

ANIMAL PRODUCTION

LEVEL-III

**Based on March 2022, Version-4 Occupational
Standard**



Module Title: Conducting Sheep and Goat Production

LG Code: AGR ANP3 MO5 LO (1-4) LG (18-21)

TTLM Code: AGR ANP3 TTLM 0523v1

May, 2023

Adama, Ethiopia

Table of Contents

Introduction to the Module	1
LO#1 Determine sheep and goat production and productivity	2
Instruction sheet-1	2
Information sheet: 1	3
Self check - 1	15
LO#2 Perform Breeding management of sheep and goat	16
Instruction sheet-2	16
Information Sheet: 2	18
Self check - 2	67
Operation sheet	68
LAP Test	69
LO#3 Identify feed and feeding of sheep and goats	70
Instruction Sheet-3	70
Information sheet-3	71
Self check - 3	833
Operation sheet	84
LAP Test	75
LO#4 Identify sheep and goat housing and facilities	86
Instruction Sheet-4	86
Information sheet-4Error! Bookmark not defined.
Self check - 4	955
Reference	96

Introduction to the Module

This unit covers the knowledge, skills and attitude required to conduct sheep and goat production that required determine sheep and goat production and productivity, Perform Breeding management of sheep and goat, Identify feed and feeding of sheep and goats and Identify sheep and goat housing and facilities.

Definition of Terminology

Breed: Is either a sub-specific group of domestic livestock with definable and identifiable external characteristics that enable it to be separated by visual appraisal from other similarly defined groups within the same species, or a group for which geographical and/or cultural separation from phenotypically similar groups has led to acceptance of its separate identity.

Prolificacy: Ability to reproduce; rate of reproduction.

Puberty: Period in time during which the reproductive system acquires mature form and function.

Creep feeding: Creep feeding is simply providing supplemental feed separately to young animals while they are still suckling. Creep rations should contain 12–13 MJ/kg of metabolisable energy with a protein content of between 13 and 16% depending on the protein levels in the forage.

Ad libitum: A feeding system where animals are given unlimited access to feed. Synonymous terms include full feeding, free choice, self-feeding.

Animal protein: Protein of animal origin derived from slaughterhouses and animal product processing plants that can be used as ingredients in feed mixtures.

Feed (feedstuff): Any naturally occurring material suitable for feeding animals.

Feed additives: Non-nutritive products that improve animal performance or preserve feeds.

Flushing: The practice of supplementing breeding animals two weeks prior and for one or two weeks after breeding to improve fertility.

LG#18	LO#1 Determine sheep and goat production and productivity
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Instruction Sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying Sheep And Goat Production Systems
- Productivity And Economic Importance Of Sheep And Goat
- Identifying Sheep And Goat Selection Criteria
- Analyzing Sheep And Goat Production Status
- Performing Sheep And Goat Culling Operation

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify Sheep And Goat Production Systems
- Productivity And Economic Importance Of Sheep And Goat
- Identify Sheep And Goat Selection Criteria
- Analysis Sheep And Goat Production Status
- Perform Sheep And Goat Culling Operation

Learning Instruction

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information sheet-1

1.1. Identifying Sheep And Goat Production Systems

There are a number of ways to classify production systems. In this handbook, sheep and goat production systems were classified using criteria that included degree of integration with crop production and contribution to livelihood, level of input and intensity of production, agro-ecology, length of growing period and relation to land and type of commodity to be produced. Three major and two minor production systems are described.

The major production systems are:

- Highland sheep–barley system
- Mixed crop–livestock system
- Pastoral and agro-pastoral production systems

The other production systems that are not currently practiced widely but have a future are:

- Ranching
- Urban and peri-urban (landless) sheep and goat production system

A. Highland sheep–barley system

This system is found in the highlands above 3000 m.a.s.l. where the major crops grown are barley and pulses such as faba beans, lentils, etc. Temperature is the main factor determining productivity in the highland sheep–barley production system. At times, night temperatures fall below 0°C and frosty nights are common, particularly between October and January. Cropping intensity in these areas is generally low. Sheep are the dominant livestock species. The main feed resource-base includes wasteland grazing, stubble and sometimes straw. Sheep flock sizes range from 30 to several hundred head.

Although sheep are reared mainly for meat, skins and coarse wool production for the cottage industry of the central highlands are subsidiary products. There is, therefore, a clear possibility of establishing more formal sheep production enterprises using appropriate technology packages. Large sheep production ranches could be established where mainly meat or dual-purpose breeds could be maintained either by individual farmers or cooperatives. These highland areas are generally unsuitable for sustainable crop production.

B. Mixed crop–livestock systems

Both sheep and goats are raised in mixed crop–livestock systems. These systems are based on cropping associated with livestock husbandry. This system is generally found in areas where the altitude ranges between 1500 and 3000 m.a.s.l. The area has adequate rainfall and moderate temperature and is thus suitable for grain production. The integration of crops and livestock is high in most areas. The integration is lower in the perennial crop–livestock system (coffee growing areas) in southern Ethiopia where animals are of minor importance.

Livestock in general and small ruminants in particular play an important role in food security and food self-sufficiency in this production system. In the grain-based mixed production system, livestock are the main cash source for the purchase of agricultural inputs. Livestock are used as a savings and insurance mechanism. Cattle are the dominant livestock species and are kept mainly for draft power. Sheep and goats are kept to meet small and immediate cash needs.

Sheep are more dominant than goats in this production system. The major commodity is meat, while milk is a subsidiary product in some areas. Skin of hair (*‘Gishe’*) goats in the extreme highland areas has a local niche market for making saddles. Coarse wool is also produced from Menz sheep and other sheep in the central and north central highlands. The wool is usually used for the local carpet-making industry.

Land-holding per household is 2–3 hectares with some areas having much smaller holdings of less than 2 ha. The major feed resources are natural pasture and crop residues. In some areas, one-fifth to one-third of the holding is used for grazing. In most of the areas, however, livestock generally depend on grazing communal land that is dwindling in size and productivity. Sheep and goats in this system experience year-round nutritional stress due to increases in cultivated land area. This results in very high grazing pressure and subsequent shortage of feed. This area is also characterized by excessive soil erosion and soil nutrient depletion because of intensive cropping and overgrazing.

The system of sheep and goat production for the most part is a low input / low output system except in some cases of concentrate supplementation and use of anthelmintics for fattening sheep and goats. There is a need to intensify production because of the high population density in these areas. Potential for intensive small ruminant production through finishing activities and

stratification of production exists:

C. Pastoral system

In general, pastoral systems are associated with agro-ecological zones (AEZ) that are too dry to sustain crop production. These are characterized by little or no crop agriculture and high mobility in search of grazing and water. Under Ethiopian conditions, pastoral systems of production are found at altitudes below 1500 m.a.s.l. and where the annual precipitation is less than 500 mm. The following characterize pastoral systems:

- Livestock are maintained as a principal activity. Fifty percent of household revenue comes from livestock or more than 20% of household food energy is derived directly from livestock or livestock-related activities.
- Rangeland is the main land resource.

Livestock species consist of camels, cattle, sheep, goats and donkeys. In recent years, pastoralists have shown an increasing interest in keeping larger numbers of sheep and goats. There are more goats than sheep in this system. Milk and meat are the two outputs. In drought years, goats gain more importance as suppliers of milk to the household. Goats also help to control bush encroachment.

Pastoralists depend on their livestock not only for their income but also for their survival. Consequently, risk avoidance is very important to the pastoralist. Livestock management is, therefore, directed towards risk minimization, which tends to reduce productivity. Pastoralism is ecologically, economically and socially important for sustainable development in dry lands.

D. Agro-pastoral system

This system is characterized by less integration with crop production as compared to the crop–livestock production systems. Producers under this system have a permanent residence and their movement is limited in terms of both distance and duration. The system is characterized by a high degree of dependence on milk and meat production. Some crop agriculture is practiced around the permanent homestead. This is also a low input / low output system. The system is usually practiced below 1500 m.a.s.l. but with higher rainfall to support short season crops compared to the pastoral system.

D. Integrating Sheep and Goats in Commercial Crop Production

Page 5 of 99	Ministry of Labor and Skills Author/Copyright	Animal Production Level -3	Version- 1 May, 2023
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Sheep and goats can be beneficial in many commercial cropping ventures, including fruits, vegetables, and tree crops. As an example, in Southeast Asia, sheep and goats are raised in plantations producing rubber, oil palm, coconut, coffee, and various fruits.

In many of these systems, herbicide was traditionally used to control weeds and grass that compete with the main crop for soil nutrients. Sheep and goat grazing is an alternative weed and grass control method. By using sheep and goats, herbicide use and labor costs for application are decreased, leading to reduced production costs and fewer harmful chemicals released into the environment. The animal manure assists in recycling soil nutrients and improves soil fertility. The animals also become a source of income for the enterprise when sold.

Contrary to popular opinion, sheep and goats do not ruin the crops. Proper management and grazing techniques can prevent damage to trees and other crops by small ruminants. Integrating sheep and goats into commercial crop production systems diversifies production and allows for two income streams, those from crops and livestock, to be realized from the same plot of land. In Ethiopia, such integration could occur in coffee plantations, rubber plantations in the southwest and other tree and fruit crop farms.

E. Sheep And Goats In Production Vegetation Management

Sheep and goats are important animal species in controlling unwanted and invasive vegetation. There are many plant species that cattle do not prefer that are consumed by sheep and goats. As cropland increases and animals are forced to graze increasingly less productive land, the need for animals that consume a diverse array of plant species is paramount.

Sheep and goats can assist in stopping the spread of some weeds and unwanted brush. This reduces the need for manual chopping or weeding. It has been said that goats are particularly destructive to an environment. However, used correctly, sheep and goats can be a conservation tool that helps protect biodiversity of plant species. These animals consume invasive plants allowing other plant species to grow and flourish. Proper management of animals and grazing is key in managing vegetation. Many of the problems associated with small ruminants, in particular goats, and environmental degradation are actually the result of man incorrectly managing these animals or trying to raise too many livestock in areas unsuited for the practice.

1.2.Productivity And Economic Importance of Sheep And Goat

Page 6 of 99	Ministry of Labor and Skills Author/Copyright	Animal Production Level -3	Version- 1 May, 2023
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The total number of sheep and goats in Ethiopia is estimated to be nearly 48 million. Sheep and goats are widely adapted to different climates and are found in all production systems. They also have lower feed requirements compared to cattle because of their small body size. This allows easy integration of small ruminants into different farming systems.

Human population growth in Ethiopia is forcing the conversion of many former grazing areas into croplands needed for increased food production. Raising large ruminants is becoming increasingly difficult as a result of the ensuing lack of grazing areas. Land holdings in densely populated areas are below 0.5 ha. In such places, the importance of sheep and goats in fulfilling the role once played by cattle for meat, milk and manure production is being increasingly recognized. The increased demand for sheep and goat meat has also increased their importance in lowland pastoral areas as a source of cash income, food security, etc. It is associated with several objectives to serve the material, cultural and recreational needs of the farmers as follows:-

1. **Income** - important means of earning supplementary income.
2. **Food** - provide animal proteins (milk and meat) that are important for the nutritional well-being of peasants.
3. **Security** - sources of investment, security and stability.
4. **Employment** - creation of employment including effective utilization of unpaid family labour.
5. **Fertiliser** - contribution to farm fertility by the return of dung and urine.
6. **By-product utilisation** - they enable economic utilisation of non marketable crop residues
7. **Bush control and clearance** - in many parts of Africa, goats are used to control and clear the bush. The task is also facilitated by many goat breeds being trypanotolerant
8. **Leather trade and handicraft** - skins are used extensively to produce various leather goods and handicraft.
9. **Fibre** - Mohair and cashmere are very important fibres in the textile trade and are highly sought after. Ordinary goat hair also has commercial value

10. **Social values** - the ownership of animals has been shown to increase cohesiveness in village activities.
11. **Recreation** - socio-economic impact of animal ownership also includes a recreational contribution to small farmers
12. **Transportation** - in highland areas such as in the Himalayas, goats provide a means of transporting small loads.

There are definite economic, managerial and biological advantages as follows:-

1. **Economic** - low individual values means a small initial investment and correspondingly small risk of loss by individual deaths. This makes goats and other sheep an attractive proposition for household use and subsistence farming, especially for poor families.
2. **Managerial** - goats can conveniently be cared for by women and children, occupy little housing space, and supply both meat and milk in quantities suitable for immediate family consumption, which is important in view of the difficulties of storage in the tropics.
3. **Biological** - one or two goats can be kept when nutrition is inadequate for even one cow.

Sheep and goats are among the major economically important livestock in Ethiopia. There are about 23.62 million sheep and 23.33 million goats in the country, playing an important role in the livelihood of resource-poor farmers. They provide their owners with a vast range of products and services such as meat, milk, skin, hair, horns, bones, manure and urine for cash, security, gifts, religious rituals, medicine, etc.

Sheep and goats are relatively cheap and are often the first asset acquired, through purchase or customary means, by a young family or by a poor family recovering from a disaster such as drought or war. Sheep and goats, once acquired, become a valuable asset providing security to the family as well as milk and dairy products.

In the subsistence sector, farmers and pastoralists depend on small ruminants for much of their livelihood, often to a greater extent than on cattle, because sheep and goats are generally owned by the poorer sectors of the community. Any intervention that improves the productivity of sheep and goats is important in creating wealth and improving the standard of living of resource-poor farmers. The short generation interval of sheep and goats coupled with high

frequency of multiple births allow for rapid increases in animal numbers. This builds financial capital and allows the sale of surplus animals for cash that can be used for other agricultural enterprises, school fees, medical bills, etc.

Very often, there are no banking facilities in rural areas and an easy way to store cash for future needs is through the purchase of sheep and goats. In fact, in some areas, small ruminants have been described as the ‘village bank’. It has to be noted that this is beyond the cash value of the animal. Small ruminants represent only 7% of the average total capital invested in livestock in the mixed crop-livestock production system, but they account on average for 40% of the cash income and 19% of the total value of subsistence food derived from all livestock production

1.3. Identifying Sheep And Goat Selection Criteria

There is a large variation among sheep and goat breeds in Ethiopia and the world. Different breeds have different environmental adaptability. Animals which are adapted to cool areas may not be suitable to hot areas. Animals which have evolved within a certain area are usually better adapted to that particular area than other breeds. Therefore, whenever possible, it would be wise to make use of such animals in improvement programs. In such programs, productivity improvement should come through selection and better management. Introduction of other animals (breeds) may be considered if their own – or that of their crosses with local breeds – adaptability to the area is proven and if their performance shows clear superiority to local animals under similar management conditions.

Selection among breeds must be based on performance data collected from groups raised in the same environment (cohorts). Comparisons need to be made in the actual environment in which animals will be raised, not on experimental stations. Comparisons must be thorough to give realistic estimates of not only lifetime production but also reproductive, mortality and morbidity rates.

A. Selection of Breeding Animals

You must develop a clear idea about the merits of individual traits to be successful in genetic selection. For selection to be effective, the selected traits must be: *heritable* (capable of being transmitted from parents to offspring), *variable* (differences must exist between animals for that

trait), and *measurable*. Weight, for example, is an easy trait to measure because all that is needed is a weighing scale. Traits to be considered in a sheep and goat selection program include those that will enhance meat, wool, and milk production.

Where small ruminants are kept primarily for meat production, selection will be on the number and weight of offspring weaned per female per year. The number of offspring born per flock per year can be increased by decreasing the number of females which fail to lamb/kid, by increasing litter size, or by increasing the frequency of parturition. Females which fail to produce offspring after consecutive opportunities should be culled. With proper selection, it is possible to realize a sizeable increase in litter size. The acceptability of twins depends on the environment (particularly nutrition) and management system. Weights at birth, weaning, six months and one year are important in selection of animals for meat. Weight at birth would have an additional influence on survival of animals.

For wool sheep, selection is based on weight of fleece. Additionally, staple length could be important. In general, selection for increased fleece weight will also result in a longer staple, but it might be necessary to pay particular attention to staple length for those sheep used for this purpose. Other wool quality aspects, such as crimp, diameter, etc., may not be important in Ethiopia, at least in the near future. Selection of animals for milk is in terms of quantity of milk produced per year. This is a function of quantity of milk per lactation, lactation length and parturition interval.

Animals to be used for breeding purposes should be selected carefully and superior animals should be identified accurately. Sheep and goats can be selected based on records of performance and visual appraisal. Selection based on records is the best way to achieve good results. Additional visual appraisal of the selected animals is advantageous. Visual appraisal of a contemporary group of animals may be considered where record keeping is not practical or is nonexistent. Visual identification of superior animals is less successful compared to selection based on records. Differences among animals of the same age from similar dams (parity, age, condition) kept under similar management serve as indicators of genetic variability that can be exploited in a breeding program.

1. Visual appraisal

Selection of sheep and goats for breeding purposes based on visual observation is done by looking at the appearance, conformation and presence or absence of defects in the animal.

2. Appearance: Only an animal which is active, alert, healthy and attractive in appearance should be considered for selection.

