



Sheep and Goat Production Handbook



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PREFACE

The sheep and goat producers' booklet was compiled and prepared by the USAID funded Empowering New Generation to Improve Nutrition and Economic Opportunities (ENGINE) program to strengthening program supported vulnerable households' indigenous knowledge synergy with modern husbandry for better benefit from sheep and goat rearing. This booklet is a customized form of the previously prepared handbooks by FARM Africa Dairy Goat Project; ILRI (IPMS Project) Sheep and Goat Production and Marketing Systems in Ethiopia: Characteristics and Strategies for Improvement; the USAID funded Ethiopia Sheep and Goat Productivity Improvement Program and the FAO (2010) Case Definition of Livestock Disease. In an effort to ease user understanding, we have used simple language and illustrations wherever possible.

The ENGINE program is leveraging the growing interest in sheep and goat rearing by project-supported groups (vulnerable households). While developing the training curriculum, we found a general lack of user-friendly training materials. Thus, we were prompted to prepare this sheep and goat handbook. It is our objective that this document will be used as reference source for vulnerable households and during ENGINE trainings.

ENGINE is an integrated nutrition program. The sheep and goat support is meant primarily for household meat and milk consumption with additional nutrition opportunities from earned income. Supported households are expected to translate income gained from animal sales into nutrition through developing nutrition oriented purchasing behavior. Thus, we have included nutrition education into the technical training. Traditionally, sheep and goat management and ownership is suitable for both for men and women but income disposal is commonly the man's right. To overcome this potential obstacle to better nutrition, gender discussions and training techniques have been included in this handbook.

To address the diverse needs to project staff and beneficiaries, we have made as comprehensive a handbook as possible. Currently this handbook includes i) sheep and goat husbandry practices; ii) basic human nutrition; and iii) approaches to gender-related issues. We anticipate updating this handbook as new information is learned and new situations arise.

The Sheep and Goat Production Handbook contains two major sections:

- 1) Sheep and goat husbandry; encompassing an introduction, brief overview of production systems, reproduction, herd management, feeding, housing and healthcare.
- 2) Sheep and goat marketing, which includes nutrition (human) messages and gender-based discussions.

The Sheep and Goat Production Handbook organized into six chapters in Section 1 addressing sheep and goat management (Chapter 1-6) and three chapters in Section 2 addressing the socio-economic benefits of sheep and goat rearing (Chapter 7-9).

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CHAPTER ONE: SHEEP AND GOAT REARING

BENEFITS OF SHEEP AND GOAT REARING

Sheep and goat rearing has quit many benefits that the sheep producers can make use of live animals and or its products. Among others, important benefits are mentioned below

Health Benefits

Sheep milk

- Sheep are raised primarily for their meat and wool, although their milk products are gaining in acceptance and economical importance. Sheep can produce 2/3 liters of milk daily. Their milk, including sheep-milk products, is an important component of the human diet in many parts of the world. Below is a bulleted discussion of these benefits. Rich in Calcium, Magnesium, Phosphorus, Potassium and Sodium. It also has small amount of Selenium, Zinc and Iron
- Rich in Vitamin A, C and Folate.
- It has small amount of Thiamin, Riboflavin, Niacin, Vitamin B6, Vitamin B12 and Pantothenic acid. On average, it is more nutritious then cow's or goat's milk.
- Space and feed requirement is very low compared to cattle and minimum risk.
- Easy to manage by vulnerable households, especially women-headed households and those with high dependency ratios.

Table 1: summarizes the nutritional content of sheep and goat milk compared to cow, camel, and human milk

Goat Milk

Milk Variety:	Goat	Cow	Sheep	Camel	Human
Protein (%)	3.0	3.0	5.85	3.35	1.1
Fat (%)	3.8	3/6		3.24	4.0
Calories/100ml	70	69			68
Vitamin A (i.u./gram fat)	39	21			32
Vitamin B (u.g./100ml)	68	45			17
Riboflavin (u.g./100ml)	210	159			26
Vitamin C (mg ascorbic acid/100ml)	2	2			3
Vitamin D (i.u./gram fat)	0.7	0.7			0.3
Calcium	0.19	0.18			0.04
Iron	0.07	0.06			0.2
Phosphorus	0.27	0.0			0.06
Cholesterol (mg/100ml)	12	15			20
Lactose (%)	4.10		4.86	4.52	
Ash (%)	0.79		0.92	0.80	
Total Solids	11.05		18.63	11.05	
Energy (kCal/ liter)	622		1080	670	

Many cultures around the world drink goat's milk. Most commonly, goat's milk is reserved for home consumption, specifically consumption by children; with cow's being reserved for cash/income. Other advantages of goat's milk include:

- Greater quantities of calcium, phosphorous and chlorine than cow's milk
- For some, goat's milk does not cause an allergic reaction. Children are commonly reared on goat's milk due to high digestibility and/or in cases of reaction to cow's milk.
- The small size of the fat globules and the soft curd are favorable qualities because it makes the milk easier to digest. Goat's milk is often recommended for infants, pregnant women, people suffering from liver disease, allergies or ulcers, or others with digestive problems

Production Benefits

Sheep and goats are some of the most widely reared livestock around the world. Their low feed, input, and labor requirements make them a desirable choice for millions of smallholders globally. Sheep and goats are easily integrated into different farming systems.

- The importance of sheep and goats in fulfilling the role once played by cattle for meat, milk and manure production is being increasingly recognized because of shrinkage of available grazing lands, increased climate variability, and increasing conflict with crop farmers.

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.
- 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.

Size

Being small-sized animals, sheep and goats require a small initial investment. 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

- Their small size, together with early maturity, makes them suitable for meeting subsistence needs for meat and milk. Sheep and goats, once acquired, become a valuable asset providing financial security to the family as well as milk and dairy products to the household.

Fat deposition

Sheep and goats vary in fat deposition, presumably due to different adaptation strategies.

- Goats tend to lay down more internal fat, which is not associated with the carcass. Survival rate during drought
- Compared to goats, sheep lay down more subcutaneous and intramuscular fat from surplus energy. Where carcass fat is a delicacy and fetches a higher price, sheep make an important contribution to the household economy.

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

- In general, they have lower feed and water requirements although a goat will surpass a sheep in drought tolerance.
- Because of their high reproductive rates, flock numbers can be restored more rapidly post-loss.

- Goats are economical in how their body utilizes and conserves water; an important biological feature in drought-prone areas. It is common for goats to be watered every four days and still provide a reasonable amount of production

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 off-take 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

Rural savings bank and inland revenue

Commonly, rural areas have no formal banking facilities. Cash resources are quickly converted to livestock as a form of wealth accumulation or savings.

- Sheep and goat, because of their relative value and high security (i.e. survivability) are the asset form of choice for millions of smallholders around the globe. In fact, in some areas, small ruminants have been described as the 'village bank'.
- 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.
- Sheep and goats contribute a quarter of the domestic meat consumption; about half of the domestic wool requirements; about 40% of fresh skins and 92% of the value of semi-processed skin and hide export trade.
- Increased domestic and international demand for Ethiopian sheep and goats has established them as important sources of Inland Revenue as well as foreign currency.

High income earning potential

For smallholder farmers, goats and sheep have high income earning potential.

- Multiple (twins triplets) offspring (kids/lambs) are typically born every year and commonly twice per year.
- Households can either easily sell the offspring or replace their own reproductive stock or grow their herd.
- Even for households with small land-holdings or minimal access to grazing areas, sheep and goats are a viable livelihood. In the space and using the same feed, you need to keep a cow you can keep six goats!

Households do not need big areas to graze as cattle require. Because their easy access to markets and large cash payouts (compared to poultry), farmers will sell goats/sheep to pay for medium to large household expenses such as school fees, hospital bills, and crop inputs. Alternatively, farmers can save income earned from milk and manure sales to finance these costs.

Because of their small size and low input requirements, sheep and goats are relatively inexpensive to maintain. Drug doses are small because of the animal's small size. This is a good alternative livelihood opportunity for people who do not have a lot of money to start with/the business can be started with small capital.

Environmental Benefits

Sheep and goats will eat many different plants including plants with relatively low nutritional value; making them easier to feed through the year.

- Besides fuel, droppings are used as manure for organic farming; good to use droppings both for homestead horticultural production and for staples farmlands.

- Because they are browsers, goats good at keeping bush under control by slowing down (i.e. eating) shrub growth.

Additional Benefits

Important for Social events

Traditionally, sheep and goats are used as dowry payment. This increases their overall value because they have non-consumptive value (i.e. can be sold/traded even if not going for slaughter).

- Although their value remains high throughout the year, market prices will peak during certain cultural or religious events as sheep and goats are often eaten during religious festivals or cultural events.
- Sheep and goats are also important in some rituals; they are used during circumcision ceremonies for example as well as in payment for land disputes, during leadership meetings, or other special events.
- Sheep and goat horns and bone are used in the traditional craft industry. Hides/skins are highly valued by artisans, especially if the hide is not marred with cuts or by insect/parasite damage.

Minimal labor requirements

Sheep and goats require less labour and time per head compared to cattle.

SHEEP AND GOAT PRODUCTION CONSTRAINTS

Sheep and goat production and productivity in rural household are constrained by many factors. These constraints are not as great as the challenges associated with cattle rearing. These constraints can be managed. Constraints include:

Feed scarcity

The feed resource base for sheep and goat production in the rural area is natural grazing and crop residues. Depending on the season, the quality and quantity of supply varies. Grazing resources in the highlands are diminishing due to increases in cropping land, recurrent drought, invasive weeds and overgrazing.

- Poor feed inputs will reduce reproductive rates and/or infant mortality.

Below average reproductive rate

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

Absence or inadequate provision of credit service

Obtaining credit can be very difficult for livestock owners. Credit facilities often view investments in livestock as high risk and/or as having low returns. This prevents the farmers' ability to expand production, purchase inputs, increase stock, etc.

- Addressing financial illiteracy and working with financial institutions can overcome some of this challenge.

High mortality rate

About one-half of all lambs/kids born die before reaching reproductive maturity.

