract of healthy sheep and goats. Under specific conditions, these bacteria can rapidly reproduce in the animals intestine, producing large quantities of toxins. The epsilon toxin produced by C. Perfringes type D is the most significant toxin producing the disease. Young animals are most susceptible. Sudden and high mortality rates may occasionally occur in lamb and kids. Although adult animals are also susceptible to enterotoxaemia, they develop immunity due to frequent exposure to low doses of these toxins.

Etiology

Enterotoxaemia is caused by *Clostridium perfringens* that produce toxin starting from A to F, of which *Clostridium type* A, B, C, D, E and F are important. In sheep and goat is caused by *Clostridium perfringens* type D

Factors associated with Enterotoxaemia outbreak

Overgrowth of *Clostridium perfrigens* type D in the intestine of shhep and goats resulting in enterotoxaemia are more likely to occur during following condition-

- Excessive consumption of milk or feed with high concentrations of garain.
- When natural immunity is compromised such as when ill, recovering from an illness or stressed.
- When animal are heavily parasitized with gastrointestinal parasites, including nematodes, cestodes and coccidian.
- When the ration is rich in carbohydrates(grain) and low in roughage.
- When motility of gastrointestinal tract is reduced.

Symptoms/ Clinical sign

The preacute form is most frequent in young animals. It is characterized by sudden death that occurs approximately 12 hours after the first signs of the disease appear. Some kids or lamb may show signs of central nervous disease, such as excitement or convulsions. Sudden death may occur in only minutes in kids and lambs showing neurological disease. The typical sign include

- Loss of appetite
- Abdominal discomfort
- Profuse/ watery diarrhea that may be bloody

Diagnosis

- Diagnosis is based on clinical signs, history of sudden death and confirmation by necropsy examination.
- Diagnosis can be confirmed by positive identification of enterocolitis, anaerobic culture and identification of clostridium perfringens type D from the feces or intestinal contents from clinical or necropsy specimen of affected animals

- The presence of hyperglycemia and glucosuria can strongly suggest enterotoxaemia in live and dead animals.
- A postmortem examination of a large and small intestine can identify watery contents, blood and fibrinous clots and small ulcer on the mucosa.
- The kidney on gross examination may have a soft consistency and encephalomalacia may occur within brain (usually seen in sheep).

Treatment

- Antibiotics especially penicillin
- Orally administered antacids.
- Anti-bloating medication
- Pain reduction used pain killer
- Intramuscular thiamine (vitamin B1) to prevent or treat encephalomalacia.
- Supportive therapy such as intravanus or subcutaneous fluids and corticosteroid used.
- Probiotics after antibiotic therapy to encourage repopulation of the microflora in the GI tract.
- *Clostridium perfringens* antitoxin is used

Prevention and control

Effective vaccines are commercially available to prevent enterotoxaemia in sheep and goats. All animals (especially young animals) within the herd should be vaccinated as it will reduce the chances that the animals will develop the disease. Use vaccine that are labeled for use in sheep and goats and follow the manufacturer's recommendations. Some of the commercially available vaccines against enterotoxaemia are also combined with tetanus toxoid. Make sure the vaccine has been refrigerated, stored properly and is not expired. Young animals should be vaccinated at 4 weeks of age and again one month latter . all adult animals including bucks, should be vaccinated at least once per year. Do not vaccine animals that appear ill and keep good vaccination record for future.

Foot rot

Synonyms- foul in the foot

This is an infectious disease of animals characterized by inflammation, necrosis and ulceration of interdigital space, coronary bands and posterior limbs resulting to lambness.

Etiology

The disease is caused by *Spherophorous necrophorus (Fusiformis necrophorus).* These are large rod shaped, gram negative bacteria.

Susceptible host- Cattle, Sheep, Goats and Pigs are susceptible

Transmission

The disease is influenced by factors which help in the breakdown of skin such as continuous wet and muddy condition or rough ground. Damage by the tick or penetration of skin by *strongyloides papilosa* larvae have been identified as conductive agent for transmission.

Symptoms/ clinical finding

- Lameness is the cardianal sign.
- There is elevation of body temperature, anorexia and loss of body weight.
- The skin of the interdigital space shows ulcerative changes.
- Affected animals may kick on the ground and disincline to move or try to move on two legs due to pain.

Foot rot affected on sheep foot

- In sheep the horns may be affected and the horns may be separated. Spontaneous recovery is also possible.

Diagnosis

- This can be achieved based on clinical signs and rapid spread of the disease as an outbreak.
- Isolation of the organisms through culture.

Treatment

Pareteral treatment- Sulphonamides and antibiotics like penicillin, Ampicillin, Tetracyline have been found useful

Local treatment-5% Copper sulphate, 2% formalin and Crystal violet have been recommended. Antibiotic ointment may be used.

Prevention and control

- Animal should be placed on dry, smooth surface in indoor condition.
- Infected animal should be isolated from the rest
- Foot bath should be given with 5% copper sulphate.
- Chlortetracycline @ 75% mg/animal daily in feed as suggested.

Para Tuberculosis

Synonyms-Johnes disease, chronic bacillary dysentery

It is a chronic infectious fetal gastrointestinal disease of ruminants characterized by progressive emaciation and diarrhea with thickening and corrugation of the wall. Lymph nodes becomes enlarged and edematous.

Etiology

The disease is caused by *Mycobacterium Johnei (Mycobacterium Para-tuberculosis).* The organism is a small, acid fast bacillus. This is strictly aerobic, non spore forming, non-motile gram positive organism

Susceptible host

This is generally a bovine disease but other ruminants like sheep and goat are also susceptible.

Transmission

- Natural infection occurs through the way of alimentary tract when the kind and lamb are very young.
- Contaminated feed and water with fecal materials are the potential way of transmission.
- The bacilli have been recovered from testes, semen, bulbourethral gland, prostrate gland and seminal vesicle.
- Infected manure is the primary source infection for transmission

Symptoms/ clinical finding

- The incubation period of the disease is very long.
- The most cardinal clinical sign is diarrhea in other ruminant.
- The diarrhea may be intermittent or continuous in nature.
- The period of remission may last for weeks or few months.
- In sheep and goat diarrhea is absent but the faeces remains soft and emaciation is observed.

P.M Lesions

- The carcasses are extremely emaciated.
- The most characteristics lesions are noted in the caecum and colon which are red and edematous.
- The lymph nodes are swollen and edematous.
- There is no evidence of nodules like tuberculosis.
- Microscopically mucosa and sub-mucosa of intestine are infiltrated with epitheloid cells, multinucleated gaint cells, eosinophils are seen.

Diagnosis

This is based on following consideration-

- Intradermal johin test
- Intravenous johin tes
- Complement fixation test (CFT)
- Haemagglutination test (HI)
- Fecal culture

Treatment

- Treatment of Para-tuberculosis often does not give encouraging result due to advanced course of the disease.
- However antitubercular drug like streptomycin sulphate may be used.

Prevention and control-

No strategy has been taken up by the government to have affective control of the disease. Following measures may be adapted-

- All animals of the enzootic zone should be treated by fecal culture method once in 6 months.
- Animals proved culturally positive should be disposed off either slaughter in case of sheep and goat.
- Faeces must be removed and heavy lime dressings are to be done to kill the bacteria.
- Feed lots and paddocks must be ploughed and covered with fresh soil.
- Stagnant water must be drained away.
- Offspring's must be removed immediately after parturition.
- Colostrums may be affectively boiled before feeding.
- Transportation of contaminated faeces should be avoided.
- Animal should be allowed to graze on pasture which is not affected.
- Movement of animals from infected area to non-infected area should be restricted.
- Proper disposal of dung should be undertaken since it is the main source of infection.
- All newly purchased animals should be tested before allowing them to mix with other animals
- Vaccination used against this disease consists of live non-pathogenic strain of *M.Paratuberculosis* is an adjuvant of equal parts of liquid paraffin and olive oil. Dose is 1.5 ml subcutaneous route.