3. Conformation: Sheep and goats to be used for various purposes would have different conformations. Animals meant for milk purposes have a different conformation than animals meant for meat. There are no specialized breeds in Ethiopia and animals are generally dual-purpose breeds. However, in areas where milk is an important product, it is wise to select animals with a conformation conducive for milk production. Milk animals should have a larger tract and udder. They have longer, thinner necks and a wedge-shaped appearance. Meat animals, on the other hand, have a stocky appearance and tend to have a rectangular shape.

A. Defects: Sheep and goats to be used for breeding should be free of defects, particularly those of genetic origin, including defects of legs, teeth and testes. In a number of goat breeds, polledness is associated with reduced fertility. Polledness in an otherwise horned goat breed should, therefore, be selected against.

B. Legs: Legs of sheep and goats (particularly males) should not be extremely hocked or curved. The rear (hind) legs should be wide apart and straight when viewed from behind. Poor leg conformation is usually of genetic origin and can affect mating ability of male.

C. Teeth: The incisor teeth on the lower jaw should perfectly meet the edge of the dental pad on the upper jaw for efficient grazing. Some sheep and goats have an overshot jaw where the upper jaw is longer than the lower while others may have an undershot jaw, in which case the upper jaw is shorter than the lower. In other cases, the teeth are deformed. Such animals, particularly males, should not be used for breeding.

D. Testes: Male sheep and goats selected for breeding should have two large, well-formed, functional, equal sized testicles in a single scrotum (some breeds normally may have a split scrotum). Sperm production is related to the size (circumference and length) of the testicles (Figure 6.5). More semen is produced by males with greater scrotal circumference. Avoid selecting males that show overly pendulous testicles. Males with very hard, small, unbalanced testes and those with scars, bumps and lumps should not be selected for breeding. In addition,

the epididymis area at the neck of the scrotum should be free of lumps. These defects may result in low fertility and/or transmission of reproductive disease as some of these defects are caused by pathogenic organisms affecting the reproductive system.

E. Udder: Ewes and does should have well formed udders with good attachment and two well-formed teats. It is important that the udder is constructed in a way that allows offspring to nurse unassisted. The external genitalia of the female should be well developed and properly structured. Vulvas which turn up at the end can cause a problem when the male is serving the female and result in poor fertility. A female that has not given birth or exhibited signs of pregnancy by 18 months of age should be culled.

1.4.analyzing Sheep and goat production status

Measures of reproduction commonly used in sheep and goats include age at puberty, age at first lambing/kidding, post-partum interval, and parturition interval and fertility indices.

1. Age at puberty

It is difficult to have an accurate measure of puberty unless hormonal assays are done at certain intervals (bi-weekly). On experimental stations, puberty may be recorded as the first behavioral estrus observed. This estrus is called pubertal estrus. The manifestation is not strong and its duration is short, hence, requiring close attention for heat detection.

2. Age at first lambing/kidding

This trait can be recorded easily in a farmer's flock. There is a big variation among production systems and breeds for this trait (12–24 months). It is usually late in animals living in harsh environments.

3. Post-partum interval (PPI)

This is the time between parturition and the resumption of cyclic ovarian activity and it is a major component of lambing/kidding interval. It has a significant contribution to productive efficiency. A mean interval of 83.5 days (51–133 days) has been reported for Somali goats. Nutrition, suckling, parity (number of times kidded/lambd) and breed affect this trait. During lactation, the onset of a new cycle is actively inhibited so that the energy is preferentially reserved for milk production for the offspring. This is called lactational anestrous. Ewes and does giving birth in the dry season have a longer interval compared to those lambing/kidding

during the rainy season. Ovarian activity in most tropical breeds commences after weaning. Suckling interferes with hypothalamic release of GnRH, provoking a marked suspension in the pulsatile LH release, resulting in extended postnatal anestrus. Females at earlier parities take longer than older ones to return to reproductive status.

4. Parturition interval (lambing/kidding interval)

This refers to the number of days between successive parturitions. It is called lambing interval in ewes and kidding interval in does. Under normal circumstances (no drought), tropical sheep/goats should be lambing/kidding at least three times in 2 years. For this to be realized, lambing/kidding interval should not exceed 8 months (245 days). As the major component of parturition interval is post-partum interval (PPI), accelerated lambing or kidding revolves around manipulating PPI because a shorter PPI will result in a shorter parturition interval. Better nutrition and early weaning could impact this measure of reproductive performance.

Tests on an eight-month lambing interval under controlled mating in Horro sheep has shown acceptable results in both ewe and lamb performance. One of the most important ways of increasing off take rate is through reduction of the parturition interval and, if done with optimal input, this may help in meeting the growing demand of the export trade.

5. Fertility

Various definitions of fertility exist in literature such as conception rate, fecundity, prolificacy, birth rate, etc. A general definition of fertility is the number of ewes lambing or does kidding divided by the number of ewes/does mated. Fertility is affected by factors such as nutrition, age, diseases and season of mating. In most cases, there is a positive effect of supplementation. Supplementation during the mating period (shortly before the mating period and afterwards) could increase the number of ova shed and improve embryo survival. This practice is called flushing and is discussed in the nutrition and management sections. Age of the ewe or doe is also an important factor. Fertility increases with age, and also starts to decline with old age.

6. Litter size (LS)

This is a combination of ovulation rate and embryo survival. Litter size (LS) varies between 1.08 and 1.75 with average of 1.38. Positive relationships between LS and age and LS and parity have been noted. LS increases with parturition number until the fifth kidding/lambing. Increases in

ewe or doe weight (prior to mating) by 1 kg over the mean of the population results in an increase of about 3.8% in LS. Breed differences in litter size are common. Finnish Landrace and the Romanov breed are considered the most prolific sheep in the world. In Ethiopia, the Horro breed is said to be prolific as compared to the Menz sheep.

A litter size of 1.93 has been reported in Boer goats. This is said to increase to 2.5 with selection. Sheep and goats in the pastoral areas are known to give birth to singles only. This might be due to negative selection that has taken place in the environment. Heritability estimates suggest the possibility of genetic improvement in LS through selection.

7. Annual reproductive rate

This is defined as the number of lambs/kids weaned per ewe/doe of reproductive age per year. Some authors use litter size at birth rather than litter size at weaning. However, the latter is preferred as it takes the mothering ability of the dam into consideration. Apart from single traits, a combination of two or more traits can be used as a measure of reproductive performance.

1.5. Performing Sheep And Goat Culling Operation

Culling in sheep and goat flocks is an important tool for the development of a good flock. It helps to remove undersized animals and breed those closest to the desired ideal type. Selection criteria should be developed and followed when culling animals. For example, ewes that do not conceive after two successive mating should be culled. Animals with defects, poor udders, bad conformation, etc., should be culled. Culling should be stringent and used as a means of improving the genetic quality and productivity of a flock. Following such criteria could mean 10–20% culling annually. These animals can be sold to enter the meat market. Flock size can be maintained by replacing culled animals by ewe lambs or doelings in the flock.

This is a method used to improve the overall productivity of the flock. Although reasons for culling could be different for different systems and agro-ecologies, from a reproductive point of view, it is essential to intensively cull ewes/does after 5–6 years of age.

It is important to detect barren ewes or does in the flock. Habitual aborters should be identified early and culled. This is of significance as abortion caused by *brucella* bacteria can be transferred to healthy animals within a short period of time. Frequent screening of the flock for *brucella* could be useful if diagnostic labs are found in the area.

Self check - 1	Written test
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Name ID NO. Date

Direction: answer all the question listed below

Test: I. Multiple choices

- Which one of the shoat production system support integrate production system?
 - Pastoral production system
 - mixed crop-livestock production
 - A and B
 - none
- Which one of the following is/are NOT used to measure the reproductive performance of shoat?
 - age at puberty
 - lambing/kidding interval
 - litter size
 - none of the above

Test: II say True or false

- Impossible to know shoat production system in Ethiopia.
- animal culling is used to reduce wastage and economic loss in farm
- No need to measure the reproductive performance of shoat

Test: III. Write short and brief answers

- mention the major shoat production system in Ethiopia
- Mention sheep and goat selection criteria.
- Mention the criteria of sheep and goat culling.

LG#19	LO#2 Perform Breeding management of sheep and goat
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Instruction Sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying Common Sheep And Goat Breeds
- Recognizing Reproductive Organ Of Sheep And Goat
- Identifying Common Reproduction Index
- Carry Out Estrus Inducement And Detection Procedures
- Carry Out Breeding Methods Of Sheep And Goat
- Applying Pregnancy And Condition Of Animal's Diagnosis Techniques To Identify Early Opportunities And Suitable Action
- Identifying And Reporting Sign Of Parturition And Potential Problems
- Preparing And Assisting Ewes And Doe During Giving Birth
- Care New Born Lambs And Kids
- Preparing And Implementing Contingency Measure

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify Common sheep and goat breeds
- Recognize Reproductive organ of sheep and goat
- Identify Common Reproduction index
- carry out Estrus inducement and detection procedures
- Carry out Breeding methods of sheep and goat
- Apply Pregnancy and condition of animal's diagnosis techniques to identify early opportunities and suitable action
- identify and report Sign of parturition and potential problems

- prepare and assist Ewes and Doe during giving birth
- care new born lambs and kids
- prepare and implement Contingency measure

Learning Instruction

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheet
6. Do the “LAP test”

Information Sheet: 2

2.1. Identifying Common sheep and goat breeds

Attempts have been made since 1975 to identify and characterize Ethiopia's sheep breeds or types. Unsuccessful attempts have been made to establish elite flocks of identified sheep such as Afar, Blackhead Ogaden (Blackhead Somali), Horro and Menz in research centers and government farms. Other additional breeds/types such as the Washera sheep in the Amhara Region and Arsi-Bale sheep in the Oromia Region have been described to a limited extent.

A. Afar Sheep

The Afar sheep formerly referred to as Adal sheep in literature, is a fat-tailed sheep. It is a small-sized breed with mature weight ranging 30–35 kilograms (kg). The natural habitat of the breed is the Middle Awash Valley in eastern Ethiopia, extending as far as Dire Dawa in the east and the town of Bati in the north. The habitat has an altitude ranging 300–1100 meters above sea level (m.a.s.l.), and is between 40 and 42 °E longitudes and 9 and 11 °N latitudes. Rainfall in the area is erratic and annual precipitation ranges from 300 to 700 millimeters (mm). The vegetation is mainly of sub-desert range types consisting of a sparse cover of low shrubs and bush cover, which is currently being invaded by *Prosopis* (an invasive tree species). The Afar sheep are hardy and tolerate periods of drought relatively well.

The Afar sheep have small ears and usually have a dewlap and thick layers of fat on the brisket. The fat tail has a wide base and reaches below the hocks. Hair is short and coarse, the predominant color being solid blond with other colors ranging from shaded white to light brown. There are a few exceptions of animals with spotted color patterns and/or dark brown hair. The average observed wither height for adult rams is 66 centimeters (cm) while that for adult ewes is 61 cm. Afar sheep weigh about 2.5 kg, 13 kg and 25.8 kg at birth, weaning (90 days), and one year of age, respectively. Ewe mature weight is about 31.6 kg. Twin births are not common.



Figure: 2.1. Afar sheep in Melka werer Research center

B. Arsi-Bale sheep

Arsi-Bale sheep are fat-tailed and covered with coarse wool (wavy wool). They are widely distributed in the highlands of eastern and south-central Ethiopia, in Arsi, Bale, Hararghe and East Shoa zones of Oromia Region and in many parts of the southern region. The climate in these areas varies from semi-arid to sub-humid with annual rainfall above 1500 mm. The production systems range from agro-pastoral to agricultural and urban. Arsi-Bale lambs weigh 2.7 kg and 14.2 kg at birth and at 120 days (weaning), respectively.



Figure: 2.2. Arsi-Bale sheep (in Background) and in Arsi-Negele market

C. Black Head Somali sheep

The Blackhead Somali is indigenous to the Ogaden area of the Somali Region. The breed is also known by various names in eastern Africa and other countries including Blackhead Persian and sometimes as Blackhead Ogaden sheep. It is widely distributed within 42–48 °E longitudes and 3–9 °N latitudes. The Blackhead Somali is distinguished by the black color of the head. The body is predominantly white but other colors may be observed. The hair is short, stiff and shiny. Both rams and ewes are hornless, though males can sometimes have rudimentary horns. The forehead is convex and the nose tends to be of the Roman type. The ears are short and pointed with an outward-forward inclination. Most animals have a well-developed dewlap which sometimes extends from the chin to the chest with considerable fat deposits. The tail is a fat rump type with a very distinct fat depot having a thin tip sticking straight backward and sometimes hanging down.

There is some undocumented evidence which indicates that there are some Somali clans in the Ogaden who specialize in stud breeding. These clans apply some sort of selection, favoring larger body size and fatter tail and rump. The adult weight of Blackhead Somali ewes is between 30 and 35 kg. The Blackhead Somali sheep are also hardy and well adapted to the dry, drought-prone environments of the Somali and southern tip of Oromia regions. The altitude in the Somali region is below 1000 m and mostly below 500 m. The climate is dry and arid with erratic rainfall and a mean annual precipitation ranging between 200 and 400 mm. The vegetation is similar to that found in the Afar Region.

D. Horro Sheep

The natural habitats of Horro sheep are the western and southwestern parts of the country. The Horro sheep is widely distributed in areas covering western Shoa to East and West Wollega, Illubabor and Jimma zones of Oromia Region. These areas lie between 35 and 38 °E longitudes and 6 and 10 °N latitudes. Altitude of the area ranges 1400– 2000 m.a.s.l.. Mean annual precipitation is between 1000 and 1400 mm. The vegetation of the habitat ranges from broadleaf savannas to woodland and open wooded grassland to forest types. The predominant color of Horro sheep is a solid tan (light brown). Other colors observed are creamy white, dark brown, and sometimes black and spotted. The body is covered with short, shiny hair. The face profile is straight with a somewhat convex appearance in males. Both rams and ewes are hornless.

Horro sheep have a relatively long neck without a dewlap but most have fat deposits below the lower jaw and in the brisket. Wattles are rarely present. The fat tail is triangular with a relatively narrow base and pointed end which hangs downward sometimes with a slight twist, mostly reaching just below the hocks. The rams usually have a mane between the head and brisket and above the neck and shoulder.

Horro sheep are larger than most other indigenous sheep having a mean height of 73 cm and 68 cm at the shoulders for adult rams and ewes, respectively. Horro sheep weigh 2.8–2.9 kg, 13–15 kg and 25–33.5 kg at birth, weaning (90 days), and one year of age, respectively. Ewe mature weight is about 38.2 kg. Twin births are common, sometimes reaching 60% in older (multiparous) ewes. Horro sheep are not only larger in size compared with other indigenous breeds but also seem to be more prolific.



Figure: 2.3. Horro Sheep

E. Menz Sheep

The natural habitat of Menz sheep is North Shoa and parts of Wollo Zone of the Amhara Region. These areas lie within 39–40 °E longitudes and 10–11 °N latitudes. Altitude in most cases is above 2500 m.a.s.l. with a cold, harsh climate that occasionally has frost, particularly between November and January. The mean annual precipitation is between 900 and 1360 mm and the rainfall pattern is bimodal.

Menz sheep are the most prominent coarse wool bearing sheep in Ethiopia. The body is compact and mostly covered with coarse hair with a wooly undercoat. The people in the area use the

coarse wool to make a cloak, locally called “*Bernos*,” and rugs. The coat color is black or dark brown, perhaps with white spots on the head, neck and legs. Other colors such as light brown, roan and white also exist.

The head has a straight profile and is free of any wool cover. Rams mostly have twisted horns while ewes are usually hornless. Menz sheep have small ears with a downward-forward inclination. This breed has no dewlap and wattles are very rare. The tail is short and fat and has a broad base, ending halfway to the hocks with a slight twist at the end. Menz sheep are not known to be a docile breed.

The mean height at the shoulders is 64 cm and 58 cm for adult rams and ewes, respectively. Menz sheep weigh about 2.3, 11 and 26–30 kg at birth, weaning (90 days) and one year of age, respectively. Ewe mature weight is estimated to be about 35 kg. Twin births are common, sometimes up to 60%.



Figure: 2.4. Menz Sheep

Ethiopian Goat Breeds and Their Characteristics

According to recent estimates, the goat population in Ethiopia is about 23.3 million. A large proportion is found in the lowlands of the country, raised in large flocks by pastoralists. Nearly 10 million goats (42% of the total) are found in the highlands.

A. Abergelle goats

The Abergelle goat is believed to be a relative of the Afar and Worre goats. It is found along the Tekeze River and some parts of Alamata of the Tigray Region, and Wag Hamra (Sekota) and East Gondar zones of the Amhara Region. Abergelle goats are stocky, compact and well-built.

The goats have a straight to concave facial profile. Both males and females have horns and in most cases the horns in males are much bigger and spiral shaped. The coat of most goats is plain and patchy. Spotted coat colors are common. The hair is short and smooth in both sexes and males have beards and ruffs. Mean height at the shoulders is 71.4 cm and 65 cm for adult bucks and does, respectively. Abergelle goats are milked for domestic consumption. Their skin is also used to make aprons, containers, etc.