- Annual mortality in all classes of stock averages 23% for sheep and 25% for goats in the central highlands.

Causes of death include season of birth, low birth weight, feed shortage, disease and predators.

Inadequate animal healthcare

Livestock farmers are often unwilling to invest in animal healthcare (vaccinations, treatment, professional services) and/or there is a general lack of veterinary services accessible by

smallholder farmers. Without consistent or timely treatment, mortality and morbidity rates are high in local herds.

- Diseased sheep and goats reduced production of meat and/or milk, skin and other byproducts.
- Disease incurred costs of patient animal treatment.
- Certain disease conditions are also causing animals and products to be banned from export markets.

Low product quality

In general, smallholder livestock farmers are unable to produce and sell sheep or goats to domestic market standards. This inability limits livestock producers' income generating potential.

Smallholder livestock producers in Ethiopia are also missing opportunities from more lucrative markets. The poor quality of live animals and small ruminant meat and meat products prevents penetration into many export markets

Poor market orientation and lack of access to market information

Like many smallholder livestock producers, sheep and goat rearing lacks market orientation and rarely develops beyond subsistence level.

- Market orientation is an important driving force for increased production and improved productivity.

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.

- Trekking for many kilometers negatively effects meat quality and overall body condition, which later predisposes them to disease and significant weight loss.

CHAPTER TWO: REPRODUCTION IN SHEEP AND GOATS

WHY REPRODUCTION IS IMPORTANT

Reproduction determines several aspects of sheep and goat production and an understanding of reproduction is crucial in reproductive management. A high rate of reproductive efficiency is important for:

- Herd expansion and replacement
- Production of meat, milk, skin and fiber
- Replacement of breeding stock

PUBERTY IN FEMALES AND MALES

Puberty is generally defined as the point of sexual development at which the animal becomes capable of reproduction (becoming pregnant and bearing offspring) but animals may not be fully sexually mature at this stage and may not actually conceive.

- Sexual maturity is the time when the animal expresses its full reproductive capacity.
- In both the male and female sheep and goats, puberty may often be reached without adequate physical growth to support reproduction.
- In females, the first ovulation may not necessarily coincide with first estrus. Female goats and sheep reach puberty as early as four months although they will not reach sexual maturity until 12 months of age. Issues such as weight, breed, genetics, and the season effect the female's age of maturity.
- In males, puberty is the time when complete separation of the prepuce. In the penis in immature rams and bucks, the penis has adhesions that prevent it from being fully extended. At puberty, these adhesions dissolve under the influence of testosterone and the penis can be fully extended. This may occur as early as 5 months. However, full reproductive competence may not occur until 15 months of age.

Factors affecting puberty

Several factors such as nutrition, body weight, breed, season of birth and growth rate are known to influence the age at puberty. In most sheep and goat breeds, attainment of puberty is dependent on achieving satisfactory body weight, usually between 40 and 70% of the mature body weight. For example, a late-maturing breed like the Somali goat is known to attain puberty at a later age. Complete separation of males and females during the early growth period may delay the onset of puberty.

- Nutrition is among the most significant factors influencing reproductive development and the onset of puberty. Poor nutrition delays first estrus and reduces uterine and ovarian development. Increasing the animal's nutritional health generally advances the onset of puberty.
- Overfeeding an animal will decrease subsequent fertility and impair mammary gland development. Therefore, care must be taken to avoid overfeeding.
- Energy and protein restriction influences age at puberty, with energy restriction having a greater influence on delaying onset of puberty than protein restriction.

Different investigations on the reproductive performance of Ethiopian sheep and goats have shown the following:

- Ewe lambs of the Menz breed attain puberty at 10 months of age and 16.9 kg mean weight or 56% of mature body weight. The onset of puberty was earlier in animals with higher weaning weights.
- Somali kids were 19 months and weighed 26 kg at puberty, indicative of a late maturing breed. In Horro sheep kept under low-to-high nutritional regime, age at first mating was reported to be 206 to 285 days while weight was 18 to 21 kg.

- From on-farm monitoring work in Ada District, weight and age at first successful mating for sheep was reported to be 20 kg and 8.7 months, respectively, while for goats it was 17kg and 7.4 months.

Effect of Temperature on Reproduction

Increased body temperature can lower the reproductive rate in ewes/does by decreasing ovulation rate, delaying heat cycles or by increasing embryonic mortality. Although physiological mechanisms in the male assist in regulating temperature, heat stress affects the process of spermatogenesis and can render bucks and rams temporarily sterile for 6 to 10 weeks.

- For these reasons, it is important to assist animals in maintaining body temperature, especially during times of the year when ambient temperature is high. A simple provision of shade in range production systems could reduce the negative effect of heat.

THE ESTRUS CYCLE IN EWES AND DOES

Once puberty is reached, large domestic animals such as sheep and goats display repeated reproductive cycles until conception.

- 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.

Detection of estrus

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

Does

- Bleating continuously
- Swollen – red colored vulva
- Flaggings 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.

When to mate

A doe should be mated 12 to 24 hrs after you have seen her on heat.

- Heat signs in the afternoon, the goat/sheep should be mated the next morning.
- Heat signs in the morning should be mated in the evening.

Seasonality of breeding

Local breeds of sheep and goats in tropical conditions are either non-seasonal breeders or exhibit only a weak seasonality of reproduction.

- In the Ethiopian highlands, most conception in sheep and goats occurs during or following the periods of the short rains in March through May.
- Peak kidding/lambing is observed in May–June on research stations and in August under farm conditions.

Most results show that in the absence of nutritional stress, there are no periods of the year when the whole flock is experiencing animals in estrus.

- A study conducted in the central highlands (Ada District) reported that most lambing and kidding occurred during the heavy rains (August–September), indicating that most of the conception occurred during or following the small rains in March–May.

INBREEDING

When any two animals are related by blood (i.e. siblings, cousins, etc) are mated this is called inbreeding.

- Inbreeding should be avoided as much as possible. Inbreeding results in weak offspring, decreased productivity e.g. milk, birth defects, and even death.
- Bucks should be rotated or moved from their stations after one and half years.
- Farmers should keep good records to help know which animals are related and which ones are not.

REPRODUCTIVE FAILURES

The cause of reproductive failures is varied and often poorly understood. Individuals or entire flocks can be affected with acute or chronic problems that can have catastrophic consequences for livestock producers. Depression of reproductive performance can be broadly classified into:

- Failure to mate
- Failure of fertilization in mated animals
- Loss during any stage of gestation (embryonic, fetal losses)
- Neonatal mortality and subsequent loss occurring until the time of weaning

The greatest economic losses occur with late gestation, abortions and neonatal mortalities or pre-weaning deaths.

Reproductive failure can also result from structural defects or functional disorders affecting the genital tract. In males, the following could easily be detected:

- Testicular hypoplasia: This is characterized by undersized testicles and very low semen production. It can be diagnosed by semen, testicular palpation and a high return rate to estrus of females mated to that particular male. This commonly occurs in animals that are actually intersexes
- Crypt-orchidism: This is a failure of one or both testicles to descend from the abdominal cavity into the scrotum. Crypt-orchidism can be unilateral (failure of one testicle to descend) or bilateral

HERD RATIOS: RAM-TO-EWE / BUCK-TO-DOE RATIOS

Maintaining the correct ratio of fertile rams/bucks and ewes/does is important as it can affect the overall reproductive efficiency. In a year-round mating system, the following ratios are recommended:

- One ram/buck to 20–25 ewes/does OR
- Three per 100 ewes/does

The age of the breeding ram/buck, the length of the mating season and the environment in which the animals are kept may influence the ratio.

GESTATION

Gestation is the period from fertilization to delivery of the fetus. The average duration of gestation periods in ewes and does is constant. To some extent, the gestation period is influenced by:

- **Age of the doe:** younger ewes and does have shorter gestation than older ones
- **Litter size:** does 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

PARTURITION (BIRTHING)

Parturition is the birth of young goats and sheep, kids and lambs respectively. The gestation period is 5 months for goats and 6 months for sheep. During this time, female animals should have adequate nutrition including water so as not to cause harm to the fetus and to make sure the mother has the best health possible in preparation for delivery and lactation.

Preparation for kidding or lambing

There are three very important rules for kidding/lambing:

- **Rule 1:** Ensure the kidding doe or lambing ewe is put in a dry clean and quiet place at the time of kidding or lambing
- **Rule 2:** The kidding/lambing place should be under a shelter (in the house) or shade. This is to protect the kid/lamb from too much sun
- **Rule 3:** The doe/ewe must have water as soon as she has given birth so she can make sure she has enough to balance the loss of water from giving birth and to have enough milk to feed the newborn.

Animals ready to delivery are to be kept where you can see what is happening easily and often.

Stages of parturition

Parturition is traditionally divided into three stages. These are outlined in **Error! Reference source not found.**

Signs of parturition

Does commonly display the following signs that they are close to birthing their offspring. **Error! Reference source not found.** to the right above shows a female goat exhibiting signs she will delivery her offspring soon.