Listeriosis

Synonyms- Circling disease, silage disease

It is an infectious fatal disease of wide range of animals and man characterized by encepthalitis. It is also causes abortion, endometritis and repeat breeding in farm animals.

Etiology

The disease is caused by Listeria monocygenes. The organism is rod shaped having rounded ends. The organism resembles diptheriod bacilli. The organism is gram positive in nature. So far 5 serotypes have been identified from farm animals. The organism isolated from faeces and silage. The organism is easily destroyed by ordinary disinfectants but may survive in soil and silage for long time.

Susceptible host

The disease has been recorded from cattle, buffalo, sheep, goat, pig, horse, bird and fish etc. wild animals and birds is also susceptible.. man has been infected through ingestion of milk showing sign of meningitis.

Transmission

- Natural infection may take place from different animals.
- Infected feed and soil act as potential source of transmission.
- Silage is considered as important spreader of this disease.
- Such silage transmitted disease is referred as silage sickness or silage disease.

Symptoms/ clinical finding

There are mainly three type of manifestation through-

- Disease with encephalitis
- Disease with abortion
- Disease with septicaemia

Encephalitis- This is the most common outcome in all species of animals. There is no age and sex barrier. Initially the affected animal becomes dull and depressed with rise in temperature remains become isolated from rest of the animals. The diseases process the animal shows dummy syndrome and head is pressed against a barrier. There is unilateral facial paralysis with drooling of saliva. The one or both aye may blindness. The animal ultimately shows circling movement which may either in left or right direction. There is paralysis of the pharynx and death occurs

due to respiratory failure.

Abortion- retention of after birth is very common following abortion. The organism are present in foetal stomach. In sheep and goat abortion usually takes place from 12 week of pregnancy onward.

Septicaemia- Acute septicaemia is not common in adult ruminants but newly lambs may suffer. Monogastric animals like horse, pig, dog show sign of septicaemia. Septicaemia sing include depression, weakness, emaciation, pyrexia etc. death usually occur within 12 hours following onset of the disease.

P.M. Lesion

- There is no gross characteristic lesion. Lesions in the brain are compressed of perivascular cuffing, lymphocytic etc
- Cerebrospinal fluid shows cloudyness due to the presence of excess globulin and leukocytes.
- Eyes show sign of panopthalmitis.
- Liver, spleen, endometrium, pericardium and lungs show yellow necrotic foci.
- Placenta and uterus show sign of placentitis and endometritis.

Diagnosis

This is based on following criteria-

- History
- Clinical finding
- Clinical pathology and P.M. lesion
- Isolation and identification of organism in selective agar media
- Animal inoculation
- ELISA and FAT

Treatment

- Treatment with Chlortetracycline@ 10mg/Kg body weight IV for 5-7 days.
- Penicillin@ 44000 i.u/ kg body weight IM for 5-7 days.
- Sulphonamide@ 100 to 150 mg/Kg body weight daily for 3 days.
- Supportive treatment with fluid and electrolytes and good nursing appear to be

helpful way for disease alleviation.

Prevention and control

- Litters and bedding of the infected animals should be carefully disposed by burning.
- Rotten vegetation should not be feed.
- Premises should be thoroughly disinfected.
- Restriction of ensilage feeding should be made in enzootic area.
- Tetracycline or chlortetracycline may be added in feed as a preventive measure when there is an outbreak.
- Killed vaccine may be used to reduce in sheep.
- Live vaccine as prepared from aerated broth culture with serotype and 4 B on typtose broth can be used to protect sheep. Dose-2ml at 3 month of age through subcutaneous route.

Joint ill

Synonyms-Navel ill

It is an infectious disease of newborn farm animals. Infection may be start at the umbilicus and may spread to some of the joint

Etiology

This is a disease of mixed etiological agents.

Lamb/kid- *Staphylococcus sp., Streptococcus sp., E. coli*

Susceptible host

The disease is prevalent in newly born where the umbilicus continues to persist without drying within 7-10 days. Cow calf, buffalo calf, foal, lamb and goat kids suffer from this infection.

Transmission

- Unhygienic condition of the environment may help to set up infection in umbilicus.
- The organisms may get the opportunity to produce infection due to bad handling of umbilicus.

- Improper ligation of umbilical cord may cause rupture leading to suppuration.
- Failure to apply antiseptic preparation following birth in umbilical cord may help in localization of infection.
- The infection may spread from tonsils and small intestine.
- Surgical interference may spread infection and thereby localization in joints.
- The organisms may enter into the joint by way of unclosed navel

Clinical findings

- The umbilical cord should dry up within a week following birth. But it may not dry leading to infectious changes. Therefore the infection may be affected for carpal, elbow, coxofemoral and tarsal joint.
- The principal signs include hot, swelling, pain and purulent discharge. The affected young become dull and depressed.
- The temperature may remains rise 2-4F higher than normal and respiratory rate remains higher.
- The umbilicus remains moist and oozing with blood stained serous material or dry swollen with painful appearance. There is formation of abscess.
- Concurrent infection of joint may be evident. The joint are swollen, hot and painful.

Diagnosis

It is based on following criteria-

- History and clinical sign of swelling of umbilicus and joints
- Detection of purulent discharge from the lesions.
- Demonstration of infectious agents in stained smear and culture.

Treatment

- Animal should be treated as soon as the swelling is noticed in the joints or umbilicus.
- Prompt and aggressive antibiotic therapy is suggested.
- Where antibiotic sensitivity is not possible broad spectrum antibiotic should be used.
- Penicillin- streptomycin combination or ampicillin or cephalexin may be used

for at least 7 days.

- Surgical drainage of umbilical content is to be done with dressing on povidone iodine may be made.
- Supportive therapy with non-steroidal, anti-inflammatory drug may be required for polyarthritis (joint ill) patient.
- Fly repellant should be used to prevent maggot formation in case of open condition

Prevention and control

- Polyarthritis can be prevented by allowing adequate colostral milk since IgG level is lowered in colostrums deprived lamb and kid
- Any surgical operation (castration, docking etc) should be done with adequate precaution under full coverage of antibacterial umbrella.
- Naval cord should be dipped in tincture iodine or povidine iodine after birth.
- Navel suckling by other calf or mother should be prevented.
- External genitalia of sheep and goat should clean prior to delivery.
- Fly repellant should be used to crub down the fly population and thus spread of infection

Brucellosis

Synonyms- Bangs's disease, Contagious abortion, Undulant fever, Enzootic abortion

It is an acute or chronic contagious disease of domestic animals that causes placentitis and abortion. The disease thereby poses a threat to cattle economy and also affects the economics of sheep and goats.

Etiology

The brucellosis is caused by *Brucella melitensis* and *Brucella ovis* **in** sheep and goat, *Brucell abortus* in cattle, *Brucella canis* in canine and *B.suis* in pig. The bbrucella species are non-motile, non-spore forming, small gram negative rod or coccobacilli. Bbrucell organism are aerobic but require added Co2 for growth.

Susceptible host

Through all the species of Brucella are relatively specific for individual species of

animals but they can produce infection in other species of animals and man. Cattle are more susceptible to *B.abortus* than other animals are occasionally infected to sheep, pig and buffaloes. *B. melitentis* and B.suis when they exposed to goat and pig.

Transmission

- Brucella infection is spread through ingestion of food and water contaminated with discharge of aborted fetal membrane.
- The organisms are shed in great contamination with the infected fetus, fetal membrane and genitalia for several days, before and after abortion.
- Transmission of infection through flies, ticks, rat, dogs, infected ram and other inanimate object is possible.
- Entry may occur through mucous membrane, broken skin even intact skin.
- Experimental transmission is possible by deposition of organism in susceptible hosts through subcutaneous or intravenous route.

Clinical finding

- Cardinal manifestation in sheep and goats are comprised of abortion and sterility.
- Mastitis
- Osteoarthritis
- Synovitis
- Spondylitis
- Orchitis have also been noted.