Figure: 2.5. Male and Female Abergelle Goat respectively

B. Afar goats

The Afar goat is also referred to as the Adal and Danakil goat. Its natural habitat is the Afar Region but it can also be found in northern and western Hararghe zones of the Oromia Region. Its distribution extends to the Afar area of Eritrea and northern Djibouti. Afar goats are well adapted to arid environments where they are watered every three or four days. These goats are hardy and used to long distance trekking in search of feed and water.

The Afar goat has a concave facial profile, narrow face and forward-pointed ears. The breed is also characterized as being leggy. Both males and females are horned, though females have smaller horns. The coat color is variable with a fine, short appearance. Most males have beards while wattles could appear in both males and females. Mean height at the shoulders is 64.5 and 60 cm for adult bucks and does, respectively. Afar goats are milked for domestic use or sale. The goats are maintained for meat, milk and skin production and for social affairs as they are commonly given away as dowry.



Figure: 2.6. Afar female goat

C. Arsi-Bale goats

The Arsi-Bale goats are widely distributed covering the whole of Arsi, Bale and western Hararghe zones of the Oromia Region, and the high altitude areas of Sidama Zone of the Southern Region. Arsi-Bale goats are also found in most areas of the Rift Valley from Lake Abaya to south Shoa Zone. They are mostly kept in small flocks in mixed farming areas. The Arsi-Bale goat has a straight facial profile. Males have curved and backward-pointed horns. Females mostly have shorter horns. Some males have ruffs while most have beards. Wattles are also present in some males and females. The coat color varies considerably with white as the most common color in males, and brown in females. Goats at higher altitudes have longer hair. Arsi-Bale goats have fairly long ears, and some of them have pendulous ears. Mean height at the shoulders is 73.2 cm and 66.1 cm for adult bucks and does, respectively. Arsi-Bale goats are reared for meat, milk and skin production. Manure is also a valuable product used to fertilize backyard farms.

D. Begayit (Barka) goats

It is believed that the Begayit, also known as Barka in Eritrea, was derived from Nubian type goats. These goats are mainly found in western Tigray. Begayit goats have a predominantly Roman type facial profile. They are tall with mean height at the shoulders being 74.3 cm for adult bucks and 67.9 cm for does. The coat color of Begayit goats is mainly white with brown patches. Their hair is particularly long around the thighs. Both sexes have horns that are straight or curved and oriented backwards. Males have beards and ruffs. Begayit goats have relatively large udders and are milked.

E. Central Highland goats

Page 24 of 99	Ministry of Labor and Skills Author/Copyright	Animal Production Level -3	Version- 1 May, 2023
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Central Highland goats are related to Western Highland and Keffa goats. These goats are mainly found in the Central highlands, west of the Rift Valley, Wollo, Gondar and Shoa. The Central Highland goats have a predominantly straight facial profile. All male goats have curved or straight horns which are oriented backwards. The coat color varies, the predominant color being red-brown, and the hair is smooth. Males have beards and ruffs. In some cases, wattles are also present. The mean height at the shoulders is 76.3 cm for adult bucks and 67.9 cm for does. Skin is an exportable commodity while manure is used to fertilize backyard farms



Figure: central highland goats

F. Hararghe Highland goats

Hararghe Highland goats are believed to have been derived from Short-eared Somali goats. These goats are small in size. The coat color is white, brown or black and the hair is short and shiny. The goats have a straight-to-concave facial profile. Both males and females are horned but there could also be a high proportion of polled goats among the flock. Horns could be straight or curved. Most male goats have beards but no ruffs. Some goats have wattles. Mean height at the shoulders is 71.5 cm and 62.5 cm for adult bucks and does, respectively. Hararghe Highland goats are kept for meat, milk, skin production and for social functions.



G. Keffa goats

The Keffa goat is related to the Western Highland goat. They are widely distributed in the highlands and lowlands of Keffa and South Shoa zones of the southern region. Keffa goats are relatively short and have a straight facial profile. Mean height at the shoulders is 75.6 cm and 66.7 cm for adult bucks and does, respectively. Most males have straight and backward-oriented horns. Keffa goats have a coarse, hairy coat, the dominant colors being black or brown. Males have beards and ruffs. Wattles are also observed in some goats. Goat meat is frequently eaten in areas where these goats are kept. They are also used for some social functions.

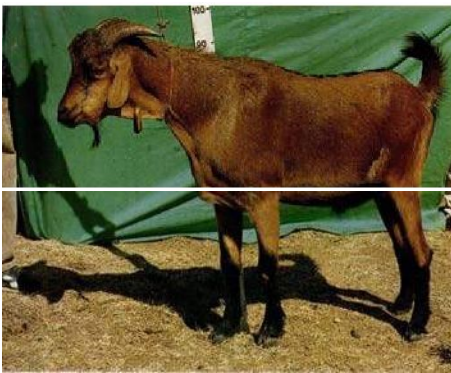


Figure: 2.8. Male and Female Keffa goat respectively

H. Somali Goats

The Short- and Long-eared Somali goats are related. The Short-eared Somali goats are widely distributed in northern and eastern Ogaden, Dire Dawa. The Long-eared Somali goats are found in all parts of the Ogaden, lowlands of Bale and Borana zones of Oromia and in some parts of Sidama zone of the Southern Region. The Short-eared Somali goats are smaller than the Long-eared ones. Mean height at shoulders for adult Short-eared Somali bucks and does is 64.9 cm and 61.8 cm, respectively. The corresponding figures for Long-eared Somali adult male and female goats are 75.8 cm and 69.4 cm, respectively.



Figure: 2.9. Somali bucks at Haramaya University Figure: 2.10. Somali does at Hawassa University

Both types have a straight facial profile and a short, smooth coat which is mainly white. Horns are present in both males and females and the horns are curved and oriented backwards. Males also have beards but only the Long-eared Somali bucks have ruffs. Short-eared Somali goats have shorter and slightly forward pointed ears while the Long-eared Somali goats have horizontally oriented and semi-pendulous ears. Both the Short- and Long-eared Somali goats are milked extensively. Goat meat is also favored in these areas compared to mutton. Both types are reared for meat, milk, various social affairs and skin production.

H. Western Highland goats

Western Highland goats are known to be related to the Central Highland and Keffa goats. These types of goats are widely found in the Highlands of South Gondar, Gojam, Wollega and West Shoa. The western Highland goat is relatively tall and has a concave facial profile. The body is mostly covered with coarse hair, forming a long coat. Mean height at the shoulders is 80.7 cm and 70.8 cm for adult bucks and does, respectively.

The most observed color is plain followed by patchy and spotted color patterns. Although both males and females have horns, there are also some polled animals. Horns are mostly straight and backward-oriented. Males also have beards and ruffs. Polledness and presence of wattles is also observed among some goats. Goat milk is not consumed in these areas.

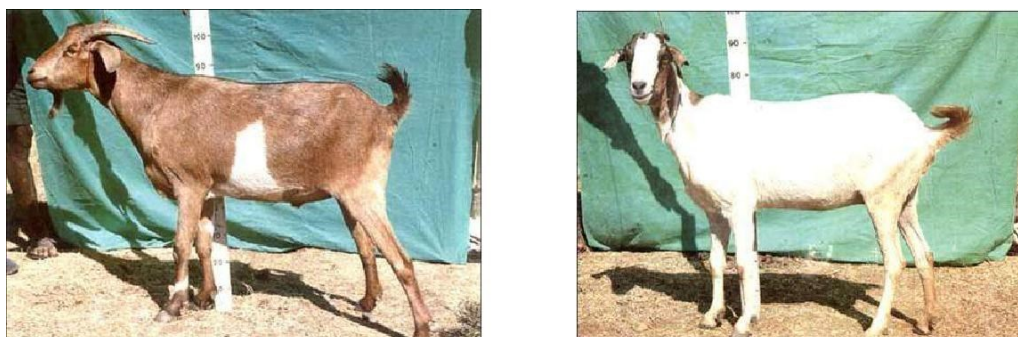


Figure: 2.11. Western Highland male (left) and female goats.

I. Western Lowland goats

The Western Lowland goats are also called Gumuz. These are thought to be closely related to the Central and Western Highland goats. The Western Lowland goats are widely distributed along

the areas bordering the Sudan (Metekel, Assosa and Gambela). Identifying features of Western Lowland goats are their relatively short stature and straight facial profile. The dominant color is white followed by fawn, black and grey. White patchy colors are also commonly observed. Mean height at the shoulders is 67.2 cm and 63.5 cm for adult bucks and does, respectively. Both males and females have straight and backward-oriented horns. Most males also have beards and ruffs. Polledness and presence of wattles is also observed in some goats. Goats are milked in the pastoral and agro-pastoral areas.



Figure: 2.12. Western Lowland male (left) and female goats

J. Woyto-Guji goats

Woyto-Guji goats are known to be related to the Arsi-Bale types. These goats inhabit a wide area extending from South Omo to southern Sidama and Wolayita. Woyto-Guji goats are also found in trypanosomiasis affected areas in and along the Gelo valley to the south of Lake Abaya and other adjacent areas. The body is covered with shiny and smooth hair of various colors. The predominant coat colors are reddish-brown appearing in a patchy pattern with black or brown stripes running along the back, on the underside or on the front of the legs.



Figure: 2.13. Male (left) and female Woyto-Guji goats

The Woyto-Guji goat is a medium-sized goat. The head is small with a mostly straight-to-concave facial profile. Most males and females are horned and there are some polled animals. Horns are mostly oriented backward or upward and sometimes laterally. Males have beards and ruffs, and some goats have wattles. Goats in these areas are kept for milk, meat, skins and manure production. They are also important for some social functions.

1. Important Exotic Sheep Breeds

There are many types of sheep in the world kept for a variety of purposes. Only some of the important breeds that can play a role in the development of Ethiopian breed productivity are selectively described. Some of these breeds have been imported into Ethiopia at some time in the past in an attempt to improve meat and fiber production of the indigenous breeds, particularly the Menz sheep.

A. Awassi sheep

Awassi sheep are widely distributed in the Middle East with a range covering Israel, southwest Iran, southern Iraq, Syria and northeast Arabia. These are fat-tailed sheep known mainly for their meat and coarse wool along with dairy potential. The average, traditionally maintained mature ewe weight is between 40 and 50 kg. Rams have large horns and ewes are polled.

Awassi rams and ewes were imported in 1980, 1984 and 1994 from Israel to be crossed with the Menz sheep at Amedguya and Debre Birhan sheep breeding and multiplication centers. Reports show that 87.5, 75 and 50% crosses were distributed to farmers through the extension program of the then Ministry of Agriculture.



Figure: 2.14. Awassi Rams at Amedguya Sheep Breeding Center, Amhara Region.

B. Corriedale Sheep

The Corriedale breed originated in New Zealand and is a cross between Lincoln and Merino with a later addition of the Leicester breed into the crossing. The intent was to develop a dual purpose breed that could produce medium wool as well as a good quality carcass. Corriedale sheep were used in Debre Birhan and Amedguya sheep breeding ranches for many years from the 1970's through the early 1990's to produce crossbred Corriedale/Menz animals for distribution. The crosses, particularly the 75 and 87.5% Corriedale rams, were distributed to many parts of the country



Figure: 2.15. Corriedale ram (left) and ewe with twin lambs.

C. Dorper sheep

The Dorper is a meat breed developed in South Africa. It is a crossbred between the Dorset Horn and Blackhead Persian breeds. Dorper sheep are also widely distributed in some African countries such as Botswana, Zimbabwe, Zambia and Kenya. Dorper sheep can also be found in North America and other countries around the world. The body of Dorper sheep, except the belly and the face, is covered with a mixture of hair and some coarse wool. Dorpers have a black head and neck with a white body, but there are also solid white Dorper sheep.

Both rams and ewes are polled. Dorper sheep are relatively big and ewes under a favorable environment weigh about 60 kg. Dorper sheep are fast-growing with good conformation for meat production. The breed is well adapted to dry environments and is well-suited to a wide range of production systems.



Figure: 2.16. Dorper ram (left) and ewe with lamb.

2. Important Exotic Goat Breeds

There are also many types of meat and dairy goat breeds in the world. Only some of the important breeds that have been introduced to Ethiopia earlier or with merits of high value for future use are described. Most of the breeds introduced to date have been dairy goats with the main purpose of crossing with local goats to improve milk production in areas where goat milk is known to be consumed.

A. Anglo-Nubian goats

The Anglo-Nubian is a dual purpose breeds known for both meat and milk production. The breed was developed through the crossing of Jamnapari (Indian) and Zaraiby (Egypt) breeds with Nubian and Damascus ancestry. Anglo-Nubians are polled, have a convex facial profile and lopped ears. The breed is well-adapted to tropical environments and was introduced to Ethiopia through FARM-Africa for upgrading Hararghe Highland goats for milk production.

There has also been a crossbreeding study of Anglo-Nubian with Somali goats at the Awassa College of Agriculture. Crossbred kids weighed about 3.2 kg and 14.8 kg at birth and nine months of age, respectively. The breed performs well both as a purebred and a crossbred for meat and milk production



Figure: 2.17. Anglo-Nubian bucks at Haramaya University

B. Beetal goats

Beetal goats were developed from the Jamnapari breed and are found in the states of Punjab, Haryana and other Indian states. The temperature of the areas where this breed is found ranges from 17 to 32°C (degree Celsius) with an average annual rainfall of 700 mm.

Beetal goats have a convex facial profile with a typical Roman nose. Ears are long, curled and drooping. The length of the ears is about 25 cm. Horns are thick and medium sized and carried horizontally with backward and upward orientation. The breed has a short, lustrous coat cover with variable colors dominated by brown or black. White spots of differing sizes are also common.



Figure: 2.18. Beetal buck (left) and doe

Beetal goats weigh 2.8, 12.2 and 21.8 kg at birth, 6 and 12 months of age, respectively. Mature weights of male and female goats are about 59 and 35 kg, respectively. Withers height for mature males is about 92 cm while that for mature females is about 77 cm. Age at first kidding is about 560 days at the farm level. Multiple births typically occur at a rate of 60%. Beetal goats give about 195 liters of milk in about 6 months of lactation.

C. Boer goats

The Boer goat was developed in South Africa through crossing Africander, South African Common, indigenous Bantus, European, Angora, and Indian blood. Boer goats are medium to large, 75–80 cm in height at the shoulders. Male and female Boer goats weigh up to 130 and 80 kg, respectively, with most animals weighing between 75 and 90 kg and 50 and 60 kg for males and females, respectively. The coat color is white with red or brown on the head and neck. The hair is short and shiny. Boer goats have horns and large drooping ears.



Figure: 2.19. Boer buck (left) and doe.

The Boer goat is a meat breed but milk and skin are also important products. The breed has good meat conformation, possessing superior rib, body length and muscling. Carcass yield ranges 48–60%. Boer goats are also known to be fertile with up to 50% of births being twins. Kids weigh 3–5 kg at birth and can reach 40–50 kg at six months of age. Some preliminary work has been done in Ethiopia to improve local goats through the use of Boer goat semen. Arsi-Bale goats were inseminated with Boer goat semen at Hawassa University to produce F1 crosses. Somali goats were also inseminated with Boer goat semen at Haramaya University to produce crossbreds. Although results have not yet been analyzed, the crossbreds seem to perform well provided that appropriate management and health care is provided

D. Damascus or Shami goats

Damascus goats are among the known dairy goat breeds of eastern Mediterranean countries and Iraq. This breed belongs to the Nubian group. It is believed that Nubian and Jamnapari goats of India might have the same ancestry. The dairy characteristic of this breed has been particularly developed through breed improvement programs in Syria and Cyprus.

Damascus goats are tall with a pronounced Roman-type nose. Ears are pendulous reaching 25–30 cm in length. The breed is normally polled. Horns, if present, are moderate in length and diameter with a back and downward orientation and have a homonymous twist in males while they are sickle-shaped in females.



Figure: 2.20. Damascus goats (buck and doe)

Mature body weight ranges 50–90 kg and 35–65 kg for males and females, respectively. Damascus goats weigh 3–4.2 kg at birth and 19 kg at weaning. Height at the withers for mature males ranges 75–89 cm, and for mature females 60–76 cm. Age at first kidding ranges 15–24 months. Multiple births occur in about 70% of the births. Milk production ranges 250–558 kg in lactation periods ranging from 155 to 300 days.

E. Jamnapari goats

Jamnapari is an Indian breed indigenous to the State of Uttar Pradesh. It is widely distributed within Uttar Pradesh and adjacent areas of Madhya Pradesh State. The area where this breed is found is climatically characterized by temperatures ranging between 19 and 32°C with a mean annual precipitation of 765 mm.

This breed was used in the development of Boer and Anglo-Nubian goat breeds. Jamnapari goats have a convex nose line with a tuft of hair. The ears are long and drooping, with a mean ear length of about 27 cm. Horns are short and flat. The breed has a short coat with a relatively thick growth of hair around the rump. Typical coat color is white with small tan patches on the head and neck.