- Restlessness of the doe/ewe
- Doe/ewe seeks a quiet place away from other flock
- Udder is enlarged, full and firm
- Muscles either side of tail will become sunken and on either side of tail a hollow appears
- Often stand or lie down and stretch her neck pointing her head skyward.
- Enlarged vulva; will have a clear discharge from the vulva



Figure 1: Female goat preparing to birth offspring

Parturition process

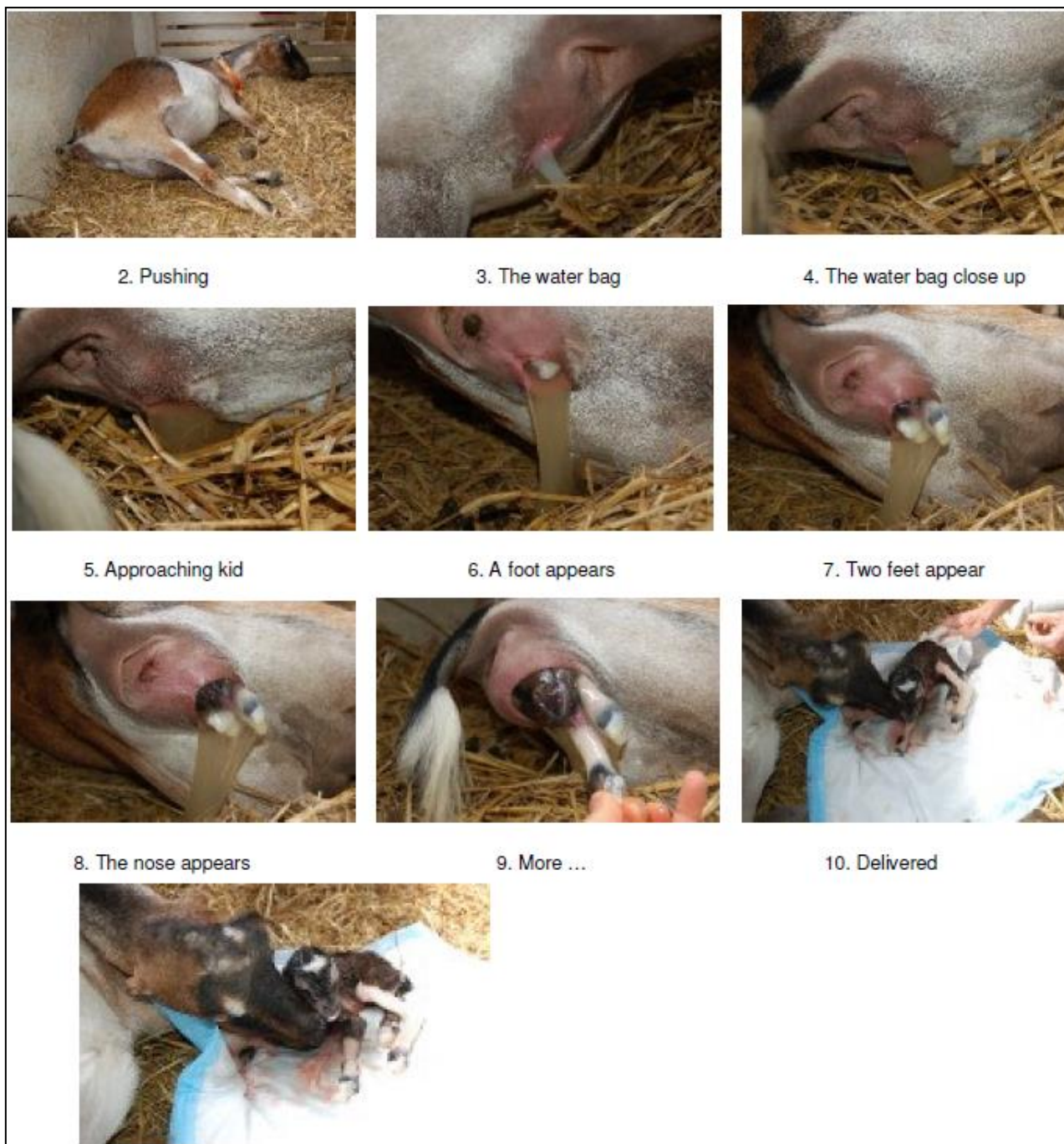
The three stages of partition are detailed on Table 2 below. Figure 2 (next page) displays, step-by-step, the birthing process.

Although female goats and sheep have been birthing their offspring for thousands of years, there are several steps the farmer can take to ease the process for the doe/ewe and increase the survival rate of the newborn kids/lambs.

Table 2: Three stages of birth in does and ewes

Stage One	Stage Two	Stage Three
<ul style="list-style-type: none"> ▪ Occurs immediately before lambing/kidding. It can last up to 12 hours. ▪ The doe/ewe isolates itself from the flock, seeking a solitary place; ▪ Doe/ewe will become restless and uneasy; ▪ She will paw and scrape the ground with her hooves. She 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 ▪ She may wander about 	<ul style="list-style-type: none"> ▪ Typically faster and lasts approximately 30–45 minutes. ▪ Stage Two 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 full delivery of the lamb/kid. In case of multiple births Stage Two is not complete until all lambs/kids are delivered. ▪ Once the lamb/kid is delivered, the doe will lick off the membrane covering of the newborn(s). This uncovers the mouth and nose and stimulates breathing. 	<ul style="list-style-type: none"> ▪ Involves release/delivery of the placenta normally within 4 hours, and ▪ Gradual reduction of the size of the uterus.

- Keep the kid in a cool dry place away from too much heat and draught
- Disinfect the navel of the kids/lambs immediately using a disinfectant e.g. Dettol® or tincture of iodine
- Ensure kid/lambs suckle colostrums within 20-30 minutes after being born
- Stimulate mother-kid/lamb bond by encouraging mother to lick the offspring
- In case of breathing problems, help by tickling the tongue, and removing all mucus from the nostrils

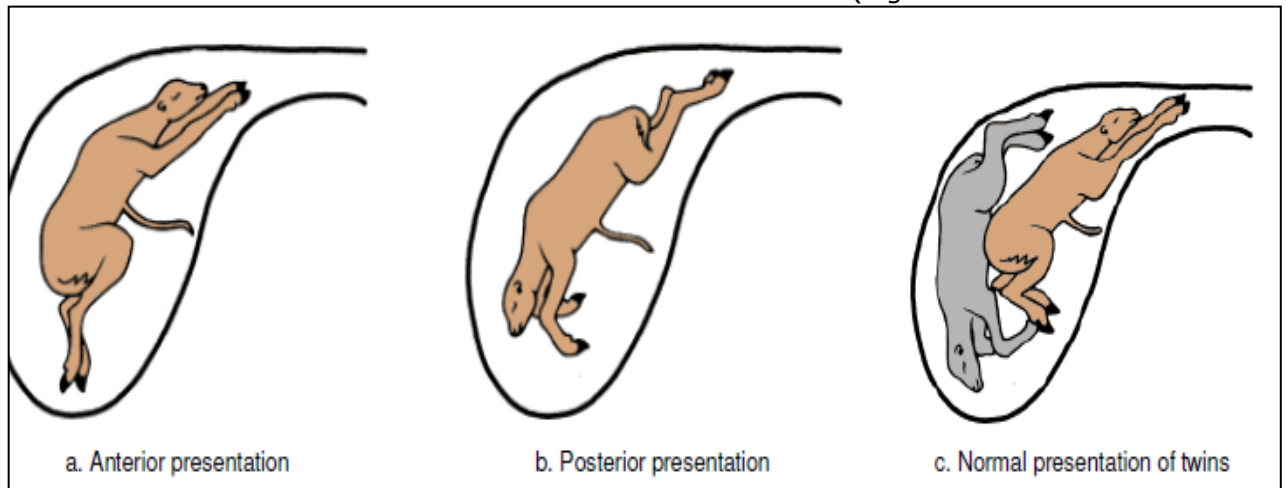


Providing assistance during parturition

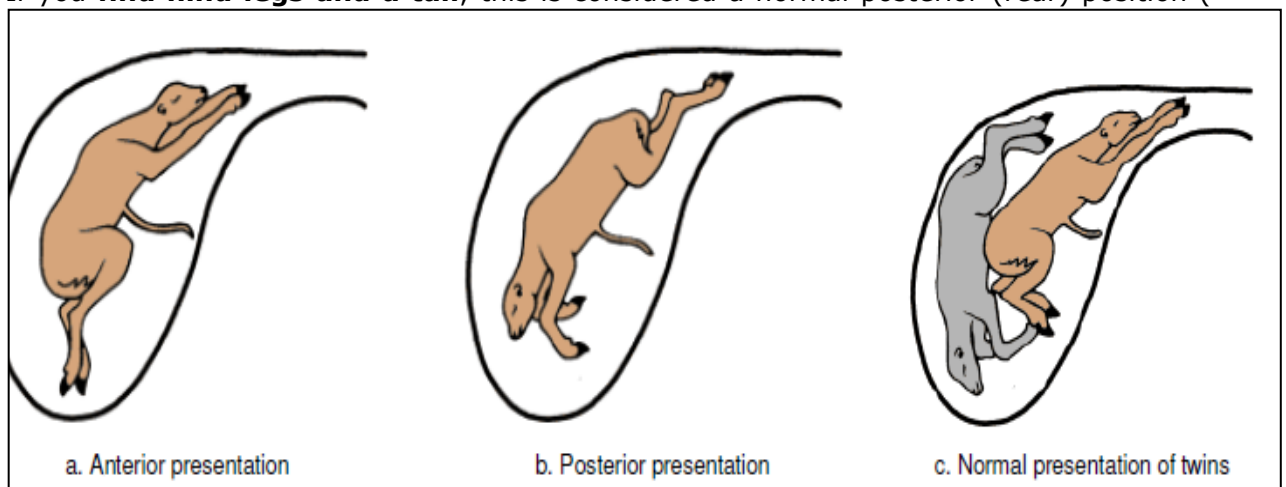
In a majority of cases, ewes and does give birth normally without assistance. However, a few may need help, especially first-time mothers. Whenever assistance is required follow the below mentioned steps:

- Hygiene, lubrication and care are most important when assisting ewes/does during parturition.
- Prepare a bucket of clean, warm water with soap. Have available disinfectant, a good lubricant such as Vaseline, and towels or clean cloths.

- Wash your hands and arms and wash the vulva and surrounding area of the ewe /doe.
- Wear latex gloves if available. There are some diseases that can pass to humans from assisting in birth.
- Apply a good lubricant and insert your hand into the reproductive tract to determine the position of the lamb/kid.
- If it is a **normal birth** (Figure 2 and



- Figure 3a), both front legs (hooves pointed up) and the head will begin to appear. In this situation, you can lightly pull on the legs when you feel the ewe/nanny push. Otherwise unless you see obvious signs of distress (ewe/nanny not pushing), it is best to let the mother complete the task on her own.
- If you **feel the legs but no head** (Figure 4b), the lamb needs to be pushed in slightly, and the head found and pulled towards the birth canal before the lamb/kid can be delivered.
- If the **head is coming but one or both of the front legs are missing**, the lamb/kid will need to be pushed in slightly (Figure 4a) and the missing limbs retrieved and gently pulled towards the birth canal. It is important to take special care and cover the hooves with your hand (i.e. hold in your palm or inside your hand) to prevent tearing of the uterine wall. Once in normal birth position, the rest of the process should proceed smoothly.
- If you **find hind legs and a tail**, this is considered a normal posterior (rear) position (



- Figure 3b), although more stressful for the ewe/doe than the normal anterior (front) position. There is a possibility that the lamb/kid will take in birth fluids so it is important to check the breathing of the newborn immediately after delivery.