Lesions

- Bacteria from the mucosa of digestive tract are carried to the mesenteric lymph nodes where they multiply or destroyed.
- Swelling and haemorrhage of lymph node and spleen.
- The organisms in pregnant animals colonize in the uterus, placenta, mammary gland and supra-mammary lymph nodes
- Affected fetal membrane are swollen and infiltrated with yellow gelatinous fluid.

- Cotyledons will show necrotic changes.
- The affected cotyledons are dirty yellow in color and covered with grayish yellow deposits.

Diagnosis

The main object of diagnosis of brucellosis in the laboratory is aimed at to identify the animals which are infected and shedding the organisms and thus spreading the disease. It is not difficult to identify the infected animals employing standard serological tests. But latent infections may occur in animals those are serologically negative. Vaccinated animals will also give positive titre.

Various serological methods have been used evaluating of Brucell are

- Isolation of organism
- Animal pathogenecity test
- Tests for the presence of antibodies, like Rose Bengal plate test, milk ring test etc.

Treatment

- There is no known treatment which can cure brucellosis in domestic animals
- Numerous drugs and combination therapy have been recommended.
- Chlortetracycline, penicillin, streptomucin, ocytetracycline have been used fair amount of success.

Prevention and control

The following measures may be adapted to prevention and control brucellosis

- Where it is desired to eradicate the disease, test and slaughter method will be the most rational approach.
- All abortion should be suspected to be due to brucellosis, unless otherwise proved.
- Hygienic disposal of uterine discharges, fetus, fetal membrane are to be observed strictly.
- Care should be taken to clear and disinfect contaminated premises.
- All newly purchased animals are to be kept in strict isolation and tested twice at the interval of 30 days before introduction in a herd.

- It is necessary to test the animals those aborted and should be eliminated.
- Regular vaccination should be provided.

12.5 Common viral diseases of sheep and goats

Viruses are smallest obligate intracellular infectious agents containing only one type of nucleic acid- either DNA or RNA as their genome. The genome is encased in a shell of protein called capsid which has a surrounding lipid-containing membrane is called envelope. The entire virus, including nucleic acid, capsid, envelope and glycoprotein spikes is called the virion or viral particle.

Common viral disease of sheep and goat are listed below-

- Bluetonge disease
- Foot and mouth disease
- Goat pox
- Sheep pox
- Maedi
- Louping ill
- Scrapie
- Peste Des Petitis ruminant (PPR)

12.6 Symptoms, treatment and control of different viral disease.

Bluetongue disease

Synonyms- Sore mouth, pseudo foot and mouth disease

Bluetongue is a viral disease affecting sheep, cattle, deer, goats and camelids (camels, llamas, alpacas, guanaco and vicuña). Although sheep are most severely affected, cattle are the main mammalian reservoir of the virus and are very important in the epidemiology of the disease.

Etiology

The disease is caused by a RNA containing virus and belongs to arthropod borne *Orbivirus* of Retroviridae family. There are many different strains (serotypes) of Bluetongue with each given a number (currently up to 27). Animals that recover from infection with one serotype will be immune to that strain but not to others.

Susceptible host

It is basically a disease of sheep but amongst sheep susceptibility varies in different age groups. Young sheep within the age group of one year are more prone to infection. Suckling lambs are relatively resistant due to passive immunity acquired through colostrums. British and merino sheep are more susceptible than African sheep. The disease remains subclinical form in cattle but may show clinical sign with high mortality rate. Goats are relatively resistant but natural infection in Sannen goat has been detected. While tail deer and other wild ruminants may be naturally affected.

Transmission

- The virus is transmitted by biting midges of the genus *Culicoides* and not normally from direct contact with infected animals.
- Peak midge populations occur during the late summer and autumn in Europe and therefore this is the time when Bluetongue is most commonly seen.
- The midges can be carried very large distances on the wind (over 200km) and this has been the primary way Bluetongue serotypes are introduced into new areas.
- White tail deer and antelopes are considered to be reservoir of infection and thus act as carrier of the virus from one season to other.

Economic importance

Bluetongue virus infection has an enormous impact on sheep production in many countries on the African continent and elsewhere. Losses result primarily from mortality, reduced production during protracted convalescence including poor wool growth, and reduced reproductive performance including temporary ram infertility. Mortality rates can be high, with an average of 5% in the 2006 BTV-8 outbreak in the Netherlands, though in some flocks this was over 70%.

Clinical finding

The clinical signs of Bluetongue, which vary depending upon viral strain and sheep breed, follow an incubation period of four to 12 days. Usually, only a small percentage of sheep develop clinical signs, however deaths in some flocks can be as high as 70%. In extensively managed flocks, unexplained sudden deaths may be

the first evidence of disease. Animals that survive the disease can lose condition with a reduction in meat and wool production.

Affected sheep have a fever (up to 42.0°C) and appear stiff and reluctant to move. They often adopt an arched back stance with the neck extended and the head held lowered. There is swelling of the face and ears, and also pulmonary oedema which may cause breathing difficulties. Erosions may appear on the lips progressing to ulcers. There is often profuse salivation, and a serous to mucopurulent nasal discharge. There may be reddening of the coronary band, and around the muzzle and mouth. The tongue may become swollen and lack of oxygen may make the tongue and mucous membranes appear blue (hence the name of the disease). Though this does not always occur. Bluetongue can also cause pregnant sheep to abort and infection during the breeding season may result in a large percentage of early embryonic losses with sheep returning to oestrus at irregular intervals. Foetal deformities similar to those seen with Schmallenberg virus can also sometimes occur.

Swelling face and ear and restless Depressed in appearance

Source-http://www.nadis.org.uk/media/9643/052611_0956_Bluetonguei5.png

Key point

- High rectal temperature
- Eye and nasal discharges
- Drooling as a result of ulcerations in the mouth
- Swelling of the mouth, head and neck.
- Lameness with inflammation at the junction of the skin and the coronary band

- Difficulty breathing
- Abortion

Diagnosis

- Diagnosis is based upon clinical signs,
- Virus detection via PCR and/or seroconversion to bluetongue virus.

Treatment

- There is no treatment against virus infection
- Antibiotics may be given parenteral route to check secondary bacterial infection.
- Localized lesion may treat with tropical antiseptic solution to accelerate rate of healing.
- Affected animals should be kept away from solar exposure.

Prevention and control

- Control of bluetongue is very difficult because of the large number of potential hosts and virus serotypes.
- While control is aimed at keeping susceptible animals away from the vector this is not always practical.
- Control of the midges can be attempted with pour-on insecticides but this is expensive and does not achieve total freedom from the midge.
- Movement restrictions on affected animals may help with reducing spread to disease free regions but given how far the midges can blow restricting stock movements is of limited use in outbreaks.
- The following vaccines have been used with success. Vaccine is indicated for protecting valuable animals against blue tongue infection.
    - **Avianised live virus vaccine**- This vaccine is prepared from two avianised virus strain and this gives immunity for 30 months.
    - **Tissue culture vaccine**- This is prepared in bovine monolayer kidney cell culture.

Foot and mouth disease

Synonyms- Apthous fever, khurkut

It is highly contagious viral disease of cloven footed animals through cattle, buffalo, sheep and goats. It is characterized by vesicular eruption in epithelium of buccal cavity, tongue, nares, muzzle, feet, teeth, and udder.

Etiology

- It is caused by filterable virus namely *Picorna virus* (Apthovirus)
- There are 7 major strains of the virus namely- O, A,C, Asia-1, Asia-2, SAT-1, SAT-2.in Nepal O. A. C and Asia-! Are responsible for disease.

Transmission

- It usually spreads through ingestion of contaminated feed and water.
- Air-borne infection can also occur.
- Suckling of animal is also transmitted by this disease.
- The infection imposes a high spread during the cooler season when air remains in damp condition.
- All the fomites like clothes, harness, beddings, straw, hay etc may get infected to spread a disease.