F. Toggenburg goats

The Toggenburg breed is also a Swiss dairy goat breed originating in the Toggenburg valley. The breed has mostly long hair. The Toggenburg breed was developed through the crossing of

Appenzel goats with Chamoisee. The identifying characteristics of this breed are its fawn-to-light grey-base color, the white stripes on the head running from the muzzle to the eyes and polls, and its white ears and legs. Mature body weight is 65 and 45 kg for males and females, respectively. Height at withers is 75–85 cm for males and 70–80 cm for females. This breed has also been introduced to Ethiopia for crossing to produce grade dairy goats by crossbreeding with Somali goats.



Figure: 2.21. Toggenburg does

G. Saanen goats

Saanen goats are one of the most prominent dairy breeds developed in Switzerland. Saanen goats have been used for crossbreeding to develop other dairy subtypes and as a result German, British, Dutch, Israel, Australian and American Saanen breeds have been developed. In Ethiopia, there were attempts in the early 1970's to cross Saanen with Afar and Highland goat types. However, the program was not sustainable since the effort was not supported by appropriate extension packages including health, feed and management. Saanen goats are characterized by their white, short coat hair. The face is straight; Saanens have short and pointed ears. Mature body weight for pure Saanen males and females is 75 and 50 kg, respectively, while milk production ranges 500–900 kg in 250–300 milking days.

2.2. Recognizing Reproductive organ of sheep and goat

Female

The reproductive tract of ewes and does is similar and, hence, discussed together. 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

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

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.

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), transports the fetus out of the maternal body during birth.

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.

Vagina: This is the exterior portion of the female reproductive tract and is the site of semen deposition during natural mating.

Vulva: barrier for preventing external contamination of the female reproductive tract.

Male

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.

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 characteristics, maintaining normal sexual behavior and sperm production.

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.

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 equal-sized testicles are present and sperm production is normal.

Epididymis: The epididymis is located in the testes and is a long and convoluted tube in which sperm cells produced by the testicles are stored and mature to a stage capable of fertilization. This change occurs as sperm cells move from the head to the body of the epididymis with mature sperm being stored in the tail of the epididymis.

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.

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.

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.

2.3. Identifying Common Reproduction index

Reproductive performance is a key determinant for the efficiency of goat production. Regular monitoring of reproductive efficiency is essential to assess management and to avoid financial losses due to poor performance. These reproductive problems cause an economic loss in the world. Inadequate management and nutritional deficiencies cause poor production.

Reproductive parameters of sheep and goat

- Breeding age- 6-8 months.
- Comes to heat after lambing – 21 days after.
- Length of pregnancy - 147 days (ranges between 144 and 152 days)
- Male female ratio - 1:20.

The primary reproductive diseases which are commonly associated with the reproductive system of small ruminants are brucellosis, leptospirosis, toxoplasmosis fever, listeriosis, campylobacteriosis along with nutritional deficiencies, socio-sexual and photoperiods also affect the reproductive system. Estrous period is repeated every 16-17 days on average in ewes (range 14-19 days). Increasing flock reproductive performance can be achieved through different interventions, including better management practice, nutrition, genetics and healthcare adopted by the producers and extension agents. Based on phenotypic information from individual cows, 2 reproductive indices (RI1 and RI2) were developed, representing a predicted probability that a cow will become pregnant at first AI as a function of explanatory variables used in a logistic model.

The reproductive index is said to measure the reproductive status of animal and can be calculated by formulating different statistical formula. It is a composite index constructed by taking into account variables, representing different aspects of reproduction. They are: (1) total fertility rate (TFR); (2) age specific fertility rate for the age group 15-19 (3) birth order; (4) the type of attention at birth, (5) perinatal mortality rate; (6) couple protection rate; and other.

2.4. Carry Out Estrus Inducement And Detection Procedures

A. Estrus synchronization in the females

It is a method thorough which estrus is induced artificially in a group of females at one time (at pre-determined time). An induction of estrus artificially in a group of females to occur at a time is called estrus synchronization.

The purposes are:

Page 38 of 99	Ministry of Labor and Skills Author/Copyright	Animal Production Level -3	Version- 1 May, 2023
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1. To inseminate a group of females at one time,
2. It allows AI to be used more efficiently. (It mechanizes the use of AI). The Synchronization of estrus forces the use AI, because it may not be possible to get males to serve all the females.
3. It helps to have many young animals at a certain time when there is enough labour to massage and feed the young animals and females. Because, young animals and dams need more feed & management. During certain season one may have surplus feed in other time shortage, so one needs to have more animals to utilize excess feed resources and to have many young animals for high market demand periods or other religious occasions.
4. It reduces time and labor cost to detect heat (estrus) every day, because in sheep or goat farming one of the difficult tasks is estrus (especially when animals are kept without males and attendant in fenced pastures). Difficulties with optimum time of mating or insemination will be resolved when estrus synchronization is used.

Disadvantages:

It requires well trained /qualified man - power (personal) & hormones used may be also expansive.

Estrus can be also induced naturally by introducing males to females which were kept separately. Sight, odor or smell and sound induce in many females' estrus /heat at a time.

In this way one can synchronize estrus in his flock. Artificial estrus synchronization is simulated from natural induction of estrus. Estrus synchronization can be done by the use of hormone progesterone. Synchronization of estrus can be done by inserting hormone progesterone into the vagina. About 5mg progesterone which is impregnated in small sponges is inserted into vagina. May be also implanted or injected intramuscularly. The sponges with progesterone are then removed 16-18 days after insertion (in goats) and 12-14 days in sheep. Progesterone is used because it inhibits the release of FSH & estrogen, which induce estrus cycle. Following the withdrawal/removal of progesterone, a single dose (400-800 IU of PMSG) of pregnant mare serum gonadotropin (PMSG) is injected. PMSG mimics the release of FSH and stimulates

follicular growth. 2 - 3 days after removal of progesterone or injection of PMSG, females will show signs of estrus/heat. At this time they can be mated or inseminated. Synchronization can be also done by a daily injection of progesterone and feeding melengestrol acetate for the same time of duration (16-18 days in goats and 12-14 days in sheep). This has got the same effect as using progesterone.

B. Estrus synchronization techniques

There are two main methods of synchronization:

- Use of exogenous hormones or their synthetic forms, and
- The male effect.

1. Hormones

Among the hormones of reproduction, progesterone can be considered as the ‘organizer’ of the estrus cycle. Manipulation of the progesterone status of the animal provides a convenient means of controlling the estrous cycle. Estrus synchronization techniques revolve around the artificial shortening or lengthening of the period of progesterone dominance of the luteal phase.

Two classes of hormones are available for estrus synchronization. These are progesterone or one of its synthetic analogs and prostaglandins. Progestagens extend the luteal phase of the estrus cycle. Most commonly, progestagen-containing vaginal pessaries are employed. The ‘Y’-shaped silicone-coated devices known as ‘Controlled Internal Drug Release (CIDR)’ impregnated with progestagen are also used. As an alternative to vaginal pessaries, implants impregnated with a highly potent synthetic progestagen ‘Norgestomate’ may be inserted under the skin on the upper side of the ear.

The period of application of exogenous progestagen is approximately equal to the life of the corpus luteum. Withdrawing the exogenous progesterone supplement will enable pulsatile release of GnRH, stimulating FSH and LH release leading to estrus and ovulation. In the second class of hormones, prostaglandin F₂ can be used to regress the corpus luteum (interrupt the luteal phase). Prostaglandin F₂ by its luteolytic activity, can synchronize estrus, but only when an

active corpus luteum exists at the time of application. In most cases, treatment with PG F2₂ is given twice, 7 days or 11 days apart, to make sure all functional corpora lutea regress.

Caution It is important to realize that prostaglandin can initiate fetal abortion in a pregnant animal. Hence, great care should be exercised not to expose animals to the product at any stage of pregnancy.

2. The male effect

The male can be used to stimulate estrus activity of females that have been previously isolated from males for a period of 3–4 weeks. After the period of separation, the male animal is suddenly introduced to the group of females. In response to introduction of the male, ewes/does secrete increasing amounts of LH and FSH, which result in ovulation after 2 or 3 days of male introduction (in some ewes/does response may be slower, i.e., 4 to 7 days). In cyclic goats, highest frequency of estrus was observed within the first 3 days of buck introduction.

The following factors affect response to male introduction:

- Within breeds, rams/bucks with greater sexual activity induce responses in more ewes.
- Rams that were given libido tests and ranked as highly sexual induce estrus more effectively than males with low libido test scores.
- Ewes/does that are on a high plane of nutrition will respond better than those nutritionally stressed.

The longer lambs/kids have been weaned from ewes/does, the better the response of the ewes/does. Once puberty is reached, large domestic animals such as sheep and goats display a polyestrous (repeated reproductive cycles) pattern of reproductive activity. The estrus cycle, defined as the number of days between two consecutive periods of estrus (heat), is on average 17 days in ewes and 21 days in does. The estrus cycle may be divided into two phases, namely: the follicular phase (growth and expulsion of the ova or egg), and the luteal phase, which starts after ovulation and formation of the corpus luteum (yellow body).

Further classification of the estrus cycle is possible as shown. Estrus cycles show variation and thus are classified as short, normal and long. Short estrus cycle and irregular estrus periods may

be seen in some goats. Occurrence of estrus in Somali goats was shown to be positively correlated with monthly rainfall and monthly minimum temperatures, while a negative correlation was observed with monthly maximum temperatures and monthly sunshine.

3. Hormonal control of the estrus cycle

Estrus cycle is controlled by GnRH (Gonadotrophic Releasing Hormone) released by the hypothalamus. Just before the onset of estrus, the pituitary gland, under the control of the hypothalamus in the brain, releases an increasing amount of Luteinizing Hormone (LH) and Follicular Stimulating Hormone (FSH).

- Growth of follicles is regulated by pituitary hormones – FSH, LH.
- LH stimulates the final maturation of the follicle containing the eggs (oocytes) and stimulates the follicle to produce the hormone estrogen.
- Estrogen brings the ewe into behavioral estrus or ‘heat.’
- The rising concentration of estrogen stimulates a surge in LH that stops further secretion of estrogen by the follicle.
- Once the egg has been released, LH transforms the follicle into a Corpus luteum (CL).
- CL produces progesterone, which in turn suppresses pituitary activity.
- If pregnancy does not occur, lysis (destruction) of the Corpus luteum occurs due to endogenous release of prostaglandin from the uterus, thus causing a fall in the progesterone level, and the cycle starts again.

4. Detection of estrus

The detection of estrus is very important when artificial insemination is conducted and when mating is controlled, i.e., Ram/back do not run with females. For this reason it is important to know the signs of estrus.

5. Behavioral signs of estrus

1. Does

- Bleating continuously

- Swollen – red colored vulva
- Flagging of the tail
- Frequent urination
- Cervical mucus discharge, which causes hairs to stick together
- Restlessness
- Mounting other goats and seeking the buck

Ewes

The signs of estrus in the ewe are not obvious unless a ram is present. As in the doe, the vulva is swollen and redder than usual, and there is a discharge of mucus but is difficult to see in a ewe with a tail or fleece. All of the symptoms mentioned may not be exhibited by a doe or ewe in estrus. The best confirmation of estrus is when the doe or ewe stands when being mounted. This is commonly called ‘*standing heat.*’ The duration of estrus is variable in that it is shorter in younger ewes and does but longer in older animals. Normal duration will be 24 to 36 hours.

6. Signs of male sexual excitement

- Rushing the female, i.e., makes an effort to search females based on the smell of Pheromones.
- Smells /sniffs/ the vulva - to distinguish whether the female is releasing Pheromones
- Pawing the females with front legs (touches with front legs, checks up whether a female stands for mounting & mating.
- Curling of the upper lip (or opens the lip) i.e., make curves (circles) to attract the female.
- Produces a loud snorting sound checking up whether the female stands or not breathing air through noses produces loud sound.
- Mounts & mates.

Heat period/Duration of heat (18-24) It is the time duration from onset of estrus/heat up to an animal stops showing signs of heat (estrus). Mating (service) should be done late in this period & before ovulation.

Estrus detection techniques

Estrus in sheep and goats is relatively easy to detect compared to that in cattle as heat signs are well pronounced, particularly in goats. Still, where controlled mating or artificial insemination (AI) is used, regular detection of estrus is necessary through:

- Using a teaser ram or buck: Teasers are males that have been either vasectomized or epididymized.
- Tying an apron made of leather or canvas around the body of a ram/or buck to prevent the penis from entering the vagina of females.
- Using a teaser with a marking harness: When a ram/buck with a marking harness mounts a female in estrus, some of the marking pigment will be transferred to the rump of the female.

The behavior of rams and bucks used for heat detection should be known as some may not do the job well

2.5. Carry Out Breeding Methods Of Sheep And Goat

I. Males:

They should be the heaviest/largest animals in the flock with a wide chest and well developed body parts, have straight body, excellent health condition and strong legs to carry their large body size. There should be a complete absence of any physical defect e.g. twisted legs, overshot or undershot jaws. They should be a twin, should be aggressive, and should possess a rugged/rough mane on the neck and shoulder. Good semen characteristics, absence of abnormalities and with good motility of sperms

2. Female

They should be large animals with excellent physical conformation and well developed body parts. For meat animals the rectangular body conformation should be apparent whereas the dairy animals should display the wedge-shape (V-shape) or the triangular body conformation. The legs should be long to give the udder good ground clearance and the udder should be well formed with no pendulous and without supernumerary/extra teats and should be a twin. The

temperament should be good/docile particularly for dairy breeds because it reflects good mothering ability. Docility and good mothering ability are desirable characteristics of a dairy animal. It should be a good milker.

For wool breeds: they should have a uniform wool colour. The wool cover around the eyes should be very little because it may cover the eyes and protects an animal from seeing into the surrounding and predisposes to predators reduces the ability of an animal to look into and select the forage it eats. Physical features or body conformation of animals can be judged by visual observation on their body size, udder size and body shape But performance/productive traits cannot be judged by visual observation of an animal without recording systems. Therefore, when animals are selected for traits of economic importance, such as milk yield, growth rate reproductive performances, recording of performance is the most accurate basis of selection. Performance of animals does not depend only on the genotype/breed of animals, but also on environmental factors like management, feeding, housing, health care season of birth and weaning, which can affect performance of animals. Therefore, environmental factors should be also taken into account or should be optimised, otherwise underestimates the performance. I.e. animals should be given enough feed as much as their requirement. Otherwise their performance may be very poor, even if their genetic potential is high. So recording of productive performance is the prerequisite for selection purposes.

Mating

Several methods of mating:

A. Random mating: one or more rams are left permanently with the ewes. Mating and lambing take place all year round

- Suitable for the a seasonal nature of the sexual activity
- Enable to exploit the maximum reproductive potential of animals
- Difficult to organize selective breeding
- Rams are not always with the best conformation
- There is no rotation of rams, same ram stays for more than 2 years, which leads to inbreeding

B. “Organized” mating: ewes are put to the ram at regular intervals (every 7-9 months) for a predetermined period of time (40-45 days on average). There is usually one ram to every 25-30 ewes. Advantages:???

C. Controlled mating: a group of ewes (25-30) is left with one ram for a predetermined period (40-45 days on average)

Mating Systems

Once males and females are sexually mature, they will display characteristic behavior prior to mating. Unless restrained, both sexes will make an effort to reach each other and mate. Smell, sight and noise are the common attractants. In sheep, the fat tail of a ewe may make mating difficult or even impossible. Experienced rams push the tail aside to let the penis penetrate the vagina. Young and inexperienced rams may need assistance, i.e., hand-mating may be essential. The following types of mating could be practiced depending on the system of production.

1. Flock-mating

Fertile rams or bucks are allowed to remain continuously with a group of females. This mating system is commonly practiced by pastoralists. Under smallholder conditions, a flock may constitute all sheep or goats in a given village. This method avoids the need for heat detection but makes recording the mating date, the sire and calculation of the expected date of parturition difficult unless breeding males are fitted with a marking harness. Flock mating provides the best result in terms of fertility and lamb/kid crop given an appropriate male-to-female ratio. However, inbreeding and subsequent declines in productivity could occur unless males are rotated or replaced on a predetermined period.

2. Pen-mating

This involves confining a sire with a group of females, in a paddock for example, for mating during the service period. A variation of this method may include housing groups of females with a selected breeding ram/buck at night. Continuous supervision is important to make changes of sires if the assigned sire does not perform well. Sires may be fitted with a marking harness that enables calculation of the estimated date of lambing/kidding.

3. Hand-mating

This involves detecting females in estrus and bringing them to breeding males. In such a system, regular and efficient heat detection methods are essential. The PM–AM method of breeding is used, where females detected in estrus in the afternoon are bred early the next morning and those detected in estrus in the morning are bred in the afternoon of the same day. In terms of fertility, this method is the least efficient as the male is restricted in breeding the female. A variation of this system is observed where a producer may have few female sheep or goats but no breeding male. One sire kept by an individual will serve sheep or goats of many surrounding owners who bring ewes/does in estrus to the male. In some instances ewes or does in estrus are brought to the market, where male animals are available for breeding.