- You may also come along a **breech** delivery (Figure 4c). You know it is a breech when you **feel a tail but no legs**. The lamb must be slightly pushed in and each rear leg needs to be retrieved one at a time with a lubricated hand.
- As soon as the lamb/kid is born, remove all placental membranes and mucous from the nose so that the young can breathe. The newborn can be gently swung from its hind legs to clear out mucous from the lungs and air passages.

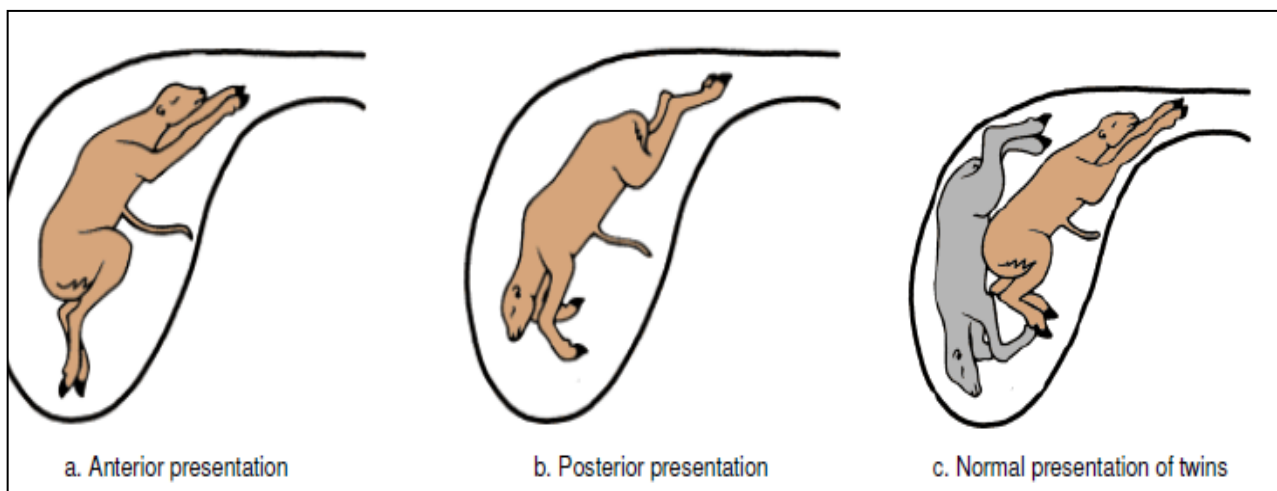
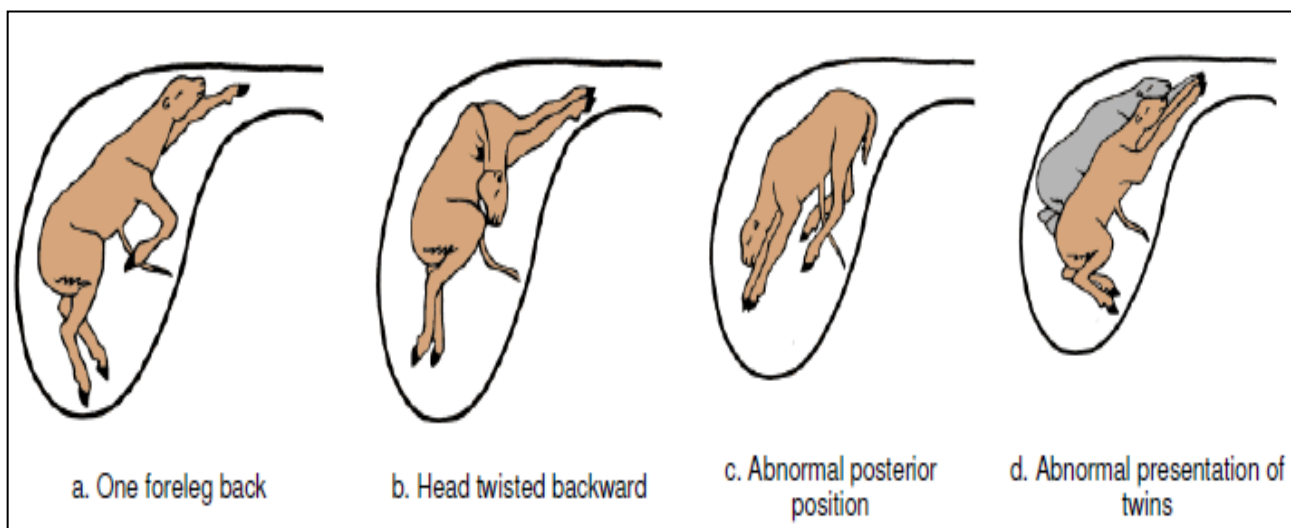


Figure 3: Normal Presentations during birthing

Figure 4: Abnormal presentations during birthing



CHAPTER THREE: SHEEP AND GOAT MANAGEMENT

CARE AND MANAGEMENT OF NURSING/LACTATING EWES AND DOES

Nursing ewes and does, especially those nursing twins or triplets, need special attention. Lactating animals and those recovering from giving birth need to be fed sufficient quantities of hay and concentrate (if available) to meet the high nutritional and energy requirements during early lactation.

The quality of feed offered and particularly that of the roughage is important. There is also a need to provide plenty of clean, fresh drinking water. Lactating ewes and does require double the amount of water as non-lactating animals.



Figure 5: Udders damaged by disease or natural birth defects

MANAGEMENT OF NEWBORN ANIMALS (LAMBS AND KIDS)

The management of lambs/kids starts before birth. Proper feeding and care of the does during the last trimester of gestation is necessary to have healthy, vigorous offspring.

- Lambs/kids with birth weight within the normal range for the breed can be raised without much difficulty
- Lambs/kids with low birth weight or are weak at birth need special follow-up, feed and shelter

Immediately after birth, the umbilical cord should be trimmed if needed using clean scissors and then dipped in tincture of iodine; the recommended concentration is 7% tincture of iodine. As much as possible, protect newborn lambs/kids from cold, rain and wind.

Mothering instinct in primiparous mothers (first kidders/lambers) often needs some time to fully develop. Do not handle lambs/kids too frequently immediately after birth and let the does lick and recognize them properly. In order to ensure the establishment of firm doe-offspring relationships, the does and their offspring should be confined together soon after birth or stay around the homestead for at least 4 days.

- If the lamb/kid is not licked dry or is born in a wet/windy place or does not consume colostrum immediately, it will develop hypothermia (very low body temperature), especially if small in size (triplet, premature, mother malnourished)
- If the lamb/kid is shivering or has a cool mouth and extremities and is not suckling, dry the lamb/kid with a cloth. The lamb/kid may need to be warmed with a heat source or with a hot water bath or warming box, particularly if body temperature is cool.
- If only one of a twin birth needs to be removed for feeding or warming, it is best to remove both offspring. If one is left, there is the risk that the doe will not accept the treated one when it is returned

If lambs appear thin and weak, check the ewe to see if she is milking. Check for mastitis in the teats, whether the teats are open, and/or if she has claimed the lamb. Hand feed the lamb with colostrum or milk replacer (if available) if any one of these problems is observed.

Colostrum

Intake of colostrum, the "first milk", is crucial for successful rearing of lambs/kids. What is special about colostrum?

- Colostrum contains a high level of nutrients important for lamb health and performance.
- Colostrum also contains a high level of antibodies against a variety of infectious agents.

At birth, the lamb/kid does not carry any antibodies because antibodies in the ewe's bloodstream do not cross the placenta.

- Colostrum strengthen disease defense mechanism. It has to be fed during the first 24 hours; feeding colostrum later than this period offers little or no advantage. This is because the intestinal wall of the newborn is only permeable to antibodies (large protein molecules) during the first 24 to 36 hours and absorption is most efficient during this period.
- If the ewe/doe has inadequate colostrum, cow colostrum can be given.

Normally, the newborn stands and suckles within 30 minutes of birth. If you do not see the newborn standing after an hour, it is wise to assist the newborn to stand and nurse so they can get the colostrum.

Growth of the young, particularly during the first weeks of life, is entirely dependent on milk of their mothers. For this reason, it is important to ensure that does produce adequate milk.

- The health and structure of the udder should be examined. Faulty udders may mean insufficient milk production for adequate lamb/kid growth (See Figure 5).

Newborn lambs/kids are pre-ruminant animals in the early stage of development.

- It will take usually 6–8 weeks for the rumen to develop.
- When concentrate feed or hay is offered, consumption starts at about 2–3 weeks of age.

Access to palatable and digestible roughage feed or concentrate is essential as it stimulates early development of the rumen.

- It is recommended that forage be chopped and given to kids, and when possible concentrate feed should be offered but not in a dry form.

Figure 6: A women practicing milk bottle- feeding of kids



CARE OF ORPHANS

In cases where a newborn loses or is rejected by their mother, try to foster orphans to docile does/ewe for nursing (grafting). If this is not an option, expressed milk or commercial milk replacer can be fed by a bottle. Alternatively, sweet potatoes vines can be used to feed orphan animals.

Grafting orphan lambs/kids

Grafting is defined as giving a lamb/kid to another ewe/doe. In cases of twins, always graft the stronger lamb, as the problem ewe/doe will normally take care of the smaller one. An experienced mother will accept a newborn covered with birth fluids immediately after

delivering her own lambs/kids. If lambs/kids aren't being cared for by their mother or are not receiving an adequate amount of milk, they may become orphan lambs. The sooner this is detected the higher the chance of survival.