Symptoms

- Fever (104-106F) for 24-48 hours.
- Loss of appetite.
- Drop in milk yield.
- Vesicle and ulcers on tongue, muzzle, dental pad and oral mucosa.
- Profuse salivation.
- Painful mastication.
- Vesicle and ulcer develops interdigital space and on the coronate.
- Lameness.
- Stamping of feet.
- Recovery within 8 days if complication doesn't occur.
- It may also cause abortion, mastitis, infertility, pneumonia and anemia ate

Diagnosis

- Diagnosis is based on symptoms.

- Isolation of virus from vesicular fluid.
- Serological test.
- Animal inoculation test.

Treatment

- There is no specific treatment, however symptomatic treatment can be done to speed up recovery and avoid complication(reduce secondary bacterial infection to use antibiotic).
- Oxytetracycline inj. @ 4-5 mg/kg body weight IM for 3-5 days.
- Mouth wash with 1% KMno4 or 2% Sodium bicarbonate solution.
- Appy Boroglycerine on mouth lesion.
- Foot washes with 2% Copper sulphate or 2-4% Sodium carbonate solution.
- Apply mixture of coal tar and Copper sulphate (5:1) on foot lesions.

Prevention and control

- Isolation of all affected animals immediately after detection
- Slaughter of all affected and in contact animals.
- Restriction of animal movement by regulation.
- Contaminated bedding and fodder should be burn.
- Sheep and goat flock must be disinfected with 1-2% castic soda or formalin solution.
- Strictly control movement of human beings in farm area.
- Vaccination should be provided as for schedule. Raksha vaccine @3ml Sc is used.

Goat pox

Synonyms- Variola capra

It is a malignant disease of goats characterized by fever and appearance of generalized pock lesions.

Etiology

It is caused by a member of the genus Capri pox virus. Goat pox virus, Sheep pox virus and virus of bovine lumpy skin disease constitute Capri pox virus group of

pox viruses and they cannot be distinguished serologically.

Susceptible host

All breeds of goats irrespective of age and sex are affected.

Transmission

- Although goat pox is a contagious disease but the exact portal of entry of the virus is not clear.
- The usual mode of transmission is from contact with the infected animals.
- The virus is present in the skin papules.\
- The virus may get entrance through wound and abrasions.
- While the affected animals rub their body on other animals , the virus directly to susceptible animals.
- The biting insect may be transmission of this disease by bite.
- Aerosol and droplet infection is quite possible.
- Food and water may act as a source and spread by disease in mechanical.

Clinical finding

- Skin papules appear in 2-5 days following temperature reaction.
- The papules are preceded by red macules which are easily seen in white skin.
- The eye lid is swollen and they may completely cover the eye ball.
- Discharge from eyes and nose becomes mucopurulent when papules on the conjunctiva and external nares become ulcerated.
- The mucous membrane of the eyes, nose, lips, vulva and prepuce become necrotic.
- In some cases ulcers and gangrene may set in animal by secondary infection.

Lesion

- Pock lesion seen in all parts of the body like-lips, cheeks, snout, nostril, face, ear, feet, thigh, abdomen, eyelid, neck, teat and udder.
- Papules are formed within 1-3 days.
- All the internal organelles are swollen and congested.

Diagnosis

- It is based on clinical finding like-appearance of pock lesion on the skin**.**
- Histological studies- Intracytoplasmic inclusion bodies in epidermal cells.
- Isolation of virus in cell culture or chorio allantoic membrane.
- FAT- It is used to detect the virus in the vesicles.

Treatment

- There is no treatment of viral disease but prevent the secondary infection to use antibiotics.
- Antiseptic or antibiotics ointment or lotions may be applied to control the disease and augment would healing
- Supportive treatment will be provided.

Prevention and control-

- Strict sanitary measures are to be adopted.
- Sick animals are to be segregated from healthy one.
- Goat traffic from the infected areas are to be prevented.
- Caprination- The lymph from the vesicles is to be withdrawn and to be inoculation in the undesirable of tail or inner surface of the ear of young goat. Alternatively the lymph may be rubbed on scarified surface of the skin.
- An immunoprophylactic agent has been used to control this disease.

Sheep pox

Synonyms- Ovine pox, Variola ovina

It is most serious pox disease of animals characterized by acute febrile condition and generalized development of pock lesion. Lesion first appear as vesicles which latter turn to pustules on the exposed parts of the body . there is high mortality rate in lamb

Etiology

The disease is caused by DNA virus of genus Capri pox virus.

Susceptible host

The sheep are naturally susceptible. The susceptibility has got bearance with breed

and age of animals. Younger sheep are more susceptible over older ones. In the young lamb the disease may flare up in an epidemic proportion. Merino breeds are more prone to disease than indigenous breeds.

Transmission

- It is highly contagious disease and there for transmission takes place due to direct contact with infected animals with the healthy animals.
- Droplet infection through nasal inhalation is an important way to disease transmission
- Wounds and abrasion of the skin also spread the disease.
- Dog, cat and birds are mechanically transmission of this disease.

Clinical finding

The disease may appear three clinical form-

- Malignant form
- Mild form
- Abortive form

Malignant form- This is most common form lambs may have 50% mortality rate, affected sheep are dull and depressed with high fever(106-107F). the pock lesion appear in various sites of skin. Lesions are mostly noted on the eye, lids, lips, nostrils, ear, cheeks and inner side of foreleg, inner side of thigh, scrotum, vulva, tail, chest etc. animal show respiratory distress.

Mild form- This form is usually noticed in adult sheep. Particular breeds of sheep are Algerian sheep and indigenous sheep are usually affected where the eruption are confined around eyes, lips and nose

Abortive form- In this form generalization is rare. The mortality is low (5%). Ewe may abort and the foetus may show pock lesions. Lactating ewe may show the sign of mastitis due to lesions in the udder.

Lesions-

Characteristic papules, vesicles, pustules and scabs are noted on cutaneous surface. Lesions may be observed in the mucosa of respiratory and alimentary tract occasionally on trachea.

Diagnosis-

- This is based on characteristic lesions on the skin. Intracytoplasmic acidophilic inclusion bodies are noted in the infected cell under histological studies.
- Confirmatory diagnosis is, animal inoculation test, complement fixation test, immune diffusion test, etc.

Treatment

- There is no treatment of viral disease but prevent the secondary infection to use antibiotics.
- Antiseptic or antibiotics ointment or lotions may be applied to control the disease and augment would healing.
- Supportive treatment will be provided.

Prevention and control

- Strict sanitary measures are to be adopted.
- Sick animals are to be segregated from healthy one.
- Goat traffic from the infected areas are to be prevented.
- Caprination- The lymph from the vesicles is to be withdrawn and to be inoculation in the undesirable of tail or inner surface of the ear of young goat. Alternatively the lymph may be rubbed on scarified surface of the skin.
- An immunoprophylactic agent has been used to control this disease.

Maedi

Synonyms- Progressive intestinal pneumonia, Maedivisna

The word "Maedi" denotes a condition in Icelandic for dyspnoea. It is a chronic viral respiratory disease of sheep and goat. The incubation period is too prolonged and there is a progressive pneumatic change in both the lungs leading to respiratory distress and death.

Etiology-

The disease is caused by Lentivirus of the family retroviridae. A relation has been reported to exit between maedi and visna. Both the disease do not occur in the same time but solitary cases in sheep has been reported where both maedi and visna

appeared simultaneously. The incubation period has been reported to be as long as 24-36 months.

Susceptible host

Sheep are most susceptible hosts. Goats may also be affected. Animal of 2 years or more that is usually affected and shows the pronounced lesions in the lungs.

Transmission

- The exact mechanism of natural transmission is yet to be determined. But direct contact of diseased animal with healthy one is suggested.
- Colostrums derived transmission is suspected.
- The disease may be produced artificially by inoculation of cultured virus through intrapulmonary or intracerebral route.