Service and mating management: If males are kept with females, males will detect the occurrence of heat/estrus and may mate repeatedly females in heat (estrus). If males are not kept with females, females should be observed for signs of estrus depending on the signs of heat, especially for goats. In sheep heat detection is difficult, b/c of their behaviors to show signs of heat and b/c of their fat tail that covers the vulva to observe the discharge on the vulva, especially for artificial insemination. Therefore, heat detection, in sheep is carried out by the use of a teaser ram. It is a male animal that detects heat (i.e. in the absence of the right type of ram in the flock).

1. A teaser ram: it can be a castrated ram or apron ram used to identify females in heat but cannot be used for mating to control unwanted mating. An apron ram is a ram whose abdomen is covered with leather material to protect mating. If they are too young they should not be permitted. A teaser buck can be also used to detect heat in goats, if there is time limitation to detect heat where goats graze on a fenced pasture without an attendant. Female sheep or goats that showed heat or that has been mated by fertile males in case of the absence of a shepherd can be identified by the use of raddle marks which can be stained on the back of females. I.e. a raddle mark is first stained on the abdomen or chest of a male animal, which will be then transferred on back females mated. In order to get a good reproductive efficiency the proportion of male to

female is about 1:20 - 30 for goats and 1:10 - 20 for sheep. But, if the management is good 1:40-50 is also possible.

The proportion of male to female depends on:

- Breed (species): Some breeds are sexually active and produce high quality semen and able to mate more females. Aggressive males are able to serve more females reflects breeding ability.
- Age: Quality and Quantity of semen from very young and old males are poor compared to matured males. Difference in quantity and Quality of semen matters also the no of females assigned to one male.
- Nutrition of males: nutritional deficiencies depress production and characteristics of semen like mobility, volume of ejaculation or concentration of sperm. Under and overfed animals will not be in a position to produce frequently & to mate more females. Both under and over feeding affect testosterone production and sexual activity of males.
- Mating season: change in the length of daylight affects quality and quantity of semen.

I.e., when light period is longer fertility or sexual interest reduces. A hormone inhibitor will be released in excess amount and reduced in testosterone or estrogen and FSH.

B. Securing and providing mating areas during joining

Mating areas are secure and provide for access during joining and the mating area must be closed to control the interference of other male animals rather than the selected one to control in breeding, cross breeding, transmission of disease and to keep the exact record.

1. Fertility and Prolificacy

Normally, fertility is defined as the regular production of viable offspring. Ability to produce sperm & ova capable of fertilization. Prolificacy refers to the (ability) capacity of sheep and goats to produce many progeny (offspring). Fertility and prolificacy are used simultaneously to describe the reproductive capacity of individual breeds.

Expression of fertility:

Page 48 of 99	Ministry of Labor and Skills Author/Copyright	Animal Production Level -3	Version- 1 May, 2023
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1. Services per conception: Refers to the average number of services/mating required per conception or per birth. This assumes that females will be mated under controlled conditions, which allow recording of the males used and services performed. The services per conception recorded for sheep and goats vary from 1.1 to 2.3.

2. Litter size: It is expressed as the number of kids/lambs born per doe (ewe), or per 100 does /ewes/ per year or per litter (per birth). The higher the figure, the better is the fertility of the flock.

3. Kidding /lambing/ rate or percentage: It is used to measure number of kids/lambs born in relation to the number of does/ewes exposed to the bucks or rams (mated). It can be also used to measure the number of kids weaned in relation to the number of does/ewes mated. The 2nd method is influenced by management in the herd. If the management is good & if there is no loss of young's both will give you the same figure.

4. Kidding or lambing interval: It is the number of days between two successive kidding or lambings. The interval comprises the service period and the gestation period. It is influenced by service period because gestation period is constant. Gestation period studied in several breeds of goats in the tropics is on average 146 days, but can range from 144 to 153 days. This variation is related to Breed difference and Environmental factors such as temperature, feeding, size of animals and litter size.

5. Service Period: It is time interval between kidding /lambing/ & the first oestrus or post-partum estrus. It affects the kidding /lambing/ interval. Short kidding /lambing/ interval is desirable if the fertility and productivity of flock is to be maintained. The breed and accuracy in heat detection influences the length of the service period and accuracy of heat detection can be managed by careful husbandry practice. The kidding interval for indigenous breeds of goats in the tropics is shorter (90-150 days) than that for European breeds (169-327 days) imported into the same hot environment, because the indigenous breeds show estrus all the year round, twice a year or three times in 2 years, while the European breeds are seasonally polyesters and usually show estrus only once a year. In the tropics, day light hours are fairly consistent whereas the

variation in day length characteristics of temperate areas affects sexual activity in goats and sheep.

6. Age at first kidding/lambing/: It is the time interval between date of their own kidding /lambing/ to the first kidding /lambing/. It is dependent on Age at first service/mating, because gestation period is constant. Young females should not be permitted for mating till they are 10 - 12 months old. $10 - 12 \text{ months} + 5 \text{ months (gestation period)} = 15 - 17 \text{ months}$, which is an age at first kidding. But in most tropics it can vary up to 15 - 26 months of age.

7. Non-Return Rate (NRR): Female animals that are not returning to estrus after first mating (service) during the time period of 60-90 days are termed as non-return animals ("pregnant" animals). The non-returns (pregnant animals) expressed as a percentage of the exposed animals are termed as non-return rate. Its efficiency is dependent on the accuracy of estrus detection in the herd, because if animals are incorrectly detected, then they cannot be pregnant (they cannot conceive). Non-return rate doesn't necessarily mean that an animal is pregnant, rather non-return rate or not returning or not showing estrus could be due to some other reasons. Females may be in normal estrus cycle, but may not show clear signs of estrus, due to different reasons:

- *Sickness:* Sick animals may not show signs of estrus, even though they are in normal estrus cycle.
- *Lactation:* in the early stages of lactation animals may not show signs of estrus due to stress of lactation. This situation is known as lactation an estrus.
- *Poor nutrition:* Poor nutrition over long periods causes animals to stop showing signs of estrus. This is known as nutritional an estrus.
- *Infertility:* infertile animals do not show signs of estrus, so can not be considered as non-return animals that can be pregnant. Because they are not cycling at all. These are possible reasons for lower efficiency of NRR. These factors make animals to be considered as non-return animals other than pregnancy. NRR was initially used for pregnancy diagnosis or as an indicator of pregnancy, but because of the low efficiency of NRR, different methods of pregnancy diagnosis have been developed.

Artificial Insemination (AI)

Page 50 of 99	Ministry of Labor and Skills Author/Copyright	Animal Production Level -3	Version- 1 May, 2023
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Artificial insemination is a technique in which semen is collected from a ram or buck and put into the reproductive tract of a ewe/doe. The standard procedure of inseminating does involves lifting up of their rear quarters with their front legs remaining on the ground. With the aid of speculum and pen light the cervical opening or 'os' is located and, under visual control, an insemination pipette is passed into or through the cervix for semen deposition. If difficulty is encountered in passing through the cervix, semen has to be deposited intra cervically or caudal to the cervical.

Use of AI has the following advantages:

- High potential for genetic improvement.
- When introducing a new breed from foreign countries, it is often easier and cheaper to import frozen semen than to import live animals.
- The risk of introducing a new disease is much lower if semen is imported.
- Genetics (semen) from superior animals in other regions or countries can be used
- Reduces cost of feeding and management of males
- Rapid improvement of the breeds can be achieved by using AI, because semen that may be ejaculated in one mating can be used for many inseminations.
- If you are testing the performance of a sire on the basis of its progeny (offspring) you can get more offspring within short period of time.
- It reduces investment in large number of males and reduces risks of illness or death of male animals.

Disadvantages: The disadvantages are few, if properly done.

Well trained personnel for proper service are required. Detection of heat may be a difficult task when animals are kept in fenced pastures (corrals) without an attendant unless a teaser ram/buck used to run with females. Still, this certainly may not tell us the exact time of occurrence of heat and one may have difficulties with optimum time of mating or insemination.

Three methods of semen preservation could be used:

- Fresh
- Refrigeration (Fresh chilled with an extender)

- Freezing

Three methods of insemination are available depending on the site of semen deposition during the process of insemination:

- Vaginal
- Cervical
- Intrauterine

Vaginal insemination is successful for fresh semen, whereas intra-cervical insemination is used for refrigerated and frozen semen. However, in order to achieve high pregnancy rates (>70%) with frozen semen, intrauterine deposition of semen is required. While in many does it is possible to pass the cervix and deposit the semen intrauterine, in certain categories of animals (e.g., doelings), breeds (e.g., Nigerian dwarf) and individuals this will only be possible using other more technically challenging techniques such as laparoscopic insemination methods. Fresh semen can be used when the male is present in the flock. The use of chilled, refrigerated semen is a useful strategy when the male is shared among groups of producers located within a relatively small area. In such cases, semen is stored at -4°C and can be used up to 24 hours from collection.

Semen is processed and frozen in liquid nitrogen for long-term preservation. In general the method of semen preservation dictates the preferred method of insemination. As a rule of thumb, the more damaged the semen, the deeper semen has to be deposited to achieve high fertility rates.

Recent advances in manipulating reproduction in the female

One of the recent advances in manipulating reproduction in females is embryo transfer (ET). Embryo transfer is removal of an embryo from donor females (with superior genetic merit) and its placement in the uterus of recipient females (possibly with inferior genetic merit (make-up).

1. Embryo Transfer (ET)

Embryo transfer involves the flushing (removal) of embryo(s) from the donor and transfer to the recipient animal. Embryo transfer operations rely on provision of sufficient numbers of viable embryos (superovulated) to justify efforts involved. This is usually done to exploit the genetic superiority of the dam line. Prior to flushing, the candidate donor ewe/doe is super-ovulated (the

production of more eggs than the female would normally produce) and bred or inseminated. For conducting embryo transfer, the estrus cycle of the recipient has to be synchronized such that when the transfer is made, the uterine environment of the recipient ewe/doe is conducive (the reproductive cycle is at a similar stage with that of the donor) for the embryo. Achievements from multiple-ovulation and embryo transfer (MOET) have not been encouraging for widespread use since the results can vary from complete failure to total success without any variation in the standard operating procedure. The unpredictability of results, combined with high costs and the use of surgical procedures for collecting and transferring embryos, have prevented large-scale use of MOET in sheep and goat improvement programs.

Procedures of ET

1. Super-ovulation

A female animal (donor) is induced to super-ovulation by injection of hormones FSH or PMSG. FSH is responsible for follicular growth and PMSG is responsible for follicular growth and stimulates the release of FSH. These hormones stimulate additional follicular growth to ovulate more ova for more embryos (normally 1 or 2 but this time more). The amounts of FSH and PMSG injected are:

	<u>Ewes</u>	<u>Does</u>
FSH	12-20 mg	12-20mg
PMSG-	1000-2000 IU	1000-1500IU
Time of injection of estrus (synchronization)	12-14 days	16-18 days after onset

These hormones result in the growth of more follicles which result in the release of more additional ova (eggs). But their time of ovulation is unknown so to ensure super-ovulation of females with additional ova, Human chronic gonadotropin (hCG) at the level of 1000-1500IU or LH of 50-75 mg can be injected at the same day (12-14 days after onset of estrus in ewes and 16 – 18 days in does). Then ewes & does show signs of heat within 2-3 days after injection of FSH or PMSG or hCG or LH. By inducing animals for super ovulation it is expected to get 5 fold transferable embryos (super - ovulation results in 5 fold transferable embryos).

2. Insemination

A super-ovulated female or doe is inseminated (mated) two or three times at 12-hours interval to ensure fertilization of all ova.

3. Embryo recovery (collection)

This can be either surgical or non-surgical by operating or opening the abdomen of an animal.

3.1. Non-surgical recovery: It is desirable because there is less risk to the life and health of the donor. It is used in repeated recovery attempts to reduce incidence of reproductive tract damage. In non-surgical recovery of embryos a catheter (plastic tube) is passed into the uterus through the cervix. The uterus is irrigated (washed up) with plenty of buffered NaCl solution at the 6th day after insemination by flushing the oviduct or uterus. Fertilized ova will move in the fluid and pass through the catheter to be collected in a bucket. This method or the non-surgical recovery of embryos gives the efficiency of embryo recovery 70-90 %.

3.2. Surgical recovery: The abdomen of a donor animal is opened by surgery and embryos are recovered (collected) by flushing the oviduct or uterine horns. Disadvantage of surgical method is that the number of repetitions is limited by the occurrence of adhesions (damages).

4. Embryo storage

Embryo can be kept for 20-30 hrs at ambient temperature, but lose their viability after 42–72 hrs. Embryos can be preserved for long duration by freezing at the temperature of liquid nitrogen (-96°C).

5. Embryo transfer

Embryo can be transferred non-surgically using the same technique as is used in AI. (Injecting into the uterus through cervix with a pipette). Embryos are deposited into the uterus through cervix of the recipient female, when she is in estrus. This provides favorable environmental condition for the embryos. Pregnancy rates can be as high as 70% in case of non-surgical transfers, but surgical gives high pregnancy rates.

Advantages of ET

Page 54 of 99	Ministry of Labor and Skills Author/Copyright	Animal Production Level -3	Version- 1 May, 2023
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1. Increases number of offspring from genetically superior dams, which otherwise can not be achieved by natural methods. By natural way, genetically superior females will give birth a maximum of 2x per year. But by ET many embryos can be obtained from one dam (many super ovulation are possible). Increases genetic potential of females, as AI increases genetic potential of males, i.e. the female is exploited for its superior genetic potential/merit in ET. But in AI, male will be exploited for its superior genetic merit.

2. Increases the possibilities of twin birth because of super ovulation (multiple births).

3. Improves possibilities for importing superior breeds. I.e. it is easier & cheaper to transport and import frozen embryos than live animals.

4. The young born to the indigenous recipients can survive better than imported animals, because it receives passive immunity from its dam's colostrum, i.e. one of the adaptation problems of imported live animals in the tropics may be resolved. Genetically superior

females that may be injured, diseased or aged are unlikely to give birth, but can provide valuable embryos, i.e. old females can be used for ET which otherwise would not be used for reproduction purposes.

5. Embryos are less likely to transmit diseases than even semen in AI and live animals in natural mating because there are very high, i.e. their recovery is done under high hygienic condition.

Limitations/disadvantages of ET

The reproductive rates of donors are increased at the expense of decreased reproductive rates of the recipients, because recipients remain non-pregnant for prolonged periods until an embryo is transferred to them.

2.6. Applying Pregnancy and condition of animal's diagnosis techniques to identify early opportunities and suitable action.

Gestation

Gestation is the period from fertilization to delivery of the fetus. The average duration of gestation periods in ewes and does is fairly constant and ranges from 147 to 152 days. To some extent, it could be influenced by:

- **Age of the dam:** younger ewes and does have shorter gestation than older ones.
- **Litter size:** dams carrying twins have shorter gestation than those carrying singles.
- **Nutrition of the pregnant ewe or doe:** low level of feeding on range shortens gestation.
- **Breeds:** small and dwarf breeds have shorter gestation periods

A. Importance of pregnancy diagnosis

Knowing the status of an animal whether an animal is pregnant or not is of considerable economic importance. Undertaking an early diagnosis of pregnancy is necessary for an early identification of non-pregnant animals. Because production cost lost as the result of infertility may be reduced by employing appropriate measures, such as treatment of animals with hormones or improving feeding practices or culling of infertile animals. Pregnancy diagnosis is also required to certify animals for sale or insurance purposes. Because pregnant animals are expensive, when they are sold and the insurance of pregnant animals is also higher than non-pregnant animals.

B. Pregnancy Detection

The most accurate tests are those that measure or detect something that is only produced by a viable fetus and that is always present when the pregnant animal has reached a certain stage.

Methods of Pregnancy Diagnosis (PD)

There are Clinical and Laboratory methods of PD.

A. Clinical methods:

Clinical methods rely on the detection of the fetus or fetal membranes and fetal fluids. The detection can be accomplished by:

1. Rectal examination or palpation

In this method, uterus is palpated through rectal wall to detect the uterine enlargement occurring during pregnancy. It is used for pregnancy diagnosis of large animals (cow, mare, Buffalo). It is not applied for ewes and does, because size of pelvic cavity is small in ewes and does.

2. Non-return to estrus

Frequent checking of animals after the normal estrus cycle (17 days for sheep and 21 days for goats) for visual signs of estrus is the simplest method. Animals not returning to estrus after the normal period are considered to be pregnant.

3. Radiography

This method can be used in detecting pregnancy in sheep and goats. It is based on the identification of the fetal skeleton on an x-ray plate. I.e. when the skeleton is displayed or seen on an x-ray plate, then an animal will be considered as pregnant. The method has got some disadvantages. It can be applied only during the last 1/3 of pregnancy when the fetal skeleton is properly developed. If an animal is detected to be non-pregnant, the animal will have long service and kidding /lambing/ (parturition) interval, which will be unprofitable for the farmer. The method is expensive for most of sheep and goat farms to have the equipment and skilled person to operate it. It causes also a radiation hazard to the operator. (An x-ray radiation emits cancerogenic substances which result the disease known as cancer.

4. Ultrasonic fetal pulse detection

In this method, sounds coming from fetal heart and umbilical vessels are detected by placing an ultrasonography on the dam's abdominal wall or by inserting into the rectum of the dam.