Techniques to facilitate grafting include:

- Bathe the grafter in amniotic fluid from the new mother (if available).
- A wooden stanchion (or head/neck press) to hold the ewe/doe in place while the orphan nurses may result in adoption in 7–10 days.
- If an orphan is older, tying its legs together so it appears helpless may help.
- If all this fails, the lambs/kids will have to be raised artificially: Feed cow's milk. If they are newborns, they need to be fed frequently, i.e., 5–6 times daily
- After the lambs/kids are 10–12 days of age, they may be fed only 3–4 times per day and offered creep feed.

MANAGING KID/LAMB MORTALITY

What cause kid/lamb death?

Mortality of lambs and kids is one of the main factors adversely affecting sheep and goat production. Losses are usually as high as 50% of the lamb/kid crop. An essential factor affecting return on investment in sheep and goat production is pre-weaning mortality.

- The highest losses usually occur during the first 30 days of life.

Causes of mortality are related to management and production system. Some of the reasons for death of newborn and young animals include:

- Low birth weight
- Low environmental temperature at birth or shortly
- Litter type (single or multiple)
- Diseases and accident
- Season of birth
- Inadequate colostrum consumption
- Inadequate milk production of the doe
- Predators

How to reduce kid/lamb mortality?

Reducing kid mortality focuses on two key issues:

- Improving birth weight of newborns by supplementary feeding of pregnant animals during the third trimester of pregnancy
- Following standard hygienic practices to prevent/reduce incidence of diseases that affect young animals

MANAGING YOUNG GOATS AND SHEEP

Tail docking

Tail docking is not a common practice in Ethiopia except in some parts of the country, e.g., Gojjam and some parts of Arsi, and it is normally done for ewe lambs only. Steps to tail docking are:

- A Burdizzo (Figure 7) instrument is used to crush the tail between the vertebrate joints before 2 days of age.
- The tail is then cut off with a knife

- Spraying the wound with antiseptic powder is recommended to prevent infection

Although castration and tail docking can be used as management tools, some communities do not accept meat from docked or castrated sheep or goats. For instance, the Muslim Festival of Sacrifice requires unblemished lambs. An unblemished lamb is one that has not been docked, castrated, or had its horns removed. Note that a sheep's tail has a purpose. It protects the sheep's anus, vulva, and udder from weather extremes. Because of this, care should be taken while docking. Tails must be left long enough to cover the ewe's vulva and the ram's anus. Docking has the following purposes:

- Even distribution of fat on the carcass
- Easier ewe mating/breeding
- Prevention of fecal matter from accumulating on the tail and hindquarters of sheep and lambs
- Reduced fly strike (wool maggots)

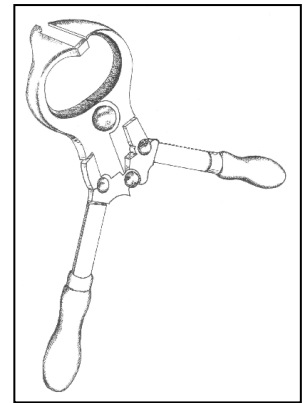


Figure 7: Burdizzo instrument for tail docking and/or castration of livestock

Castration

In most cases, non-breeding males and males not slaughtered at a young age need to be castrated. Castration is done to control mating by preventing inbreeding and inferior males from breeding, or for production of fattened carcass. Male goats that will not be bred should be castrated early in life (in the first 2 months) and kept for meat. The main effect of castration is on the composition of the carcass and weight development. In general, the following effects are noted:

- Carcasses from castrated sheep/goats have more fat tissue
- Castration could retard growth and reduce the quantity of lean meat if done late (after 6 months)
- In the case of goats, meat from castrated males has no 'goaty smell' as does the meat from entire bucks

Weaning

The weaning period is the time when lambs/kids stop feeding on liquid milk or milk replacer. Decline of maternal antibodies and the stress of weaning appears to predispose kids to respiratory infection. Retardation of growth commonly known as 'weaning shock' is common following weaning but every effort should be made to reduce it as excessive retardation might not be compensated for at later stages.

- Weaning typically takes place between 4-6 months of age. Although age is a good indicator of weaning times, body weight is the best indicator.
- Young can be weaned successfully once the birth weight has increased 2.5 times.
- After weaning, lambs/kids depend entirely on dry feed. This change must be gradual to avoid losses due to faulty feeding management. Let kids try hay and

Enterotoxaemia is caused by two strains of bacteria called *Clostridium perfringens* – the strains are termed types C and D.

These bacteria are normally found in low numbers in the gastrointestinal tract of all sheep and goats; "laying low" in the small and large intestine – that is, they are present in relatively low numbers.

The change that triggers disease is often an increase in the amount of grain, protein supplement, milk or milk replacer (for lambs and kids), and/or grass that the sheep or goat is ingesting. These feeds are rich in starch, sugar, and/or protein.

When unusually high levels of these nutrients reach the intestine, *Clostridium perfringens* undergoes explosive growth. As the organism grows in number, it releases very potent toxins (bacterial poisons) that cause damage to the intestine as well as numerous other organs. This can result in fatalities, particularly in the non-vaccinated animal or in the newborn lamb or kid whose dam has not been vaccinated.

grains early in life to strengthen their stomachs.

- When kids/lambs start eating fodder they will suffer high worm infection so they need to be dewormed after exposure.
- When given concentrates kids are likely to suffer Enterotoxiemia (see Textbox to right) so you will need to vaccinate against these diseases.
- Do not stop feeding milk suddenly but this should be gradual to avoid indigestion or bloat.

MANAGING MILKING/DAIRY SHEEP AND GOATS

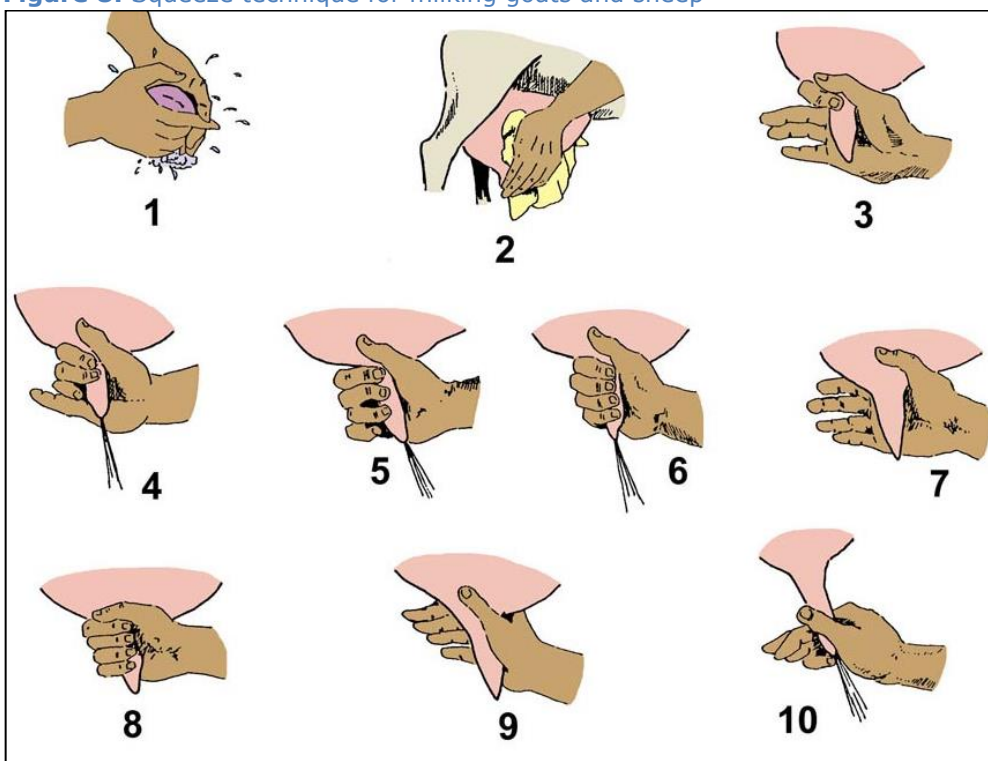
Hand milking

The majority of smallholder farmers across Ethiopia milk their animals (goats, sheep, cattle, camel) by hand. Good milking is done by the squeeze method. This technique mimics the nursing technique used by young animals and, if done correctly, can hygienically express the majority of the milk. Avoid the pulling technique as it hurts the udder and the teat and udder will get a mastitis infection

Milking technique - squeeze

- 1) Wash hands and teats/udder with clean water. (Figure 8, 1 & 2)
- 2) Take hold and squeeze the base of the teat with the thumb and forefinger to trap the milk in the teat. (Figure 8, 3)
- 3) Close the other three fingers in a downwards motion with the topmost finger grasping around the teat followed by the second and then the third. (Figure 8, 4 - 6)
- 4) The milk in the teats is squeezed downwards and not pulled. Squeezing slowly downward makes the milk come out.
- 5) Repeat this in a rhythm and quickly; using the full hand to avoid finger and thumb striping. (Figure 8, 7-9)
- 6) This should take about 7 minutes. So be quick so that you get as much milk as possible.

Figure 8: Squeeze technique for milking goats and sheep



Precautions

To ensure the best quality milk possible the following practices are recommended:

- Always house/pen the doe and the serving buck in different pens to prevent smell in the milk
- Make the milking premises far from the buck pen
- Wind direction should be from milking premises to the male pen and not vice versa
- Wash milk equipment with hot water rinse and dry on a rack immediately after milking
- Avoid giving feeds with strong smells just before milking and during milking e.g. silage, pineapple, waste etc to avoid tainting the milk
- Use of sprays/oils/soaps with smell by milker will taint the milk

In addition to good milk hygiene, these recommended practices will keep your does and ewes healthy and highly productive:

- Always be calm, friendly to the doe/ewe and milk at the same time every day
- Maintain similar milking position (back position or side position)
- If possible same person should milk always
- The nails on the hand of the milker should be short
- Measure and record your milk immediately
- The hair on the flanks and around the udder should be trimmed regularly and the goat brushed occasionally

After milking

Irregular milking can lead to low yields and increased chance of mastitis. It is important to keep a consistent twice-daily milking schedule. To prevent mastitis, full draining of the teat is recommended.