Clinical findings

- There is usually prolonged incubation period even to the extent of 2 years.
- The clinical signs are characterized by restlessness, emaciation and dyspnoea.
- Too much acceleration of respiratory rate.
- There may be double respiratory efforts.
- There is no appreciable rise of temperature.
- There is occasional cough and nasal discharge.
- Auscultation will reveal presence of fluid in the lungs.
- Illness continues for 3-6 months.
- The morbidity is 2-3% annually and mortality being 100%

Lesions

- The affected lungs are abnormally large in size and weight and they will not collapse on opening of thorax.
- Lungs are rubbery in consistency and grayish yellow to grayish blue in color.
- Some lungs may show pin-point to pin head sized nodules on their pleural surfaces,

Diagnosis

This is based on the following consideration-

- Prolonged course of disease.
- Gross and microscopic characteristic lesions
- Clinical pathology- anemia, hemoglobin level drops 7-8 gm/dl.
- Isolation of virus from leukocytes or cell culture.
- Virus neutralization test
- Complement fixation test.
- ELISA test etc

Treatment

Treatment is not fruitful against these insidious conditions.

Prevention and control-

- There is no effective measure which can control the disease.
- The steps comprising of isolation of lambs from ewes, giving them no colostrums and rearing them superlatively have been found satisfactory.
- Restriction of movement and outdoor ways of raising may act well to reduce the possibility of this infection.
- Elimination of affected sheep from the flock by slaughter and proper disposal of carcass may crub down the incidence of the disease.

Louping –ll

Synonyms- Ovine encephalomyelitis

It is an acute tick borne viral disease of livestock and man characterised by central nervous system derangement. It is primarily a disease of sheep, occurs mainly in lambs and yearling sheep.

Etiology

The disease is caused by virus belonging to genus flavivirus, family of togaviridae. Virus has resemblance with tick-borne encephalitis viruses causing encephalitis in man.

The virus is about 40-50 nm in diameter. The virus particle contains a single molecule of single standed RNA. The viruses replicate in the cytoplasm and

maturation occurs by budding intra cytoplasmic membranes.

Susceptible hosts

It is primarily a disease if sheep but goat, cattle, horse, pig may occasionally show the clicinal signs of the disease.

Transmission

- Transmission through ticks
- Transmission through droplet infection
- Transmission through needle
- Transmission through ingestion
- Transmission through milk

Lesions

No specific gross lesions are present at post-mortem examination.

Clinical findings

Sheep

1. Incubation period is 2-4 days.
2. Sudden onset of high fever (107ºF) for 2-3 days.
3. Twitching of the lip and nostrils.
4. Muscular tremor and rigidity of musculature of the neck and limbs.
5. The sheep walks into objectives and may stand with head press against them.
6. Convulsion, paralysis and death occur after 1-2 days.
7. Young lambs may die suddenly without specific nervous signs.

Goat

1. Doe excrets virus through milk and kids become affected by ingestion such milk.

Treatment

- There is no specific treatment for louping-ill.
- Anticera may be effective secondary bacterial infection if given within 48 hours of exposure.

Prevention and Control

- The sheep should not be allowed to graze at tick infested area.
- Immunisation is a traditional and rational approach.
- Vacciante all animals to be retained for breeding at 6 months of age.
- A single dose gives an antibody titre which persists for 2 years.
- Regular dipping of sheep with acaricide should be carried out to control the vector.

Scrapie

Synonyms- Tremblante du mouton; Rida.

It is highly fatal, non-febrile, chronic neurologic incidious disease of adult sheep and goats characterized by acute pruritis, in-coordination in gait, muscle tremor and severe emaciation. This disease simulates with a group of diseases known as "transmissible sub-acute spongiform encephalopathies"

Etiology

There is still a doubt whether scrapie is a disease of inheritance or caused by infectious agent. Currently it is assumed that an infectious agent is responsible for this this disease. Genotypic configuration plays an important role in incubation period of the disease and susceptibility of the host.

Susceptible host

Most breeds of sheep are highly susceptible to this disease. Young are more susceptible than adults. Occasionally, goats are also affected.

Transmission

- The transmission occurs through oral route by contagion of the affected animal.
- Meternal transmission may occur at pre or post natal stage.
- The disease may also be transmitted through abrasive lesion in the body.
- It also can be produced in mice and other laboratory animals by injecting the tissues of brain, spinal cord, lymph nodes, intestinal tract of infected sheep or goat.

Clinical findings

- Hyperexcitability, nervousness, aggresiveness, hyperaesthesia.
- Muscular tremor observed in head and neck muscle.
- There is inco-ordination in gait and severe convulsion.
- The affected animal urinates very frequently at scanty volume of urine.
- Sheep drink small quantity of water.
- The fleece is dry rough and brittle.
- Intence itching with hind feet and biting at the extremities makes the animal difficult to feed.
- Pregnant ewes may abort due to pregnancy toxaemia.

Goat

- Incubation period within 2-24 weeks.
- Atexia, hyperaesthesia, pruritus loss of body weight emaciation are seen very commonly.

Lesions

- Neurone of medulla
- Pons
- Midbrain
- Spinal cord

Treatment

- There is no specific treatment for the disease.
- Only supportive treatment and use of antibiotic control secondary infection of bbacteria.

Prevention and Control

- Eliminating the source of infection.
- Infected materials along with aborted materials should be properly disposed off.
- Depopulated of infected farms and areas are to be made adopting slaughter eradication method.
- Selection schemes for sheep have to be established as genetic background plays

an important role in susceptibility of disease occurrence.

- In enzootic area, all clinically affected animals should be burnt as soon as possible;
- Special care should be taken up to avoid contact between susceptible animals and the placenta of a possibly infected one.

Peste Des Petitis ruminant (PPR)

Synonyms- Pseudorinderpest, Goat Plague, Peste of sheep and goat

Peste des petits ruminants (PPR), also known as'goat plague', is a viral disease of goats and sheep characterized by fever, sores in the mouth, diarrhea, pneumonia, and sometimes death.

Etiology

It is caused by a morbillivirus in the family of paramyxoviruses, that is related to rinderpest, measles and canine distemper. Cattle and several wild ruminants have been infected most often experimentally, but goats and sheep are the usual targets.

Susceptible host

The disease is markedly evidence in goat. Sheep are less susceptible. Subclinical infection may occur in cattle. White tail deer is also susceptible. This virus does not affect man.

Transmission

- The virus is secreted in tears, nasal discharge, secretions from coughing, and in the faeces of infected animals.
- Therefore, close contact between animals, especially through inhalation of fi ne droplets that are released into the air when affected animals cough and sneeze will spread the disease.
- Water, feed troughs, and bedding can also be contaminated with secretions and become additional sources of infection; however the virus does not survive for a long time outside the body of a host animal.
- Since animals excrete the virus before showing signs of the disease, it can spread by movement of infected animals.

Clinical findings

- Similar to Rinderpest in cattle, after an incubation period of 3-6 days, there is a sudden onset of fever, severe depression, loss of appetite, and clear nasal discharge.
- The nasal discharge becomes thicker and yellow, often becoming so profuse that it forms a crust that blocks the nostrils causing respiratory distress.
- The eyes may also become infected, causing eyelids to mat together with discharge. Tissues in the mouth can swell and ulcers form on the lower gums, dental pad, hard palate, cheeks and tongue.
- Severe diarrhea develops in some animals, resulting in dehydration and weight loss.
- Pneumonia is common in later stages. Pregnant animals may abort.
- The prognosis of peste des petits ruminants is poor and death can occur within fi ve to ten days of the onset of fever.
- Young animals are most severely affected, goats more than sheep. In its most severe form (peracute) animals are found dead.
- However, the disease can be mild or unapparent and circulate in a country causing little or no illness until susceptible goats are exposed.

Diagnosis

- Diagnosis is based on History and clinical findins.
- The disease may be suspected when there is sudden onset of fever, nasal discharges, diarrhoea in sheep and goats, while cattle are uninvolved. Because the disease could resemble a great many common diseases including Foot and Mouth Disease, Bluetongue or Rinderpest.
- Laboratory confirrmation is important. Identification of the virus or serological testing is performed as outlined in the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals.

Treatment

- There is no specific treatment among viral disease.
- Symptomatic treatment for bacteria and respiratory problem be done by antibiotics.
- Fluid and antimicrobial therapy is indicated.