B. Laboratory Methods

This method relies on the determination of hormones produced by the maternal tissues and fetus. Hormones are determined from the blood, milk & urine of the dam.

The hormones that are commonly used are:

1. Progesterone

Progesterone levels are measured in the milk and blood of the dam. Samples can be collected at the next expected estrus cycle. The following 1st estrus after mating (18 -21 days) in case of goats and (17-19 days) in case of sheep. Milk samples are preferred than blood samples, as far as an animal is lactating, if not take blood samples. The reasons are:

Progesterone levels are high in milk than in blood and urine, i.e. results can be easily interpreted and understood. Collection of milk has no any discomfort (pain) or harm on the animal. If progesterone level of pregnant animals is lower than the standard progesterone level, an animal is not pregnant, but if progesterone level is high, an animal can be considered as pregnant. However, high levels of progesterone do not always necessarily mean pregnancy. Because:

If in case, a female had longer estrus cycle length than the normal length after mating, regression of a corpus luteum has not yet taken place. Hence, produces progesterone. Prostaglandin has not yet released from uterus which results in the regression of corpus luteum. That means, a corpus luteum would be present on the day of sampling (18-22 days) and progesterone level would be higher, which is not related with the pregnancy of an animal. As such a female can be considered as pregnant, because of high levels of progesterone but not in the reality. If early embryonic mortality occurs after sampling, a female would be incorrectly diagnosed as pregnant and a female would be incorrectly considered as pregnant. Due to these reasons, the accuracy of this method is different from breed to breed (species to species). In goats the test can be as accurate as 98% but in sheep as 87%. If progesterone test is carried out 20-21 days after mating of goats 98 % conception rate accuracy of diagnosis can be a achieved. In sheep, if progesterone test is carried out 17-19 days after mating 87% accuracy of diagnosis is achieved. Therefore, pregnancy diagnosis on the basis of progesterone test should be done on the basis of three milk samples collected at 8-days interval after the next estrus cycle, i.e. to increase the accuracy of the test, three times sampling at 8 days interval is necessary. Otherwise the method is more accurate to detect non-pregnancy than detecting pregnancy (the accuracy

for non-pregnancy is almost 100%), because, females with low progesterone are not pregnant, i.e. there is no doubt that they may be pregnant, but females with high progesterone may be or may not be pregnant. Females who had early embryonic mortality would not be pregnant.

2. Oestrone sulphate test

This hormone is the major estrogen released by the fetus. This can be measured (detected) from the maternal blood milk or urine. Oestrone sulphate is detected in the blood and milk 40-50 days after mating in goats and sheep. If oestrone sulphate is detected the female animal is pregnant because oestrone sulphate is produced only by the fetus. This method is more accurate than progesterone test. Which method one may use, depends on the availability of necessary facilities. From clinical methods ultrasonic fetal pulse detection has no any harm to the operator and from laboratory methods oestrone sulphate test is more accurate method of pregnancy diagnosis.

2.7. identifying and reporting Sign of parturition and potential problems

During the first three months of pregnancy, the development of fetus is low, hence no appreciable increase in the food is required. They can stay on the diet of dry animals. However, during the last 4 – 6 weeks of pregnancy, the fetus grows rapidly and can deplete the food reserves of the dam. So the quantity and quality of food given during this period should be sufficient to meet requirements of both the fetus and the dam. Good feeding during this pregnancy period produces greater development of udder tissues that increase milk yield. It results in a higher birth weight of kids and lambs. It also reduces kid and dam mortality due to increased birth weight, kids will be less susceptible and will have higher survival rates. Due to less mobilization of the fat reserves of the dams, the possibility that ketosis/pregnancy disease may occur in dams will be minimized. It results in a greater live weight gain of the kids after birth, due to increased milk yield and higher birth weight. During the pregnancy period about 0.25 – 0.335 kg concentrate feed per day should be provided depending on the quality of pasture. Care should be taken in feeding pregnant dams to avoid overfeeding which leads to over weight and causes kidding/lambing difficulties/dystocia and avoid underfeeding which results pregnancy disease. Water and mineral licks should be available at all times. Pregnant dams should be kept in an individual pen towards the end of pregnancy till they give birth. This avoids

trampling of kids and lambs and others may bother/butt the dam. The floor should be bedded to give more comfort to the dam. Lambing/kidding pens and equipment should be disinfected. Ewes should be sheared before lambing to maintain the wool clean and wool around udder and teats should be also removed otherwise prevents suckling of lambs. During lambing/kidding dams can be helped if they show parturition disorders. Assistance should be given if the following abnormal presentations are observed.

1. One leg held back
2. Two legs held back and only head is presented
3. kid/lamb upside down
4. Back to front presentation/breech birth, i.e. if two hind legs are presented.

When parturition approaches the female shows the following:

1. Restlessness
2. Sitting down and getting up
3. Smelling the ground
4. Kidding/lambing with 1 – 2 hrs
5. Appearance of the water bag
6. Onset of contraction and
7. Appearance of parts of the kid/lamb.

Example Mineral requirement for pregnancy

P= 1.9g/day Mg = 0.77=0.8g/day = are required

Deficiency may reduce growth rate and may result in death of embryos. In general if one or more of the macro-minerals are deficient in the diet, deficiency symptoms can occur such as:

Eating of soils	Diarrhea
Low growth rate	Loss of appetite
Poor fertility	Loss of hair

Water requirement Pregnancy

In the last months of pregnancy, water requirement rises to 140% of the pre-pregnancy level, if she is carrying 1 lamb/kid but if she is carrying twins, the requirement rises to 200 % (due to requirement of the fetus).

2.8. preparing and assisting Ewes and Does during giving birth

Animals are prepared for giving birth in accordance with enterprise requirements. Prepared Does and ewes are crutched or shorn prior to giving birth. Care in this time, the gain in mass of the fetus amounts to 85% of its birth weight. Nutrient intake should be increased during this period. Concentrate sources of energy should be available as the rumen size is limited because of the developing fetus. However, care should be taken to avoid excessive feeding to reduce the chance of difficult birth. Multiple-bearing dams should receive more feed than single-bearing dams. It is advisable to separate dams at an advanced stage of pregnancy from the main flock. This will help to give them effective care. Bring pregnant animals into lambing/kidding corrals 4 to 6 days before parturition and provide the maximum possible comfort. If possible, provide bedding material. It is not advisable to handle pregnant animals too frequently.

The process of parturition in sheep and goats is complex. In the ewe, maternal plasma progesterone declines 7 to 15 days before delivery while in goats such a decline is noted 24 hours before delivery. Estrogens increase during the last days in ewes and gradually in goats. These events stimulate the muscles in the uterus to contract. The fetus and placenta are expelled and this is followed by the involution (shrinking of the uterus to normal size).

Signs of approaching parturition: Approximately 2 weeks before lambing/kidding some changes occur: the udder and teats swell (more prominent in dairy breeds) and the vulva becomes loose.

Stages in parturition:- Parturition is traditionally divided into three stages

Stage One: - Is immediately before lambing/kidding (up to 12 hours).

- The doe/ewe isolates itself from the flock, seeking a solitary place;
- Becomes restless and uneasy
- Paws and scrapes the ground, sits and stands;

- Stretches and strains with her neck skyward when sitting;
- Forces placenta, fetus, and fluids against the cervix to dilate it;
- The water bladder appears or has already ruptured;
- The ewe/doe licks the fluid, wanders about.

Stage Two

Is typically faster and lasts about 30–45 minutes:

- It is accompanied by straining (contraction of abdominal muscle)
- The lamb/kid normally appears front feet and nose first. At this stage, the animal is normally lying on her side. This stage is completed by expulsion of the last lamb/kid in case of multiple births.
- Once the lamb/kid is ejected, the dam will lick off the membrane covering of the lamb/kid. This uncovers the mouth and nose and stimulates breathing.

Stage Three

Involves:

- Expulsion of the placenta normally within 4 hours, and
- Involution of the uterus.

Assistance during parturition

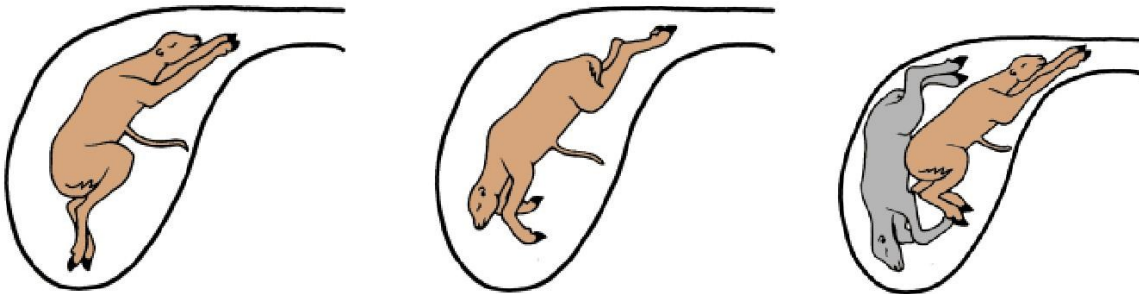
In a majority cases, ewes and does give birth normally without assistance. However, a few may need assistance. It is important to get acquainted with the normal birth presentation to be able to provide appropriate assistance. This subject is dealt with in more detail in the Management chapter. Parturition in healthy ewes/does is generally normal. Maiden ewes/does in poor condition or small-framed females mated to big males can have difficulty in parturition and may have to be assisted.

You should first see the front legs and nose or head of the lamb if it is a normal birth. In this case, delivery can be expected within fifteen minutes. If the ewe/doe is still laboring after 30 minutes, you should seek professional assistance. If that is not available, proceed as follows:

Page 62 of 99	Ministry of Labor and Skills Author/Copyright	Animal Production Level -3	Version- 1 May, 2023
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Hygiene, lubrication and care are most important when assisting ewes/does during parturition. Prepare a bucket of clean, warm water with soap and get some disinfectant, a good lubricant such as Vaseline and towels. Wash your hands and arms and wash the vulva and surrounding area of the ewe /doe. Wear latex gloves if available.

Normal presentations during parturition



a. Anterior presentation b. Posterior presentation c. Normal presentation of twins Figure

Abnormal presentations during parturition

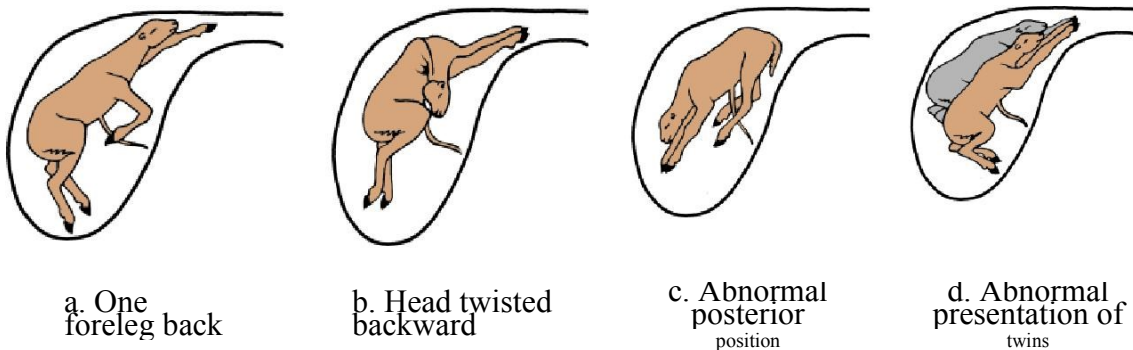


Figure: 2.23. Lambs/kid presentation during parturition

Material used during assist parturition:- Delivery gloves, lubricant, rope, PPE(overall, boot helmet) and others.

If the calf is in the wrong position, it is possible for a person to examine the cow and gently rearrange the calf so that is in the correct position and can be delivered. If the calf appears to

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

Before assisting a cow, the cow's vulva and the surrounding area should be cleaned, as well as the hand and arm of the person who will be assisting the cow. Any other equipment that may be going inside the animal should be disinfected and properly stored between uses. If bacteria gets inside the reproductive tract, infections may be deleterious to future reproductive performance. When everything necessary has been disinfected, it is critical that large amounts of lubricant are used before anything enters the birth canal. Products such as petroleum-based jellies or even solid cooking compounds can be used as lubrication. A lack of lubrication can cause serious tissue damage to the cow, which may endanger her reproductive ability in the future. There is some indication that assisting with parturition too early can interfere with the third stage of parturition.

If pulling a lamb or kid is not possible, a Caesarian section may be necessary to get the lamb or kid out alive. Contact a veterinarian. The main consideration in the lambing or kidding process is to make sure things go quickly. Prolonged labor can inflict serious strain on the ewe or doe, as well as extended attempts in pulling the lamb or kid can cause some serious infections of the reproductive tract

Procedure to assist delivery

1. make materials like delivery gloves, lubricant, rope etc ready
2. wear personal protective equipment
3. disinfect all material and tools before using
4. the cow's vulva and the surrounding area should be cleaned
5. the workers hand should be cleaned
6. wear gloves
7. identify the position of fetus/new and if not normal try to push in word and rotate and adjust the fetus position gently
8. Try to pull out fetus gentle by slow swinging fetus left to right and vice versa

2.9. Care New Born Lambs and Kids

Page 64 of 99	Ministry of Labor and Skills Author/Copyright	Animal Production Level -3	Version- 1 May, 2023
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A. Young lambs/kids before weaning: Newborn lambs and kids should be supplied with colostrums within the first hour after birth. Colostrum helps protect them against diseases due to its content of antibodies and high nutritional value. For the first few weeks of life, all a lamb/kid needs for nourishment is its mother's milk. Hay, water and protein supplements should be placed near the lambs/kids so that they start to eat and drink. Young ones can begin to consume other feeds at about six weeks of age. They should be fed the best quality feeds available to help them grow and get them accustomed to eating feeds other than milk. The feed needs to be of high quality because they can eat only small amounts. They should receive:

- High quality young forage, free choice.
- Supplementary legumes as much as are available.
- Free choice supply of concentrate. The concentrate should be fed in creep feeders so that only the lambs/kids can consume it. This prevents the adult animals from eating the feed intended for the young animals.

B. Weaned lambs/kids: Weaning involves removing young ones from the milk diet to other forms of feed. This separation can be stressful. Lambs/kids are very vulnerable to disease and growth depression at the time of weaning unless they are weaned on to high quality feeds. Weaning at two to three months of age depending upon management is possible. Abrupt weaning is unnatural and should be avoided. Ideally, weaned lambs/kids should receive:

- High quality young forage, free choice.
- Free choice supplementary legumes.
- Free choice concentrates. They can be started with 70 g/day of mixed concentrate or 150 g wheat bran,

C. Control predators to new born animals

If ewes/does are giving birth unobserved on the range, the newborns are exposed to predators or kids/lambs may be abandoned by their dams. Abandonment may happen frequently with first time mothers. Losses due to predators have been reported to be a major cause of kid loss in the Alaba Woreda of the SNNPRS. According to the key informants, the breeding time of the fox, a time of high nutrient demand, coincides with the major lambing/kidding season; thus, kids become prey.

2.10. Preparing And Implementing Contingency Measure

Environmental implications associated with animal production are identified, assessed and relevant measures implemented. Negative environmental impacts may result from the unsafe use and disposal of poisons and veterinarian chemicals (vaccinations, drenching, blowfly control), and any consequent residual chemicals. Impacts may also result from high concentrations of animals, particularly in holding or confined areas, causing increased run-off flows and/or wind erosion, loss of ground cover, soil disturbance, dust problems, weed seeds in animal manure, contamination of ground and surface water supplies, and odors.

Self check - 2	Written test
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Name ID NO. Date

Direction: answer all the question listed below

Test: I. choices the correct answers (1pts each)

1. Which one of the following is/are exotic sheep breeds in Ethiopia?

A. Black head Somali sheep B. Menz sheep C. Awassi sheep D. Horro sheep

2. Which one of the following is/are larger than most other indigenous sheep

A. Black head Somali sheep B. Menz sheep C. Afar sheep D. Horro sheep

3. Which one of the following is female reproductive organ where fetus develops?

A. Ovaries B. Oviduct C. Uterus D. Cervix

4. Mating system in which males are allowed to remain continuously with a group of female.

A. pen-mating B. flock-mating C. hand-mating D. organized mating

Test: II. Write True or False (1pts each)

1. no need to identify sheep and goat breed
2. Sheep and goat does not used as dairy product
3. only indigenous breed of sheep and goats are available in Ethiopia
4. it is impossible of estrus inducing artificially

Test: III. Write short and brief answers

1. List the indigenous breed of Ethiopian sheep.(2pts)

2. Discuss pron and con of sheep and goat production (3pts)

3. Mention female goat behavioral signs of estrus (2pts)

Satisfactory rating - 9 points

Unsatisfactory - below 9 points

You can ask you teacher for the copy of the correct answers.