- The kid should be allowed to suck the milked teat after milking for proper emptying of teat canal

After milking use a teat dip containing a suitable antiseptic e.g. tincture of iodine

Mastitis

Mastitis, or a bacterial infection of the teats and udder, is a common but completely avoidable problem. It causes great pain to the animal, makes the milk un-consumable, and, if not treated, can lead to serious illness or death.

- Mastitis can reduce yields by at least 10%

Mastitis prevention and control best practices include:

- Goats or sheep with mastitis should be milked last to prevent the spread of the infection to other goats
- Treatment of sick animals with antibiotics
- Isolation of milking sheep or goat with mastitis
- Milk from sick dairy goat or sheep, especially breeding sheep and goat with mastitis should not be sold but be discarded

Stopping lactation (Drying off)

On average, a lactating sheep and goat will produce milk for 90-150 days respectively. The animals breed, age and nutritional status will greatly affect the length of the lactation period. For optimal animal health and best performance in the next lactation, lactating animals should have an opportunity to rest and regenerate mammary tissue between lactations.

- Animals should be dry for 45 to 60 days. This is sufficient time to rest and regenerate mammary tissue. If animals have prolonged dry periods, they run the risk of becoming obese, experiencing obesity-related diseases and having difficulty birthing.
- If a doe or ewe has been served and is pregnant – a 'drying off' period is recommended during the 4th and 5th month of goat's pregnancy and 5th and 6th month of sheep pregnancy as the embryo's gains weight rapidly.

Recommendations for drying-off are:

- Preparation for dry off should begin at least two weeks prior to the dry-off date with a significant change in the animal's diet. Slowly reducing the energy content of the diet and feeding primarily a high-fiber diet will reduce the nutrients available for the animal to make milk; this is often all that is needed to reduce milk production to a level that makes dry off safe and simple.
- Abrupt dry-off: After animals have been on a high fiber, low energy diet for about two weeks, their udder should be assessed for level of continued milk production and mammary health. If all seems well, abrupt dry off should be implemented. This means the animal is milked (by a human or its offspring) a final time, then not again until the next birth and lactation.
- Gradual dry-off: The doe or ewe is dried gradually i.e. milking is done normally but the amount milked at every subsequent milking is reduced gradually until finally one stops. This prevents development of milk clots.
- During this period, does and ewes should be housed alone to avoid disturbance by the other flock.

KEEPING MILK CLEAN

Clean milk production is crucial for the safety and health of both the milking animals and the human consumers of the milk. Producing clean milk means clean animals, a clean milking area, and clean milkers.

Clean sheep/goats

- Before milking the udder should be washed with clean water which has disinfectant added to it
- Use two cloths alternatively for washing the udders. Leave one in the disinfectant whilst the other is in use.
- The first drop of milk from each teat should be thrown away as it has a very high bacteria count

Clean milking area & equipment

- The milking shed should be cleaned after each milking and disinfected

Clean milkers

- The most important thing to do is keep yourself clean.
- People who are ill should not milk.
- Before starting milking, the milker should wash his/her hands, arms with soap and hot water, or disinfectant
- Keep finger nails cut and clean

Figure 9: Washing hands with soap and clean water before and after milking



Record keeping

Why keep records?

Farmers around the world are encouraged to keep records. Often it is not understood why a farmer should keep records and what records they should keep. The advantages to record keeping include:

- Helps you to know your goats
- Recording increases animal values and therefore sales income
- Recording promotes increased milk yields
- Recording promotes improved genetic merit
- Helps you to manage your animals well

Which records to keep?

A farmer should keep simple records of

- Birth dates
- Birth weights
- Sire and doe
- Milk records
- Treatment records
- Service dates
- Good record on service date will help you calculate the expected date of birth.
 - You can know the expected date by counting 5 months and 6 months from the date of service and take off three days for goat and sheep date of birth respectively.

CULLING

Culling, or selectively removing and slaughtering members of the herd, 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, the following management practices are highly recommended:

- It is essential to intensively cull ewes/does after 5–6 years of age. This strengthens the overall reproductive health and growth potential of the herd.
- It is important to detect barren ewes or does in the flock. Because they do not contribute to the herd, these animals should be sold or culled.
- 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

CHAPTER FOUR: HOUSING FOR SHEEP AND GOATS

Importance of building sheep and goat house:

- Animals do not get sick very often
- You can make sure that only the animals you want to breed do so
- Make it very easy to feed
- Stop wasting feed
- Save the sheep and goats wasting energy and increase the amount of milk you get
- Keep goat's feet dry and clean all the time

HOUSING SITE SELECTION

Due consideration should be given to the following points in site selection for a sheep and goat house

- **Drainage:** The area should be slightly sloped for effective drainage

- **Wind direction:**

Animal houses should be partially or totally protected from the direction of strong wind depending on the wind intensity of the area.

- **Climatic factors:**

Such as temperature and rainfall

- **Environmental**

- **factors:** Livestock housing should not be placed within 10 meters of springs, rivers/streams or other water bodies.

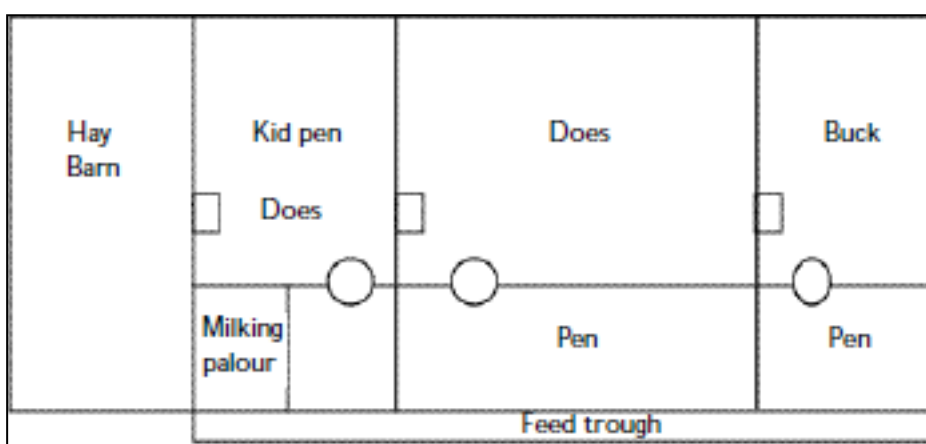


Figure 10: Sample floor plan for improved multi-animal housing

HOUSING DESIGN

Having an appropriate design for sheep and goat housing is crucial prior to beginning construction. Housing design should be practical, cost saving, and protect the health of both animals and people. Key design features include; the floor plan, floor construction, wall construction, roofing, and other additional facilities

Floor plan

Housing for goats and sheep should be practical, easy to build, and protect the health of the animals. Multiple pens can easily be put under one roof. Pens should have easy access to the outside, a place for water and feed, and be easy to clean. Figure 10 outlines a simple design that gives young animals access to their mothers, and has easy access for feeding and waste removal.

Floor design is particularly important in wet climates, where dung and urine on a damp floor make ideal conditions for the multiplication of disease-causing organisms. In particular, kids and lambs are very susceptible to pneumonia and it is wise to avoid damp and poorly ventilated houses. Specific floor plan recommendations are:

- House should be raised 50 cm (or just below knee height) from the ground
- Ventilation is good and dung and urine drop through the floor, preventing build-up and reducing risk of disease spreading

Table 1: Size requirements based on production system

Type of Housing	Space (m ² /animal)			
	Breeding Female	Breeding Male	Young Stock	Additional
Permanent confinement (zero-grazing)	1.2	2.0	0.8	Exercise yard, feed racks, watering trough
Night housing with day-time grazing	0.8	1.5	0.5	

- Where slatted floors cannot be constructed and concrete or earthen floors are used, it is important to control temperature of the floor and avoid muddiness
 - In such cases, bedding materials may be used. Straw or wood shavings or any material that can absorb moisture can be used for this purpose

Floor construction

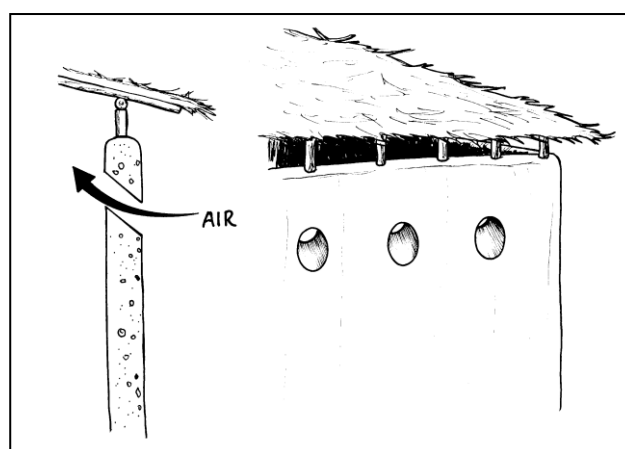
- The floor should be sloped, porous or slatted for water drainage. A minimum floor slope of 5% is recommended; that is, for every 1 m there should be a fall of 5 cm
- Houses with raised, slatted floors have a number of advantages including keeping the floor clean and dry
- The spaces between slats need to be big enough to allow manure to drop easily, but small enough to prevent feet from passing through.
 - A spacing of 1.5 cm is optimal for adult sheep (slightly narrower for goats). For young lambs, 1.3 cm is enough
- Floors may be made from stones or bricks. With all floors, ease of manure removal and disposal should be given attention

Roof construction

The roof is important as it protects animals against the sun and rain. The under-surface of the roof should remain cool and watertight. To ensure adequate ventilation, the height of the roof and the design should be considered.