- Some antibiotic are Oxytetracycline @10mg/kg body weight along with levamizole @ 2.5 mg/kg body weight for 3-5 days.

Prevention and control-

- When the disease appears in a previously unaffected area, the standard disease control measures consisting of quarantine, movement control, sanitary slaughter, and cleaning and disinfection are applied. The virus is susceptible to most disinfectants.
- There are no medications available to treat the disease, but supportive treatment may decrease mortality.
- A vaccine is used where the disease is established and it provides good immunity. Because of the close relationship of PPR virus to Rinderpest virus, Rinderpest virus had been used as a vaccine, but with the current efforts to eradicate Rinderpest worldwide, it is no longer used.

12.7 Measure to keep the flock healthy

Health depends on maintaining the integrity of the animal's normal defences, primarily the skin and mucous membranes. Breaks in these normal tissue barriers can admit entry of disease organisms.

Flock health benefits

Maintaining a healthy flock has three major benefits.

1. **Production and Welfare:** Healthy animals, whose comfort has been taken into account, produce more, with lower feed and management costs.
2. **Markets:** Reliable health also results in a more saleable product and increases the value and success of the market in general. In this regard, reportable diseases and food safety issues, recognized as serious problems by the government, can affect the viability of the industry as a whole.
3. **Zoonoses:** As many diseases of sheep and goats can affect humans, maintaining animal health is in the best interest of the producer (*See* Zoonotic diseases below).

Immunity

Animals develop immunity, first by passively receiving antibodies from their

mothers, then by acquiring immunity to what they are exposed to (developing their own antibodies). Immunity is in the form of:

- **Antibodies** that are specific large proteins, produced by animal's immune system when exposed to toxins or disease agents *e.g.* bacteria, viruses, or they are received passively *e.g.* from colostrum. Antibodies bind to toxins or germs in various ways to nullify their effect.
- **Cell-mediated immunity** is the formation of trained '**killer cells**', *e.g.* lymphocytes, that are stimulated to bind to infected agents or cells and trigger a protective response.

Maintenance of health

Factors that affect the normal maintenance of health include:

- Age
- Body condition/nutritional stree
- Stage of production/ reproductive
- Previous health condition
- Source-farm raised vs. purchased
- Handling/ housing – stress
- Environmental stress

Many factors are affected by management actions. Thus planning and attention to management details can maintain or improve health.

The introduction of new disease agents to the flock also relates to factors and influences health. This is limited by keeping closed a herd as possible and using good sanitation procedure.

Biosecurity

- *Biosecurity* is a process or procedure of protecting a flock or herd from infectious diseases that do not currently exist on a property. It includes any precautionary measures that are taken to prevent diseases from emerging or from entering the farm. This process can be applied to an individual, a farm, a district, or an entire country.
- The consequences of a serious disease outbreak may place an entire enterprise

at risk. By having in place a clearly documented set of disease prevention and control strategies, producers can greatly reduce the risk of disease entering or spreading within the property

Phages of Biosecurity

Biosecurity has four sequential phases: mitigation, preparedness, response and recovery. 4

Mitigation is a type of prevention that lessens danger or harm by securing premises against infectious diseases.

Preparedness includes planning and implementing mitigation practices. Producers analyze the weaknesses and strengths of their facilities to determine the most effective ways of protecting them.

Response is handling a disease outbreak efficiently and effectively. The first 24 hours are crucial. Abnormal animal health issues, including massive die-offs and unusual symptoms must be immediately reported to the nearest animal health personnel, development agent or animal health regulatory officials.

Recovery begins when the disease outbreak has been eradicated or controlled. During recovery, premises and facilities are restored to an acceptable operational level. Covering pits and disinfecting premises might be part of the recovery process.

General Biosecurity measures

The following steps are recommended for establishing a biosecure farm:

- Keep a flock or herd history. This records the details of all individual animals.
- Start a herd or flock with good, healthy individuals.
- Design and follow a quarantine protocol for animal additions to the herd.
- Prevent unplanned contact with other animals over which you have no control.
- Provide medication only as necessary, or as recommended by veterinarians.
- Practice good sanitation and keep the farm clean
- Provide adequate housing and shelter for all sheep and goats.
- Minimize animal stress through good management practices.
- Provide sufficient feed in a balanced ration formulated for different seasons of

the year.

- Limit visitors to the farm.
- Limit vehicle traffic onto the farm to those that are essential for farm business and provide an area outside the farm to disinfect tires.
- Control insect populations and the access of wildlife, rodent, bird, and domesticated animal populations to your farm.
- Ensure that feed is not contaminated by manure or urine.
- Disinfect reusable equipment between animals.
- Examine the herd for diseases.
- Design and implement a disease control program as soon as potential diseases are detected inside the farm.
- Consult animal health personnel and vaccinate the herd against clostridial and other important locally endemic diseases.
- Formulate and follow a strategic deworming program designed to prevent internal parasite problems and maintain dewormer drug effectiveness.
- Treat animals returning from market or exhibition as new additions to the herd and follow a quarantine protocol for these animals.
- Necropsy all animals that die on the farm as a means to diagnose any diseases present

Specific Biosecurity measures

a. Bringing new animals into the herd

The most common source of new infections is new animals introduced into the herd. Sheep and goats can appear healthy while at the same time carrying a range of diseases. Purchasing sheep and goats that have the least disease risk must be a primary aim of farmers. The risk of buying infected sheep and goats cannot be totally eliminated, but can be significantly reduced by making careful enquires regarding the health status of the sheep and goats.

Once a decision is reached on buying an animal, follow these steps:

1. Find out the disease history of the herd of origin, the results of previous disease testing and the herd's current health.

2. Determine the pre-purchase disease status of the individual animal(s) that you are purchasing. Check teeth, udders, and in the case of males, ensure they are reproductively sound. Examine feet of all the sheep and goats and treat as necessary for foot rot. A veterinary examination prior to purchase and transport may help in identifying important diseases in sheep and goats.
3. If the sheep and goats appear healthy, transport them in clean vehicles to your herd and place them in quarantine or an isolation area. The quarantine area should have adequate fencing to ensure containment of isolated sheep and goats. The location is important to minimize contamination of other paddocks and areas of the farm. If a disease has been introduced, vigilance will help detect the outbreak in the early stages, so that its spread can be prevented and damage minimized.
4. The ideal duration of quarantine is 30 days. A quarantine facility or isolation area is an animal holding facility that is physically separated from the rest of the herd. There should be no fence line contact, no aerosol contact, no manure runoff contact and no potential for spread by fomites or vectors. Change boots and clothing before entering quarantine facilities and don't go back to the main herd after you have been in the quarantine unit.
5. At the midpoint of the quarantine period a careful physical examination should be performed to ensure the animal is free of physically obvious diseases. At the same time consider retesting the animal for critical diseases to exclude from your herd. There exists a distinct possibility that the purchased animal will test positive to a disease for which it was negative at time of purchase. The following situations could cause this scenario:
    - The animal was incubating the disease at the time of purchase.
    - The initial test was a false negative.
    - The stress of movement caused a latent infection to reactivate.
    - The animal was exposed to the disease in transit or after reaching your farm.
    - Some form of dishonesty or "laboratory error" has occurred.
6. At this time it may be beneficial to administer appropriate antibacterial drugs;

deworm and vaccinate for common diseases found in the area and herd.

7. Acclimatize new animals to the environment, feed and water. This will allow the animal's innate resistance to be minimally stressed and will help the sheep and goats in preventing disease. Sudden changes in food and water are viewed with suspicion which means they may eat or drink less than they should.
8. At the end of the quarantine period it would be wise to allow exposure of the new animal to a small group of the herd. If these selected animals don't get sick after mixing with the purchased animal one can assume that the rest of your herd will be safe. If the selected animals do get sick, they can be kept in quarantine until cured or removed from the herd. By following this procedure, you prevent the whole herd from being infected with a potential disease and you have proven that the incoming animal is not a carrier of disease.

b. Other sources of contact

In addition to bringing a new animal into the herd, direct animal contact can occur when grazing along fence lines in the presence of neighboring animals, during communal grazing times, or during movement of animals for sale and returning home unsold. These exposed sheep and goats should go through a quarantine period before being reintroduced to the herd. In order to avoid fence-line contact with other animals, double fencing of the perimeter is required. When greeting new arrivals sheep and goats snort and blow nasal secretions. These droplets will travel up to 1 meter so animals should be separated by fencing at least twice that far (2 meters).