Operation Sheet-2

Name..... ID..... Date

Technique of helping during parturition of ewe and does

1. Tools and equipment's

- delivery gloves
- lubricant

2. Procedures

- First properly detect ewe or does are on time for delivery
- Bring to delivery room
- Call your assistant with full aiding equipment
- Wear personal protective equipment and delivery gloves
- Lubricate you delivery gloves on your hand
- Carefully watch the position of delivery newborn
- help delivering ewes or does accordingly



LAP TEST-2

Performance Test

Name..... ID..... Date

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **10 minutes**. The project is expected from each student to do it.

Task: Perform assisting parturition of ewe and does.

LG#20	LO#3 identify feed and feeding of sheep and goats
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Instruction Sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying and aligning normal Feeding behaviors and Digestive systems of sheep and goat
- identifying and confirming Feed and feed supplements source and feeding plan
- identifying and confirming Nutritional requirements of sheep and goat
- Monitoring and recording Feeding strategies and reporting abnormalities
- Implementing Procedures to minimize feed wastage and spoilage
- Assessing and determining Sheep and goat body condition score
- Monitoring and maintaining Condition and security of paddocks

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify and align normal Feeding behaviors and Digestive systems of sheep and goat
- identify and confirm Feed and feed supplements source and feeding plan
- identify and confirm Nutritional requirements of sheep and goat
- Monitor and record Feeding strategies and reporting abnormalities
- Implement Procedures to minimize feed wastage and spoilage
- Assess and determine Sheep and goat body condition score
- Monitor and maintain Condition and security of paddocks

Learning Instruction

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets

4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information sheet-3

3.1. Identifying and aligning normal Feeding behaviors and Digestive systems of sheep and goats

A. Feeding behavior

Sheep and goats have different but complementary feeding habits. Sheep are grazers and amenable to herding, hence a species of choice in mixed cropping areas where cereal production dominates. On the other hand, goats are browsers and highly selective feeders – a strategy that enables them to thrive and produce even when feed resources, except bushes and shrubs, appear to be non-existent. Thus, the presence of goats in mixed species grazing systems can lead to a more efficient use of the natural resource base and add flexibility to the management of livestock. This characteristic is especially desirable in fragile environments.

B. Size

Being small-sized animals, sheep and goats require a small initial investment. Their small size, together with early maturity, makes them suitable for meeting subsistence needs for meat and milk.

C. Fat deposition

Sheep and goats vary in fat deposition, presumably due to different adaptation strategies. Compared to goats, sheep lay down more subcutaneous and intramuscular fat from surplus energy. Goats tend to lay down more internal fat, which is not associated with the carcass. Where carcass fat is a delicacy and fetches a higher price, sheep make an important contribution to the household economy.

D. Survival rate during drought

Sheep and goats have higher survival rates under drought conditions compared to cattle.

Moreover, because of their reproductive rates, flock numbers can be restored more rapidly. With regard to goats, water economy is also an important biological feature. It is common for goats to be watered every four days and still provide a reasonable amount of production.

E. High off take

Due to their short reproductive cycles (short lambing/kidding interval) and high incidence of multiple births (particularly for some breeds such as the Horro), there is potential for a higher annual offtake of sheep and goats than seen with cattle. This allows farmers/producers a quick interval of selling part of their flock and generating cash income.

Structure and Function of the Digestive Tract/Digestive system

Sheep and goats are ruminants. Ruminants have the ability to consume and digest coarse, fibrous feedstuffs that form the major feed base in Ethiopia. The digestive tract of ruminants is unique in structure and function, allowing them to digest the fibrous feeds they consume. The following are some of the unique features of the ruminant digestive tract compared to monogastric animals (animals with a simple stomach such as swine, dogs, cats, humans, etc.):

- Ability to digest carbohydrate sources not digested by monogastrics.
- Ability to use sources of non-protein nitrogen (NPN) to satisfy part of their protein needs.
- Large stomach volume to accommodate and utilize bulky feeds.
- Mouth and teeth well adapted for prehension and grinding of fibrous feeds.
- Well-developed salivary glands for production of large volumes of saliva

An unhealthy and small population of rumen micro-organisms results in slow digestion and a slow passage of feed. The following conditions should be maintained in the reticulo-rumen to allow micro-organisms to grow and flourish.

- Constant temperature and pH (~6–7).
- Anaerobic environment conducive to rumen micro-organisms that are predominantly obligate anaerobes.
- Ruminal contractions to stir and mix the microbes and contents.
- Removal of the by-products of microbial digestion (volatile fatty acids, etc.).

Inadequate supply of nutrients, mainly nitrogen, sulphur and cobalt to the microbes will reduce microbial growth, and consequently reduce digestion. Supplementation of these nutrients is

required in many cases. Often, the primary limitation is the concentration of ammonia (NH₃) in the rumen.

3.2. Identifying and Confirming Feed and Feed Supplements Source and Feeding Plan

A supplement is a semi-concentrated source of one or more nutrients used to improve the nutritional value of a basal feed, e.g., protein supplement, mineral supplement. Supplementation may be at various levels and for different reasons. It may be done to assure survival, to assure maintenance or to assure production and reproduction. Supplementation can be done by providing a complete feed or by giving specific nutrients. Supplementation can enable animals to consume more forage, to digest the same quantity of forage more efficiently or to overcome a nutrient deficiency that critically limits performance

Grazing stock may sometimes be supplemented with hay or straw to provide bulk for prevention of nutritional disorders. This is when the pasture is very lush with high moisture or protein content or where there is a danger of bloat in legume-rich swards. Bypass nutrients, with the exception of those from legume leaves, come generally from rather expensive feeds which are either in demand for human nutrition (cereals) or exported for foreign exchange (oil seeds). However, because recent research has shown that inclusion at a low rate in the diets is beneficial, these supplementary feeds should be economical in many situations.

Most supplements are expensive and their use in ruminant nutrition competes with monogastric animal and/or human nutrition. Moreover, they are generally not easily available. Optimum utilization of these scarce resources is, therefore, essential. This targeted use of supplements is referred to as “strategic supplementation” and is designed to have maximum effect and optimum economic benefits. This can be achieved by identifying and providing critically deficient nutrients based on the following considerations:

- Supply rumen microbes with the necessary rumen-degradable nitrogen and other essential nutrients to enhance their capacity to degrade poor-quality roughages in the rumen. This is a first priority.
- Supply small amounts of bypass nutrient sources to increase utilization of absorbed nutrients and animal performance.

- Supplement during times of most critical deficiency of a nutrient, giving priority to supplementation of the most critically deficient nutrient.

I. The reason for supplying supplementary feeds

Supplementary feeds offered to correct specific nutrient deficiencies in grazed herbage, to allow for general qualitative or quantitative limitations in nutrient supply, or to ensure a smooth transition from one feeding regime to another.

II. Identifying source of supplementary feeds

The supplements used range from simple mineral preparation through conserved for ages to complex concentrate mixtures. Some of the common supplements are: -

- **Roughage:** - hay, silages, straw and leaves of trees and bushes.
- **Concentrates:** - that formulated in industry and a balanced diet.
- **Energy sources:** - cereal grains, molasses, wheat bran, wheat short, etc
- **Protein sources:** - nug cakes, soybean meal, cotton seed meal, linseed meal, meat meal, meat and bone meal, fish meal, etc
- **Mineral sources:** - mineral licks, bone meal, etc
- **Vitamin sources:-** different types of vitamins

III. Preparing supplementary feeds

Now a day, livestock feeds are prepared in factories; such feeds may come in different shapes and forms. But there are some supplementary feeds that come easily are prepared without the help of factories. Agricultural Research Institute developed an animal feed block formation machine to serve the purpose of animal feed management to supplement minerals.

3.3. identifying and confirming Nutritional requirements of sheep and goat

Pregnant females need feed to support the growth of the fetus. They shouldn't be fed to become too fat. Females that are too fat will have trouble lambing/kidding.

- Females in early pregnancy should receive:

- ✓ Grass/crop residue, free choice.
- ✓ One part legume for every 3 parts grass/residue.
- ✓ A handful of concentrate, 200 g/head/day mixed concentrate containing, for example, 49% bran, 49% noug seed cake, 1% limestone and 1% salt or 500 g of wheat bran.
- **Females in late pregnancy (2–3 weeks before the due date):** This is by far the most critical period during which correct feeding is important as the fetus grows fastest at this stage of development. They should receive:
 - ✓ Free access to good pasture and other roughage.
 - ✓ One part legume for every 3 parts grass/residue.
 - ✓ Concentrate, 250–400 g/head/day mixed concentrate containing, for example, 49% bran, 49% noug seed cake, 1% limestone and 1% salt or 1 kg wheat bran depending on condition of the animal.

Feed requirements of animals affected by age, sex, status of production, breed types, level of production. Offspring needs to be fed with milk for 2-3 times in a day so that kids can be protected from diseases. After two weeks, progeny can have soft grass and feeds. Kids must be weaned from its mother after 10-12 weeks, and feed more forage and feeds with protein.

After 4 months of parturition, Doeling and Buckling should be kept in separate from preventing unnecessary mating behaviors from bucks to doeling. It is necessary that growth of Boer cross kids should be 50-150 grams per day. As possible as for the whole 24 hours, green forage and fodders should be kept in the place of stall. Salt and other multi-nutrients minerals cake and clean water adequately needs to be fed to goats.

Table: Required forage and fodder for goat based on weight

Goat	Forage and fodder
Growing kids(up to 10-15kg)	2-3 kg per day
Small goat (up to 20 kg)	4kg kg per day
Medium goat (up to 5kg)	5 kg per day
Big goat (up to 30kg)	6 kg per day

3.4. Monitoring and recording Feeding strategies and reporting abnormalities

A balanced feeding program for sheep and goats should contain forages, hay, grains, browse and shrub plants and a source of bypass protein. Keep the following points in mind while feeding different classes of animals.

- Balance feed availability and number of animals kept.
- Adjust the number of animals to the level of feed.
- Produce more feed to meet requirements.
- A ration that is modified whenever necessary to meet the changing requirements of animals during different stages of the reproductive cycle is usually more economical.
- The amount of feed supplied should be accurately adjusted to the requirements of the animal so that feed is not wasted by feeding more than the animal needs.

Feeds of similar nutritive values/properties can be interchanged based on prices in order to obtain each essential nutrient from the cheapest available source. Experience and observation will show what feeds animals like and how much they will eat. Some guidelines for feeding different groups of animals are indicated below.

I. Adult breeding males: Adult males used for breeding need to be well-fed to maintain their body condition for mating. Breeding males need to be supplemented beginning two weeks before start of breeding. They shouldn't, however, be allowed to become too fat. Breeding males need to be supplied with plenty of water and allowed to exercise. Supply of good pasture is enough when not being used for mating. Feed as follows starting two weeks before and during breeding season:

- Grass/crop residues, free choice (as much as they can consume).
- Supplement legumes, up to 1 part for every 4–6 parts of grass/residue consumed.
- Alternatively, supplement a handful (about 250 grams) of concentrate containing, for example, 49% bran, 49% noug seed cake, 1% limestone and 1% salt. The allowance should be higher (400– 600 g) if the male is large and is serving a large number of females.

II. Dry breeding females: A dry female that has recently been weaned from her lambs/kids can be maintained on good quality pasture or fed good quality hay depending on her physical

condition at weaning. Very thin animals that are adversely affected by the stress of lactation (especially those that gave birth to twins or triplets) need supplementation in addition to forage for adequate preparation for the next breeding and conception. Thin breeding females should be flushed before breeding. Flushing is the practice of feeding the ewe/doe so that she starts to gain weight about two weeks before breeding. Flushing may increase lambing percentage and embryo survival. Flushing can also reduce mortality of offspring. Flushing works best on females in poor body condition.

III. Young, replacement females: Young females selected for breeding need extra feed for growth so that they will be large enough and in good shape for breeding. They should be fed as follows:

- Grass/crop residue, free choice.
- Supplement legumes, up to 1 part for every 3 parts of grass/residue consumed.
- Supplement a handful (250–300 g) of a mixed concentrate containing, for example, 49% bran, 49% noug seed cake, 1% limestone and 1% salt.

IV. Pregnant females: Pregnant females need feed to support the growth of the fetus. They shouldn't be fed to become too fat. Females that are too fat will have trouble lambing/kidding.

- Females in early pregnancy should receive:
- Grass/crop residue, free choice.
- One part legume for every 3 parts grass/residue.
- A handful of concentrate, 200 g/head/day mixed concentrate containing, for example, 49% bran, 49% noug seed cake, 1% limestone and 1% salt or 500 g of wheat bran.

V. Females in late pregnancy (2–3 weeks before the due date): This is by far the most critical period during which correct feeding is important as the fetus grows fastest at this stage of development. They should receive:

- Free access to good pasture and other roughage.
- One part legume for every 3 parts grass/residue.
- Concentrate, 250–400 g/head/day mixed concentrate containing, for example, 49% bran, 49% noug seed cake, 1% limestone and 1% salt or 1 kg wheat bran depending on condition of the animal.

VI. Lactating females: The requirement of these classes of animals is similar to females in late pregnancy. Their rations should generally contain 14–16% crude protein. They have high requirements for milk production. They should receive:

- Grass/crop residue, free choice.
- One part legume for every 3 parts grass/residue.
- Concentrate: 250–300 g/head/day mixed concentrate containing, for example, 49% bran, 49% noug seed cake, 1% limestone and 1% salt or 1 kg wheat bran. The level of concentrate should be higher for high milk producers. An allowance of concentrates at the rate of one third of the amount of milk produced is necessary.

VII. Reporting feeding abnormalities

Feeding abnormalities are recorded and reported in line With enterprise requirements. it is used to control target weights, amount and type of feed and feed supplements (Hay, grain, predetermined rations, trace elements, vitamins and sources of nutrients including silage, paddock feed, grain legumes, mineral blocks, protein meals, calcium and other nutrient supplements, and specific purpose feeds) , feeding frequency and rates, feeding methods , procedures and others. Because there is health risk influenced by nutrition and feeding like

1. **Pregnant toxemia Symptoms [1-3 weeks before parturition]** lethargy, sluggishness, lack behind, failure to eat, recumbency , stiff gait, neurological dysfunction ,coma → death, differential diagnosis:milk fever,
2. **Risk factor** inadequate nutrition, insufficient energy density, Multiple fetuses high energy demand by fetuses, Obesity, fat mobilization → toxic ketone bodies,Poor body condition, Lack of exercise, Stress and Environment Severe weather conditions
Treatment Oral glucose, Propylene glycol, IV glucose and Caesarian section
3. **Prevention** Adequate energy in diet, Adequate feeder space, Proper body condition, Exercise and Minimize stress
4. **Virginal prolapsed** Protrusion of vagina through vulva usually occurs 1-3 weeks prior to lambing. Often corrects itself after lambing.
5. Causes Increased abdominal pressure, Calcium status ? Short tail docks ?, Internal fat, Gravity and Genetics

Treatment: - Replace, purse string (suture), Bearing retainer, spoon, Prolapse harness and Cull

6. **Abortion:-** Risk factors: - Ingestion of bacteria, spoiled feed and consumption of contaminated with cat feces feed.

Treatment: - antibiotics isolate affected females and aborting females develop immunity

7. **Bloat:** - an excessive intake of feed, which quickly starts to ferment in the rumen causing accumulation of gasses in the rumen of the goat.

3.5. Implementing Procedures To Minimize Feed Wastage and Spoilage

To minimize feed wastage grouping animals by their nutrient requirement, production type and prepare feeds in the form of block and prepare feeding materials like Feeding trough-30-40cm/animal, Watering trough



Figure: 3.1. Feeding trough to minimize feed wastage

To preserve feeds for long period of time without spoilage prepare feeds in the form of hay silage and treatment feeds physically (Chopping, Grinding and pelleting), Steam treatment, Water soaking, and chemically like alkali treatment urea treatment and other it is also used to increase palatability of feed and recycle feed wastes like silage. Silage prepared from residues of feed during animal feeding and unpalatable feed waste.

Goats are fussy eaters and will waste food by pulling it from racks to the ground and spoiling it they will also jump in to racks and contaminate forage. Feeding racks and troughs for fodder should be designed so that food does not fall on to the floor so that animals cannot stand in the food nor contaminate it with dung and urine.

3.6. Assessing and Determining Sheep and Goat Body Condition Score

Body condition scoring (BCS)

- A valuable management tool that can be used to evaluate the feeding program and the need for changes.
- Body condition is a better indicator of condition than weight.
- The most important times to body condition score are breeding, late gestation, and weaning.
- Body condition scoring estimates fat and muscle on a scale of 1 to 5. Half scores are commonly used. The cattle system (1-9) can also be used.
- 1 BCS equals 13% of the live weight of a female in moderate condition (3-3.5).
- Exact score is not important as the relative scores and the differences between scores.



Figure: 3.2. Body condition of sheep and goat

Condition scoring is a system of describing or classifying animals by differences in relative body fatness. It is a subjective scoring system but provides a fairly reliable assessment of body composition. Body condition at the time of mating has an important influence on the number of lambs and kids born and on the proportion of barren ewes/does.