- A high roof encourages air movement but is more likely to be damaged by strong winds
 - In some cases a design with a chimney or roof vent could be useful to assist ventilation and remove ammonia that could easily accumulate
 - Figure 11 outlines one roof/wall design that encourages the continuous flow of air.
- The following materials are used for roof construction in different locations:
 - Iron sheet
 - Grass/bushes
 - Wood
 - Stone/brick
 - Earth
 - The majority of houses have roofing made of grass/bushes

Figure 11: Roof and wall design that encourages good ventilation



Wall construction

In rural areas, animal housing is commonly built with woven plant materials or the same mud/wattle human housing is constructed from. These styles are not undesirable as long as they provide appropriate ventilation to remove heat, moisture and pollutants so that animals stay cool, dry and clean. Some points to consider before building your animal shelter:

- Outer walls protect the animals from external influences while separation walls within the house prevent mixing among the animals.
- Attention needs to be given to construction of pens within the house. Pens serve as a means of controlling animals and for management purposes, such as controlling breeding.
- Areas for lambing/kidding and isolation of sick animals should be included.

ADDITIONAL FACILITIES

Feed trough

Feeding animals on the ground in a confined space encourages disease transmission and feed waste. Fodder should not be put on the ground for sheep and goats. Instead a feeding rack should be included in the pen. Different feeding rack/trough styles are shown in Figure 14.

- Feeding rack for forage/fodder (Figure 12): One meter (3 feet) above the platform with a width of 30 cm and a depth of 15 cm
 - Approximately 30 to 40 cm per animal space is the minimum
- Wooden troughs can be created from construction rafters or logs. (Figure 14)
- Metal troughs can be made from sheet metal or a half-cut barrel (Figure 14)

Water troughs

Confined goats and sheep should be offered clean water daily. Most smallholder farmers will carry water to their animals (if confined) 2-3 times per day or trek the animals to a water source twice daily.

Lactating animals have the highest water needs of any animal. On average,

- Goats can be expected to consume 3-7 liters/animal/day and
- Sheep 3-5 liters/animal/day.

Water troughs can be made from a variety of supplies. Watertight tins, buckets or bowls can be adequate.

- Any type of watering trough used should be easy to clean and ideally lifted off the floor to prevent spillage and contamination with feed or fecal matter (Figure 13).
 - Water troughs can be placed 1 foot above the floor in the feeding area, or
 - Hung in a 5 liter tin on the door/wall



Figure 14: Locally made feeding troughs

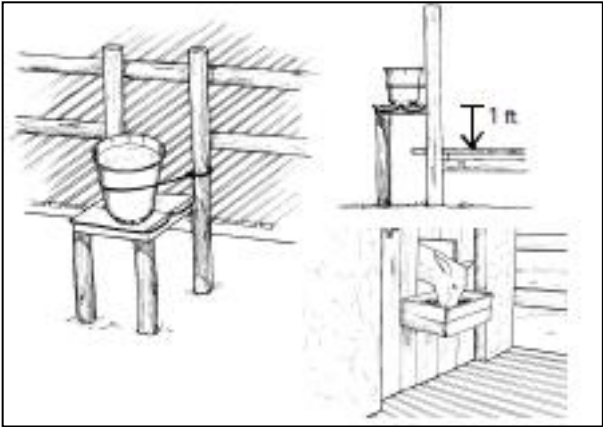


Figure 13: Placement for elevated water or feeding troughs

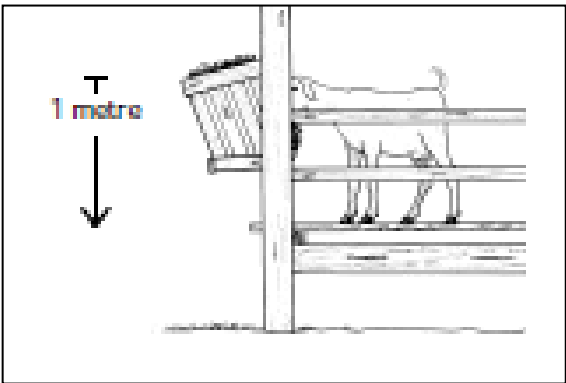


Figure 12: Height recommendation for elevated forage rack

CHAPTER FIVE: FEEDING OF SHEEP AND GOAT

SHEEP AND GOAT FEEDING HABITS

The biggest difference between sheep and goats is their foraging behavior and diet selection.

- Goats are natural browsers, preferring to eat leaves, twigs, vines, and shrubs. They are very agile and will stand on their hind legs to reach vegetation. Goats like to eat the tops of plants.
 - Goats prefer to eat feed at a height of 20–120 cm
 - Goats require a more nutritious diet.
- Sheep are grazers, preferring to eat short, tender grasses and clover. Their dietary preference is forbs and they like to graze close to the soil surface.
 - Sheep will graze for an average of seven hours per day, mostly in the hours around dawn and in the late afternoon, near sunset.
 - When supplements are fed, it is best to feed them in the middle of the day so that normal grazing patterns are not disrupted.

NUTRITIONAL REQUIREMENTS

Sheep and goats do not require specific feedstuffs. They require energy, protein, vitamins, minerals, fiber, and water.

Energy

Energy makes up the largest portion of the diet and is usually the most limiting nutrient in sheep diets. Carbohydrates, fat, and excess protein in the diet all contribute towards fulfilling the energy requirements of sheep. Carbohydrates are the major sources of energy. Concentrates (grain) contain starch, which is a rich source of energy. Forages contain fiber or cellulose, which is not as rich in energy as starch. The major sources of energy in a goat sheep's diet are pasture and browse, hay, silage, and grains.

Energy is quantified in the ration in many ways. The simplest measure is TDN or total digestible nutrients. Metabolizable energy (ME) and net energy (NE) values are more accurate measures of energy in a sheep's diet. TDN is usually used to formulate rations for breeding animals, while the net energy system is usually used to calculate diets for growing lambs.

Protein

Protein is usually the most expensive part of the diet. Since the rumen manufactures protein from amino acids, the quantity of protein is more important than the quality of protein in a goat or sheep's diet. Protein requirements are highest for young, growing kids/lambs that are building muscle and lactating does/ewes that are producing milk proteins.

Though levels vary, grains are usually low in protein. Urea is the most inexpensive source of protein or dietary nitrogen. Other sources of protein include soybean meal, sunflower meal, cottonseed meal, whole cottonseed, whole soybeans, peanut meal, canola meal, fishmeal, and alfalfa pellets. Legume hays, when they are harvested in the early to mid-bloom stage are intermediate sources of protein.

Calcium and phosphorus

Calcium (Ca) and phosphorus (P) are interrelated in the development and maintenance of the skeleton. Deficiencies may result in rickets. An imbalance of Ca and P in the diet can cause urinary calculi in male animals. The calcium in most forages is usually adequate to meet the needs of sheep/goats. Deficiencies of calcium most often result when high-grain diets are fed. The ratio of calcium to phosphorus in the goat/sheep's diet should be at least 2:1.

Vitamins

Goats and sheep require vitamins A, D, and E. Vitamin A is absent in plant material, but is synthesized from beta-carotene. Vitamin D is required to prevent rickets in young animals and

osteomalacia in older animals. B-vitamins are not required in the diets of ruminants because they are synthesized in the rumen. Vitamin K is essential for blood clotting.

Fiber

Fiber adds bulk to the diet and keeps the sheep's rumen functioning properly by increases rumination and salivation.

Water

Water participates in nearly all body functions and is the most important "nutrient," though oftentimes the most neglected aspect of feeding goat or sheep. A goat or sheep will consume anywhere from 3-12 liters of water per day, depending upon its physiological state and the environmental conditions.

WHAT DO SHEEP AND GOAT LIKE TO EAT?

Both goats and sheep are selective eaters. Although their diets are diverse, they are specific in their choice of plants and parts of plants.

- Both species like diversity in their diets and will become bored if they have the same thing to eat every day – this is especially true for confined or semi-confined animals.

Because both species are selective in what they eat, they will eat their preferred plants and parts of plants first – making them very wasteful eaters.

- For example, when given un-chopped feeds like Napier grass goats will eat the leaves only and waste the stem.

Goats and sheep are also clean feeders – they will not eat feeds that are not fresh, have been trampled on, or are somehow viewed as 'dirty'. (e.g. grass with mud splash from rain)

- Goats and sheep prefer not to eat sticky, moldy or wet dusty feeds.

Sheep preferences:

- Mostly sheep eat grass, clover, forbs, and other pasture plants. They especially love forbs. It is usually their first choice of food in a pasture. A forbe is a broad-leaf plant other than grass. It is a flowering plant. Forbs are often very nutritious. As compared to cattle, sheep eat a greater variety of plants and select a more nutritious diet, but less so than goats.

Goat preferences:

- The goat has very sensitive lips and their natural curiosity gives them a habit of "mouthing" and "smelling" for food that is clean and tasty.

FEEDING BEST PRACTICES

Given the behaviors and nutritional requirements of goats and sheep. We recommend the following Best Practices for feeding goats and sheep.

- Feed only clean, fresh and dry fodder that does not have mold, excessive dust/dirt.
 - Dusty feeds and concentrates should be wetted a little
 - If you use molasses to make feed taste better do not use too much it will make feed stick
 - Chop/Cut forages to prevent waste
- Always have fresh water for sheep and goats to drink at any time.
- Provide a Mineral Lick [block] always to all goats Clean the feeding trough and water bucket every day.
- Provide a diverse diet of feeds such as grasses and legumes, tree leaves and fresh kitchen remains.
 - Mix feeds with grass hay, straw or Napier to balance

- Only 1/3 of the days feed can be leucenea. Do not feed too much leucenea, it can poison the goats
- Do not feed too much leguminous feed such as desmodium
- For confined animals, feed sheep and goats at least 3 times a day and at the same time every day.
- Leave some feed in the feed trough or rack or hanging to be eaten overnight. If it is placed directly on the ground, there is a chance the feed will be wasted because the animals have trampled on it and/or soiled it.

NEED-BASED FEEDING PRACTICES

As was discussed above, sheep and goats have different preferences and dietary needs. However, even within one species, the dietary needs of individual animals will be influenced by weather conditions, the animal's age, reproductive and health status. Below we provide general suggestions on meeting the nutritional needs of individual animals:

Feeding sick sheep and goats

- Small, weak, young and sick sheep and goats should be fed separately so they do not compete for feed or become stressed while feeding.
- In general, limit the amount of stress sick/weak animals experience. If completely separating them from the flock causes increased stress, try to confine them in close proximity of other animals or confine their 'friends' along with them.