Diseases from other species

Cattle, sheep and goats share a number of diseases and mixing these species is not necessarily safe. Other animal species can also transmit disease. For instance, Toxoplasmosis is a disease that causes abortions in sheep and goats. The infectious agent is a protozoan parasite that is transmitted by the domestic cat. Cats get infected by eating diseased mice. Sheep and goats get infected when they fed grain contaminated with cat feces. Control rodent populations on the farm.

Diseases introduced by fomites

People (visitors): A strategically placed notice on the entry gate of the farm will

help ensure that all visitors check in at the office before having contact with stock. Disinfecting footwear and wearing clean outer clothing should become routine practice for personnel arriving for work on the farm. It is best to keep people (especially other livestock producers) from entering and walking through your facility without following biosecurity measures.

Trucks and trailers: Trucks and trailers that are used for hauling livestock accumulate manure and other body fluids. If these vehicles are not washed and sanitized between loads they can serve as a very efficient fomite. Similar arrangements should be made for feed trucks and other farm service vehicles

Feed: Feed can be a source of infectious material onto your farm. The feed can get contaminated at the mill, at the store, or on your farm by feces from birds or rats. This contamination could result in feeding grain mixed with Salmonella or other infectious agent to your animals. The solution is to buy feed from reputable suppliers, keep the feed in rodent proof containers and avoid having spilled grain on the premises as it serves to draw birds and rodents.

Water: Well water can be a source of contamination from manure or chemical (fertilizer, pesticide, etc.) runoff and may serve as a source of disease. Water that flows onto the property from other livestock enterprises should always be fenced off.

Movement of effluent between properties: Contact of uninfected animals with infected effluent coming from an adjacent infected farm or property can spread disease.

Dead animals: All mortality should be handled and disposed of properly to prevent access by herd mates, predators, rodents, cats, etc., and eliminate the opportunity for disease transfer.

Movement of contaminated personnel and equipment: Movement of people, clothing, footwear, equipment and vehicles between infected and uninfected premises should be avoided to limit disease spread within and between enterprises

Vectors: Vectors are animals or insects that spread disease. Select livestock facility sites on areas that are not prone to water logging and vector multiplication. It is also

good to use fly repellants and immunize the sheep and goats against the common vector borne diseases

Biocontainment

After protecting the herd from outside threats, it is also important to control diseases which already exist within the established herd.

A. Limit disease spread

Limiting the disease to a certain population of animals in the herd or to a certain geographic location in the herd and not allowing it to spread can be achieved by:

Isolating affected sheep and goats in a pen away from the rest of the herd.

Removing non-infected lambs or kids from infected dams to prevent potential infection.

B. Follow an all–in–all–out policy

Another important concept of biocontainment is to bring a set of animals into a facility, raise them to a specified production level, remove all animals at the same time, then clean and disinfect the facility prior to introducing the next group.

C. Immunization of the established herd

Health in sheep and goats is a balance between the resistance of an animal to disease and the dose of disease to which it is challenged. Sanitation is the tool used to reduce disease challenges to animals.

Disease resistance is composed of environmental factors and immunologic factors. Sheep and goats that are well fed and housed will be more resistant to disease than those that are poorly nourished and poorly housed.

Sheep and goats that are immunized through vaccination against a specific disease will be more resistant to it than those that have not been vaccinated and consequently do not have immunity. To protect sheep and goats from disease through vaccination, it is important that vaccination be carried out prior to the challenge of the disease.

By combining local information on disease occurrence with epidemiological knowledge, disease prevention program could be developed by animal health staff.

The program should include routine annual vaccination of sheep and goats for the following diseases:

- Pasteurellosis ovine
- Sheep and goat pox;
- Anthrax;
- Pest des petits ruminants (PPR)
- Caprine pleuropneumonia (CCPP) for goats.
- Blackleg

During an outbreak of disease, a ring vaccination program for sheep and goats found around the outbreak area is conducted, serving as a barrier to halt the spread of infection.

Disease Surveillance

Disease surveillance is a very useful tool in disease control programs. Disease surveillance lets someone know how a disease control program is working at various points in time.

There are two general methods to survey the level of disease in a herd, examining animals and examining data collected from animals.

12.8 Vaccination schedule of sheep and goat

Vaccination means develops and active immune system by the use of vaccine. Vaccine also helps for immunization of animals. Immunization is the process by which an animal's immune system becomes fortified against an agent. Immunization is done through various techniques, most commonly vaccination. Vaccines against microorganisms that cause diseases can prepare the body's immune system, thus helping to fight or prevent an infection. Active immunization involves administration of vaccines containing antigenic molecules (or genes for these molecules) derived from infectious agents. Simply vaccination is the administration of vaccines. As a result, vaccinated animals mount acquired immune responses and develop prolonged, strong immunity to those agents. When properly used, vaccines are highly effective in controlling infectious diseases.

Vaccination schedule for goats

Months	Vaccine	Adult goat	Kids (Above six month)
January	Contagious pleuro pneumonia (CCPP)	0.2 ml I/dermal	0.2 ml I/dermal
March	Haemorrhagic septicaemia (HS)	5 ml S/c	2.5 ml S/c
April	Goat pox	Scratch method	Scratch method
May	Enterotoxaemia F.M.D	5 ml S/c	2.5 ml S/c
June	Rinderpest	1 ml S/c	1 ml S/c
July	Black Quarter	5 ml S/c	2.5 ml S/c
August	F.M.D	5 ml S/c	0.5 ml S/c
September	Eterotoxaemia	5 ml S/c	2.5 ml S/c

Source- G.C.Banerjee, Textbook of Animal Husbandry pp-975

Vaccination Schedule for Sheep

Disease	Vaccine	Age	Dose	Booster	Interval	Season
F.M.D	F.M.D vaccine	Adult	5 ml S/c	-	Annual	Winter/ autumn
Rinderpest	RD tissue culture vaccine	Adult	1 ml S/c	6 months	Annual	Winter
Black quarter	B.Q vaccine	Adult	2 ml S/c	-	Annual	All season
Lamb dysentery	Lamb dysentery vaccine	Lamb	2 ml S/c	-	Annual	All season
Black quarter	B.Q Polyvalent vaccine	Lamb Adult	2ml S/c 5 ml S/c	-	Annual	All season

Enterotoxaemia	Enterotoxaemia vaccine	Lamb Adult	2.5ml S/c 5ml S/c	7-10 days	Annual	Lambing season
Haemorrhagic septicaemia	H.S adjuvant vaccine	Adult	2ml S/c	-	Annual	March/ June
Sheep pox	Sheep pox vaccine	Lamb Sheep	3ml S/c 5ml S/c	Repeat 6 month	Annual	December / March

Source- G.C.Banerjee, Textbook of Animal Husbandry pp-1014

Assessment

A. Very short Answer Question

1. Meaning about health management.
2. What do you mean by bacteria and virus?
3. What do you mean by drenching?

B. Long Answer Question

1. List out the common endo-parasite and describe any three endo-parasite of sheep and goats.
2. List out the common ecto-parasite and describe in details causing in sheep and goat.
3. What do you mean by bacteria and list out the common bacterial disease of sheep and goat? Describe any one bacterial disease.
4. What do you mean by virus and list out the common viral disease of sheep and goats? Describe in details any one viral disease.
5. What do you mean by vaccination? Describe the vaccination schedule of sheep and goats.