Changes in body condition are inevitable with large fluctuations in feed supply. There are circumstances where body weight *per se* does not reflect an animal's condition, i.e., an animal with a large frame may have a higher body weight when at a low level of body reserves than

another animal with a small frame but abundant reserves. Large variation in gross live weight may also occur because of changes in gut fill, pregnancy and parturition. The nutritional plane to which an animal has been exposed over a reasonable length of time is reflected by the extent to which fat is stored or muscle mass has been diminished. This may be assessed visually and expressed as a condition score.

Body condition scoring is simple but useful procedures which can help producers make management decisions regarding the quality and quantity of feed needed to optimize performance. It can also play an important role in sheep and goat marketing

Table: 3.1. Scales for body condition scoring of sheep.

Condition score Description	
Starving - 0	Extremely emaciated and on the point of death. It is not possible to detect any muscle or fatty tissue between the skin and the bone.
Very thin - 1	The spinous process is prominent and sharp. The transverse processes are also sharp, the fingers pass easily under the ends, and it is possible to feel between each process. The eye muscle areas are shallow with no fat cover.
Thin - 2	The spinous process feels prominent but smooth, and individual processes can be felt only as fine corrugations. The transverse process is smooth and rounded, and it is possible to pass the fingers under the ends with a little pressure. The eye muscle area is of moderate depth, but has little fat cover
Moderate - 3	The spinous process is detected only as a small elevation; it is smooth and rounded and individual bones can be felt only with pressure. The transverse process is smooth and well covered, and firm pressure is required to feel over the ends. The eye muscle area is full, and has a moderate degree of fat cover
Fat – 4	The spinous processes can just be detected with pressure as a hard line between the fat covered eye muscle area. The end of the transverse process cannot be felt. The eye muscle area is full, and has a thick covering of fat
Very fat - 5	The spinous process can't be detected even with firm pressure, and there is a depression

3.7. Monitoring and Maintaining Condition and Security of Paddocks

Paddock condition is the average condition of pastures across a land type. It is slow to change and reflects how the pasture has been treated over the long-term. It is a measure of the health of the pasture and its ability to grow high quality forage, recover from disturbances and resist land degradation. Pasture (or grassland) management is the practice of growing healthy grass and related plants to sustain year-round forage availability, whilst also encouraging ecological health. This can conserve or enhance native grasses in your pasture as well as improving the soil health.

Managing your pasture actively will also allow you to grow the type of grass you want. The grass already growing in your paddock may not be the best kind for small ruminant but by over seeding and/or planting you can encourage growth of more shoat feed varieties. Good pasture management may reduce your feed costs as well as improving biodiversity and reducing the environmental impact, as grassland is a big carbon trap. Healthy grassland is also more resistant to poaching and desiccation.

Self check - 3	Written test
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Name ID NO. Date

Direction: answer all the question listed below

Test-I choices the best answers

1. Which one of the following animals are all must categorized under grazing feeding behavior?

- A. Sheep B. Goat C. Camel D. Cow

2. Which one of the following feedstuff NOT categorized under roughage?

- A. cereal grains B. Hay C. Silage D. straw

Test: II Write True or False

1. sheep and goat has the same feeding behavior with cattle
2. sheep and goats have higher survival rates under drought condition than cattle
3. Female goat requires the same quality and quantity of feed during pregnancy and non pregnancy.
4. Paddock condition is the average condition of pastures across a land type.

Test-III writes short and brief answers

1. Why we supplement nutrients? (2pts)
2. List factors that affect feed requirement of animals. (2pts)
3. What is feed abnormality means? (2pts)
4. What is the advantage of knowing body condition of animals? (3pts)

Satisfactory rating - 9 points

Unsatisfactory - below 9 points

You can ask you teacher for the copy of the correct answers.



Operation sheet-3

Name..... ID..... Date

Tools and materials to perform operation

- Weight balance
- Container

Procedures

- collect material
- Check and correct your balance weight
- Weigh feed for five goats that need 4kg per day



LAP TEST-2

Performance Test

Name..... ID..... Date

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **30minutes hour**. The project is expected from each student to do it.

Task: Perform measuring the total weight feed for five (5) goats which need 4kg per day per each goat.

LG#21	LO#4 Identify sheep and goat housing and facilities
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Instruction Sheet	
<p>This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:</p> <ul style="list-style-type: none"> • Site Selection Criteria To Select Appropriate Site For Sheep and Goat Production • Preparing Sheep and Goat Production Site • Assessing and Clarifying Requirements For Sheep and Goat Housing • Assessing and Preparing Sheep and Goat House Building Materials • Confirming Budgetary Constraints Of Sheep and Goat Housing • Assessing and Determining Facilities <p>This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:</p> <ul style="list-style-type: none"> • Site Selection Criteria To Select Appropriate Site For Sheep and Goat Production • Prepare Sheep and Goat Production Site • Assess and Clarify Requirements For Sheep and Goat Housing • Assess and Prepare Sheep and Goat House Building Materials • Confirm Budgetary Constraints Of Sheep and Goat Housing • Assess and Determine Facilities 	
Learning Instruction	
<ol style="list-style-type: none"> 1. Read The Specific Objectives Of This Learning Guide. 2. Follow The Instructions Described Below. 3. Read The Information Written In The Information Sheets 4. Accomplish The Self-Checks 5. Perform Operation Sheets 6. Do The “LAP Test” 	

Information sheet-4

4.1.Site Selection Criteria To Select Appropriate Site For Sheep and Goat Production

Factors to consider in selecting a site for a new or expanded livestock operation include the following:

- Distance to neighboring residences
- Direction of prevailing winds in relation to neighbors
- An adequate source of water
- Access to land for manure application
- Topography
- Soil type
- Proximity to surface water bodies, sinkholes and flood plains
- Depth to groundwater
- climate

Likelihood of odor complaints by neighbors may be a major deterrent to siting large livestock operations in many locations.

A. Accessibility

A livestock operation should have good access to markets, preferably by means of state maintained, hard-surfaced highways with bridges permitting large trucks. Prompt snow removal is important. Avoid sites where the cost of constructing and maintaining the road from the livestock operation to the public road will be excessive because of distance, required bridges, snow drifting or other topographical or soils problems. This cost may be balanced against the need to provide setback or separation distance between the operation and potential odor receptors.

B. Water

Page 87 of 99	Ministry of Labor and Skills Author/Copyright	Animal Production Level -3	Version- 1 May, 2023
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A year-round supply of water is essential for the animals, sanitation, workers and residences and fire protection. Water may be needed for animal manure dilution and flush-cleaning facilities. Public water supplies are expensive for watering livestock.

C. Electricity

Electrical demand may be high for large animal feeding operations, especially for pumping, grinding and materials handling. Unless a three-phase line is nearby, the cost of providing such a line for the large motors that require three-phase power can be costly. Livestock operations subject to frequent power outages may feel compelled to install a standby power source. Outages are more likely if the site is far removed from the electrical substation.

D. Soil/plant filter

Harvested crops or forage that use large amounts of nutrients are best suited for sustainability of the soil/plant filter. Because soil nutrients on pastureland tend to be recycled rather than removed, nutrient applications to pastureland are less efficient than applications to forage or crops that will be harvested.

E. Biological and operational factors

- Before a site can be selected for a project, the following should be ascertained:
- species to be cultured
- resources and availability of stocking materials (spawners, fry or fingerlings)
- type of project

(i) small-scale rural project	system of culture adopted	operational method	1.production target
(ii) large-scale rural project	1.extensive	1.monoculture	2.estimated size of
	2.semi-intensive	2.polyculture	area required
	3.intensive	3.integrated	

F. Economic and social factors

The most important economic and social factors are as follows:

- development plans for the project area
- ownership, availability of land and land values, land regulations and rights, as well as any legal restrictions relating to land
- proximity to all-weather road connections
- availability of electricity, telephone or radio connections, as well as unit power cost
- availability of equipment, services and supplies needed for running the project
- availability of construction materials
- location of markets for the produce and determination of demand
- availability of organic and artificial fertilizers, drugs and chemical materials
- availability of supplementary feeds
- costs of equipment, materials, feeds, etc. needed for running the project
- availability of suitable transport facilities
- availability of ice for marketing
- availability of staff with adequate experience of pond management
- availability of skilled and semi-skilled labourers
- Reasonable amenities for permanent staff, for example, schools, shopping facilities, hospital, etc.
- information on the local financing methods or credits
- political realities

4.2.Preparing Sheep and goat production site

Any activity of livestock production requires the first step after site selection was about preparing the site which encompass in to different activity before introducing animals in to new farm. so preparing site which is preferable for livestock production is done by considering different activity or by following different procedure which start from site selection and go up to

product production. the following some points are what we should have to do while preparing site for small ruminant production:

- Be aware of hiding and denning places for rodents.
- Inspect rodents from living there.
- Remove piles of boards, wood, or other junk.
- Check for rain and storm water damage.
- Identify and correct manure runoff problems.
- Remove standing water, which can be a breeding ground for mosquitoes.
- Prevent standing water on the ground near water systems in pastures.
- Check fences along farm and pasture perimeters; repair any damage.

Livestock establishment include the fulfillment of different facility and structure that support as a main or supportive facility. So, site preparing has a lot off steps; such as:

- Clearing the site from different tree trunk and stone
- Constructing fence
- Installing water pape
- Constructing different house in a single farm that used for different purpose like feed storage house, barn, guard house etc

Then the other thing is fulfilling and providing the following point also included under preparing production site

- Provide on-farm laundry facilities for employees.
- Wash farm clothing with detergents and bleach or washing soda.
- Insist workers wash their hands before milking dairy animals and after working with sick animals.
- Nitrile gloves are recommended when frequent cleaning between animals is necessary.
- Insist workers wear protective plastic or rubber gloves when assisting with births.

4.3. Assessing and clarifying Requirements for sheep and goat housing

As for living human needs house; goats do also need shed/barn. Some people have raised goats together with barn of cattle; but for commercial goats farming, it is good to have goats shed constructed separately for better care. By using local materials, goat farming shed should be constructed resilient to earthquake. As per ages of goats, separate spaces should be allocated within the shed. Kids should be kept into clean,

dry and warm spaces to protect from potential pneumonia. It is appropriate to lay dry and soft grass in the floor. A space from 0.2 to .5 square meters is necessary from parturition to 3 months older per kid. Problem due to internal parasites for the kids arises in wet and damp places, therefore shed should be maintained dry and warm.

Shed is necessary to protect goats from the Sun, water and cold; protect from tigers and jackals etc. at night and protect from theft. Sheds built above the ground is good for appropriate management of dung of goats which will help to control infections and non-infectious diseases. As well as, it will be easy for management of goat feeding to farmers.

It is beneficial to construct goat shed by using low cost and locally available materials. While constructing shed, separate spaces should be maintained for kids, dry doe, pregnant doe, kidding doe, wether and breeding buck. There is fear of uncontrolled pregnancy and abortions, if bucks and adult goats are mixed together in one space. Shed's floor is maintained to keep secure footing; but dung and urine should pass from the holes, and it should be easy to clean the shed. If holes are bigger than a finger size, goat's legs get entangled, gets wounded, no secured footings can get fractured legs also.

4.4. Assessing and preparing Sheep and goat house building materials

Sheep and goat barn construction need not be complicated or expensive. The materials used in construction should be those locally available that will result in a long-lasting structure. Animal safety and welfare is very important in the design and construction of housing.

The following materials are used for roof construction in different locations:

- Iron sheet:- For roofing, For fencing shed
- Grass/bushes:- For roofing,

- Wood:- To make wall, fencing of shed
- Stone/brick:- To make wall, fencing of shed
- Babmboo:- Used for pole, creating a floor, fencing of shed
- Nail:- to attach/fix wood together
- Soil:- for making mud to seal a wall
- Rope: to tie together

Orientation

The orientation of the shed can be important depending on the climate. One can prevent the sun from heating up the stall too much by placing the longitudinal axis of the stall east - west. If, on the other hand, one wants the sun to shine on the floor so that the floor dries up and parasites die, it is better to build the shed along a north - south axis (This is preferred in humid areas).

4.5.Confirming Budgetary Constraints Of Sheep and Goat Housing

A. Major Constraints of Sheep and Goat Production in Ethiopia

Sheep and goat production and productivity in Ethiopia is constrained by many factors. The major ones are summarized below.

Scarcity of feed: The feed resource base for sheep and goat production in Ethiopia is natural grazing and crop residues. The quality and supply of these resources is seasonally variable. Grazing resources in the highlands are diminishing due to increases in cropping land. Bush encroachment and overgrazing have reduced grazing resources in the pastoral areas.

Lack of infrastructure: Infrastructure necessary to transport livestock or livestock products from remote rural communities, where production is concentrated, to urban markets is lacking. Sheep and goats are generally trekked long distances for marketing, often without adequate water and feed. They are also trekked similarly long distances in search of feed and water. There are very limited market centers and stock routes with the necessary facilities such as feeding and watering points.

High mortality rates: About one-half of all lambs/kids born die due to various causes. This is a very important constraint limiting productivity. Annual mortality in all classes of stock averages 23% for sheep and 25% for goats in the central highlands.

Inadequate veterinary coverage: This results in high mortality and morbidity. Certain disease

conditions are also causing Ethiopian animals and products to be banned from export markets.

Long marketing channels and lack of market information: Producers do not have access to market information. The system lacks market orientation, which would have been an important driving force for increased production.

Low product quality: Poor quality of live animals and small ruminant meat and meat products prevents penetration into many export markets.

Absence or inadequate provision of credit services: Livestock owners have difficulty obtaining credit to begin or expand production, purchase inputs, increase stock, etc.

Low average reproductive rates: Typical reproductive rates average as low as 55 lambs and 56 kids born per 100 mature females per year in the central highlands.

4.6. Assessing and determining Facilities

Essential sheep and goat facilities differ according to the system of management and climatic conditions. In modern production systems, where large flocks of sheep or goats are raised and managed, facilities to handle sheep and goats are essential for efficient management. Some of these facilities are:

Fences	Isolation ward for sick animals
Handling pens	Manure disposal pit (away from the house), and
Housing (house/barn – different kinds)	Equipment (feeding and watering troughs, etc.)
Dipping vats/spraying area	

A. Fences

Fences are important not only to protect animals against predators or theft but also to isolate them from other animals. Fences could be constructed from locally available materials with considerations for cost and durability. Materials resistant against termites are most durable. Alternatively, wooden posts of treated eucalyptus could be used. Barbed wire is commonly used but can damage the skin when animals try to squeeze through an opening. Fences require regular supervision and maintenance. In some instances trees or brush may be grown and fashioned into a live fence.

B. Handling pens

Sheep and goats need to be handled, either in groups or individually, for vaccination, treatment,

mating, weighing, etc. Handling pens are useful in reducing injury and stress on animals and workers. An ideal lay-out for a handling pen includes a receiving pen, forcing pen, crush, sorting gate, foot bath, dip or spray race (long and narrow passage wide enough for only one sheep or goat), draining pens and a holding pen. In particular, the receiving pen should match the number of animals expected to be handled at one time. Under the current smallholder conditions of Ethiopia, one handling pen per village may serve the purpose as long as complications with disease transmissions are minimal.

Self check - 4	Written test
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Name ID NO. Date

Direction: answer all the question listed below

Test-I choices the best answers

- Which one of the following is/are NOT site selection criteria?
 - resource availability
 - facility and infrastructure
 - Topography
 - none of the above
- All are the reason of why sheep and goat housing required. Except ____
 - to protect from adverse climatic condition
 - to make management easy
 - to protect from predators
 - none of the above
- What types of land preferable for livestock farm construction?
 - rough topography
 - poor drainage
 - gentle landscape
 - none

Test: I Write True or False

- suitable farm site selection decrease the risk of economic loss of farm
- Lamb and kid mortalities are very important constraint that limits productivity.
- Shed is necessary to protect goats from the Sun, water and cold.
- A livestock operation should have good access to markets.

Test-III writes short and brief answers

- List the materials that are used for house construction. (3pts)
- Mention major constraint of sheep and goat production in Ethiopia. (3pts)
- List some examples of sheep and goat production facility. (2pts)

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No	Name	Qualification	Educational background	Institution	Phone number	E-mail
1	Terefe Tolcha	MSc.	Animal Production	Alage ATVET College	0911067132	terefetc@gmail.com
2	Moges Demilie	MSc.	Animal Production	Kombolcha ATVET College	0913326341	mogesdemilie@gmail.com
3	Murtessa Negessa	MSc.	Animal breeding and genetics	Mizan ATVET College	0923568489	murtessa12@gmail.com
4	Kassahun Kebede	MSc.	Animal breeding and genetics	Agarfa ATVET College	0920626996	kassk2006@gmail.com
5	Obsa Diriba	MSc.	Animal Production	Gewane ATVET College	0920022972	obsa9072@gmail.com
6	Areba Hussein	BSc.	Animal Production	Gewane ATVET College	0933161587	arebahussein7@gmail.com
7	Baisa Sirna	MSc.	Animal breeding and genetics	Mizan ATVET College	0921917546	baisasirna@gmail.com
8	Bekele Abdisa	MSc.	Animal Production	Agarfa ATVET College	0920839098	bakeabdi@gmail.com
9	Abera shiferaw	MSc.	Animal Production	Holeta Poly Technique College	0911556155	aberashiferaw@gmail.com