Glossary

I/M- Intramuscular route

I/V- Intravenous route

I/d- Intra dermal route

S/c- Subcutaneous route

Unit 13
Record keeping

Objective

- To know about importance of farm record.
- To study the method of record keeping in small ruminants.
- To know the knowledge about record keeping in small ruminants farm.
- To demonstrate the farm record form in different record keeping in small ruminants.

B. Contents

- Importance of farm record
- Record keeping in small ruminant's farm

Learning process

A producer may well know a lot about the animals he keeps. However, keeping the information in ones memory is not reliable enough; anybody can easily forget something. Keeping written records helps to avoid loss of useful information. Record keeping is an essential part of good animal farm business management. A combination of high production and efficient production is the key to a profitable sheep and goat operation. On-farm records are essential in evaluating and improving the performance of sheep and goats within a farm operation. A good record keeping system can assist a farmer to make informed business and management decisions. Producers should have a record book in which all records are kept. This should be stored in a place where it will not become soiled or wet, making the records useless. The format should be simple and readily understood. Simple record keeping need not take too much time and the advantages are numerous. Recording is made easy if animals have some form of identification. Thus, animal recording and identification are inseparable.

13.1 Importance of farm record

The importance of record keeping on the farm may be grouped as follows-

- Give a history of what has happened on the farm for the period during which it

has been kept. Comparison of one year's records with the next, a farmer can see what progress he is making and trace weaknesses that need to be improved.

- Serve as an aid to managerial control during production. A producer can keep track of events like as-
  - Whether activities are going according to plan,
  - Check on feed utilization,
  - whether yields and profits are improving or going down,
- When animals were vaccinated, dipped, given any medicine or castrated; etc.;
- Trace origin of animals and serve as a tool for selection of breeding animals. If records are used for selection purposes, comparisons should be made between animals in the same flock to avoid confusion arising from differences in farm conditions or other environmental effects.
- Provide figures for farm planning and budgeting. Accurate financial and production data help a producer make necessary adjustments to operate more efficiently, plan for the future and pinpoint the weaknesses of a farm and allow the producer to act accordingly.
- Tell how much the producer is earning by maintaining financial records that have the appropriate level of detail depending upon the complexity of the operation. A more complex farm operation requires a more detailed system.
- Keep track of assets: Progress in the farm operation cannot be determined from year to year without keeping an inventory. Almost everything should be included in the inventory such as money (receivables, and payables), livestock, crops, supplies and property.

13.2 Record keeping in small ruminant's farm

Requirement of a record keeping system in farm

A record-keeping system should depend on the expected use of the records. There is no "best"

Record keeping system for all situations. A farm record should, however, fulfill the following:

- Provide accurate and relevant information.
- Fit into the farm organization or framework.

- Be available to make informed decisions.
- Be efficient in terms of time and cost.
- Be simple. Records should not be complex and be limited to necessary information. Complex records will probably increase chances of making mistakes or they may not be regularly kept because too much time will be required to properly fill out the records.

Types of record in farming

There are numerous different types of records that can be kept. However, the producer should keep records of information relevant to the type of enterprise he/she is operating and limited to information that can be utilized. There are two general categories of sheep/goat farm records namely-

- **Production records**: Production records for a sheep and goat enterprise should, for example, consist of information on herd health, performance of the herd as well as the performance of the individuals within the herd over successive years. These records should also include information on fertility, prolificacy, rearing or mothering ability and milk production directly or indirectly estimated through lamb/kid growth rate to a given age.
- **Financial records**: relate primarily to money or economic interactions on the farm. There are some lending institutions that will require detailed business and personal information on all farm assets as well as the status of unpaid financial obligations. Financial records justify or prove farm income or expense transactions. Examples of financial records are product sales, operating expenses (feed cost, veterinary expenses, forage seeds etc.), equipment purchases, accounts payable, inventories, depreciation records, loan balances and price information.

General principles of Record keeping farm

- All records, to be of value, must be accurate, neat and complete. One way of making sure that records are accurate is by filling them in as soon as possible after the operation or transaction and by checking them regularly. If possible records should be kept every day.
- The other important rule in keeping accurate records is to actually measure quantities. It is no use for example guessing the area of land or yields. Land

should be measured using measuring instruments and yield of products should be weighed.

- The whole purpose of keeping records and accounts is to make improvements. There is absolutely no value in spending time on records and calculations of profit, and production in individual enterprises, if no use is made of them.
- All the results should be compared with some standards. The standards for comparison might be the results for previous years or the results for other farms. Development agents may collect standards for comparison. Alternatively a group of farmers may decide to meet from time to time to compare the results of their farming business. One farmer may find his management is better than that of his friends in one enterprise and worse in another. By comparing results and discussing problems, farmers can help each other to improve their management.
- Below is a list of records that may need to be kept under Ethiopian conditions. The value and relevance of the different types of records will vary with differing sheep and goat production systems.
    a. **Health records**: including morbidity, mortality, signs and symptoms, diagnosis, treatments and vaccinations, etc.
    b. **Feed consumption:** This is difficult to estimate on farms where animals graze, but for capital-intensive farm businesses, such as finishing or fattening operations, the amount of concentrate fed should be recorded to calculate profitability.
    c. **Mating records:** Sire, dam and progeny identification is important in breeding, sale, and culling decisions.
    d. **Lambing/kidding records**, which include identity, dam ID, birth weight, date of birth, type of birth and sex.
    e. **Milk production records:** recording once weekly may suffice as this gives an indication of total milk production. Therefore, in dual-purpose sheep and goats, or even in meat types, a random sample of lactating females may be selected for recording their once-a-week milk production.
    f. **Growth/ weight records:** kept periodically (possibly on a monthly basis)

by recording the body weight of animals.

g. **Inventory**: Inventory of available animals on the farm and other assets.

h. **Carcass yield or dressing percentage**: is a factor that has tremendous economic value, particularly in a community-based breeding program. This information could be obtained from slaughterhouses/abattoirs if the animals are slaughtered in slaughter houses.

Some example of record keeping model

1. Breeding record format

Owner name-

Religion-

Village name/Municipality/ word no-

Farm name-

Dam ID	Dam breed	Dam birth date	Sire ID	Sire breed	Mating date	Lambing/ Kidding date	Remark

2. Animal health record format

Owner name-

Religion-

Village name/Municipality/ word no-

Farm name-

No	ID/ Name	Date of observation	Major sign observed	Suspected disease	Treatment	Response	Remark

3. Vaccination record format

Owner name-

Religion-

Village name/Municipality/ word no-

Farm name-

No	ID/Name	Date of vaccination	Type of vaccine used	Remark

4. Lamb/kid performance record format

Owner name-

Religion-

Village name/ Municipality/ word no-

Pre-weaning record

Lamb/kid ID	Birth date	Sex	Birth type (S/T/TR)	Dam ID	Dam breed	Sire ID	Sire breed	Birth weight(kg)	Remark

S-Single, T-Twin and TR-Triplet

At weaning record

Weaning date	Weaning weight (kg)	Type of rearing	Weaning group	Weight at marketing	Body condition score (1-5)	Lamb/kid price	Remark

5. Individual ewe/doe record format

Owner name-

Religion-

Village/ Municipality/ward no-

Farm name-

ID No-	Age	Date lambed / kidded	Weight of lamb/ kid (kg)	Type of birth (S/T/TR)*	Parity	Mothering ability **	Date brought in farm	Date removed/ culled	Remark

S-Single, T-Twin, TR-Triplet

** -Excellent mother, parity- poor

Assessment

A. Very short Answer Question

1. Meaning about farm record?
2. List some important of farm record kipping.

B. Short Answer Question

1. Describe the importance of farm record in small ruminants.
2. Meaning about farm record and details about the types of farm record.
3. Mention the chart about breeding record, performance record and vaccination record format.
4. Describe the general principle of farm record in small ruminants.

Glossary

S- Single
T-Twin
TR- Triplet
ID- Identification of animals
Dam- Female animal
Sire- Male animal
Culled- Removed animal/ Unproductive animal to discard
Ewe- Female sheep
Doe-Female goat

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