Water: A dehydrated goat or sheep is an almost dead goat or sheep. Adult or kid/lamb, a goat/sheep cannot survive long without adequate fluid levels in its body. Nearly every illness or injury to a goat/sheep involves some level of dehydration.

- Thus it is extremely important to make available fresh and clean water to any sick animal. Ideally, ORS will also be given to keep the animals electrolyte balance correct.

Goats: A goat standing off by itself is either a doe getting ready to kid or a sick goat. Goats are herd animals. They hate being alone.

- When a goat is ill, its body diverts blood to organs essential for survival, such as the heart, kidneys, and lungs. Thus, a goat that can't hold its head up also cannot digest solid food in its stomach.

Sheep: Like goats, or many sick animals, a sick sheep is likely to be standing off to the side away from other animals. Other characteristics of a sick animal include:

- An animal not able to keep up with the flock when you are moving
- An animal not eating when the rest are, sick animals will go off feed Standing with head down and ears drooped even as you approach
- Breathing sounds out of ordinary, rasping or shallow

Sick animals should be given extra amounts and higher quality forages to give them the extra energy and nutrients to recover.

- **Sheep and Goats:** Feed green leaves, when available, are the best food source that the sheep and goat can be offered. Green leaves on freshly cut branches are the sheep's and goat's natural food and are more easily digested than anything else is.
 - Do not provide processed grains such as sacked feed or cracked/shelled maize; the sick goat will not be able to digest them properly and recovery will be delayed.

Feeding mature sheep and goats

Feeding of mature non-lactating or breeding animals should follow the basic guidelines provided above in Feeding Best Practices section. If the flock does not appear to be thriving/growing on

the current feeding routine, look at the quality and quantity of the feedstuffs being offered. It is recommended to find alternative feed sources in this situation.

Feed requirements will change depending on the season. The farmer needs to be aware of the current weather conditions and adjust the feeding and watering practices accordingly.

The most important practices for feeding mature animals is:

- Provide clean water throughout the day and night
- Fresh and clean forage is best
- Diverse feedstuffs ensure a more nutritious diet.

Feeding rams and bucks

As with any healthy mature animal, the amount and quality of feed should sufficiently meet the animal's daily requirements. For breeding males, it is best if they maintain a steady weight but do not become too fat/heavy. Below are the recommended best practices for feeding breeding rams and bucks:

- Give more feed two months before the ram or buck has to serve the does this will improve the bucks sperm and make it more active.
- When a ram or buck is being used a lot to serve ewe or does respectively, it should be separated from other sheep or goats for about 2-3 hours per day. This will allow it time to eat and rest.
- Because of their increased activity, breeding males should be offered increased amounts of clean water throughout the day/night.
- Breeding males should be able to lick a mineral lick or have access to loose minerals at any time. This will help keep balanced electrolyte levels.

Feeding breeding and lactating ewes and does

Below are feeding best practices specifically for breeding ewes and does.

- One month before mating the ewe and doe should be fed and watered very well so as she is in the best of health
 - If she is very well she is more likely to have twins or even triplets
- Concentrates should be fed to ewes and does just before the ewes and does are served by the ram and buck respectively
- Increase feed gradually for 2 months up until the ewe and doe gives birth
- Continue feeding concentrate while she is giving milk
- Mineral licks hasten coming on heat
- Always have fresh water for sheep and goats to drink at any time.

Feeding during pregnancy

The nutritional needs of pregnant females changes throughout the pregnancy. Below are some general guidelines of feeding best practices over length of the pregnancy

First 3 months of pregnancy

- Newly pregnant females can be fed as normal (Feeding Best Practices discussed above)
- Shearing, vaccinating, working ewes, pronounced changes in feeding practices should be avoided during the first 30 days of gestation.
- Ewes need only slightly above maintenance levels of nutrition for the first 15 weeks of pregnancy.

Figure 15: Young sweet potato plants. The vines (shown) are a favored food of goats.

The last two months of pregnancy

- Late gestation (last 4 to 6 weeks) is a critical period for doe/ewe reproduction. This is when the majority of fetal growth is occurring, placing increasing nutritional demands on the doe/ewe.
- Dams/Ewes consuming inadequate diets are prone to pregnancy toxemia and milk fever.
- Nutrition in late-pregnancy affects the size and vigor of kids/lambs and the milk producing ability of the doe/ewe.



During first 2 months after lamb or Kids birth and giving milk

- The sheep and goat must be well fed for milk production and maintenance of body weight.
- Mothers can be supplemented with at least 200 gm/day of dairy meal. Make this addition gradually so as not to disrupt her gastro-intestinal system.
 - It is recommended to reduce added dairy meal to 100gm/day after the 3rd month

Feeding lambs and kids

Feeding the newborn up till 3 months

- Newborn lambs and kids should suck colostrum within 24 hours. In the first 24-48 hours after being born, it is best to leave the newborn with the mother, but with some supervision, to make sure the newborn is able to nurse and receives colostrum.
- At one week, lambs and kids should be provided with small quantities of good clean feed e. g. sweet potato vines, tree legumes leaves or natural tree leaves
- Lambs and kids should continue with milk for the first three weeks
- Lambs and kids should be allowed milk with fresh mixed fodder up to 3-4 months

Feeding young stock

- Should be fed on fresh, highly nutritious mixed fodder
- Give lots of water at all times
- Mineral blocks must be given at this stage

WHAT KIND OF FEED SHOULD THE SHEEP AND GOAT BE GIVEN

- The dairy sheep and goat gives as much milk as it is given the right food!! There are many feeds the sheep and goat likes. Here are some good feeds that can be used:

Sweet potato vines

Sweet potatoes are good crop to plant because it gives tubers for the family to eat and the leaves can be fed to the sheep and goats

- Favorite food of goats
- Can be planted beside river beds, steep hillsides and steep areas along roadside edges

Useful in feeding orphaned lambs and kids.

Napier

Napier grass (*Pennisetum purpureum*) is an important carbohydrate-rich fodder grass, also known as "elephant grass"

- Napier grass is propagated easily.
- It has deep roots, so is fairly drought-resistant.
- The tender, young leaves and stems are very palatable for livestock.
- Napier grass grows very fast but it can become invasive with its extensive rhizomial root network
- Plant Napier along river beds, along soil terraces, fence/row lines, road reserves etc.
- Good Napier needs manure and top dressing with a fertilizer and needs weeding
- Cut Napier often so it is easy for the goats to eat and digest
- Where new fields are being planted mixed cropping with desmodium improves the quality of the fodder.
- Vine-like or creeping leguminous species (*Centrocema pubescens*, *Desmodium intortum*, *Vicia sativa*) can be intercropped with Napier. When harvesting, leave the plants together, chop and feed for a mixed forage meal.
- If you plant Napier around your maize it stops Maize stalk borer!
- Where a farmer has a big shamba then plant as one crop near the home to save time and work when taking to the goats



Figure 16: Napier grass being grown with leguminous plants (mucuna) for better animal nutrition.

Fodder trees and legumes

Growing and feeding leguminous plants to livestock can be one of the most beneficial activities a smallholder farmer does. Browse species have considerable potential in mixed crop livestock production systems, to supplement low quality feeds, fix atmospheric nitrogen, provide fuel and shelter and to help in soil and water conservation.

Recommended leguminous and fodder trees and crops include:

- Leuceana
- Calliandra (does better in high altitudes (tea zones) than Leuceana)
- Sesbania
- Desmodium

- Sweet potato (vines)

General feeding and growing recommendations include:

- Preferred leguminous species have high protein content. Thus, they must be mixed with other forages and not be the only forage crop being fed.
- The trees and legumes, can be planted along the fences and terraces
 - Leuceana is good in fences
- Do not forget that many weeds also make good fodder

Maize

- While maize is grown for farmer's food, harvest stalks and stems (stovers) are a good source of animal fodder.
- Thinning - extra maize seedlings that grow from the same seed hole should be thinned and dried a little before feeding to the goats (Figure 17)
- Remove extra leaves - this should start with the leaves below the cobs as soon as the cob can be seen
- Cutting the tops - this should be done after the grains have hardened (Figure 17)
- Stovers - these should have sweeteners (molasses) added to increase palatability or sprinkle common salt after chopping. (Figure 17)
- Broken grains - these are very nutritious especially after a heavy harvest but should be fed carefully to avoid grain overload.



Figure 17: Thinning young maize plants (top) for stronger/healthier plants. Cutting the top of maize plants (bottom left) to push energy into stem and ear. Applying common salt (bottom right) to stover for preservation.

HAY MAKING

- Haymaking is a good way to preserve grasses for dry season feeding.
- Hay can be grasses, legumes or mixture of the two. Plants suitable for haymaking are those of erect type, leafy and not stemy.
- To produce good quality hay, you must cut the plants at the right time. For legumes cut when about 50 % starts blooming and for grasses about 50 % heading
- Try not to cut grasses/plants for hay making until after the rains have stopped. Long dry days and nights are the key to haymaking. Dry the cuts evenly and quickly for about three days depending on sun intensity.

- Quality hay is greenish, 25% water content, not moldy and acceptable by animals. To avoid spoilage feed in trough, keep clean, remove and destroy any spoiled hay, mix with green legumes and save for dry season.

CHAPTER SIX: SHEEP AND GOAT FLOCK HEALTH

SICK SHEEP AND GOAT: HOW TO IDENTIFY?

Table 2 below provides a quick summary of the common characteristics of sick and healthy sheep and goats.

Table 2: Characteristics of healthy vs. sick sheep and goats

Healthy	Sick
<p><i>A healthy sheep/goat:</i></p> <ul style="list-style-type: none"> ▪ has a good appetite. ▪ appears bright, alert and responsive when playing and climbing. ▪ stays with the flock. ▪ has smooth, clean and shiny coat. ▪ has clear eyes with some pink color in the eyelids. ▪ has an erect tail and a moist nose <p><i>Healthy lambs/kids:</i></p> <ul style="list-style-type: none"> ▪ are active and alert, and breath normally ▪ They are up on their feet in 30–60 minutes ▪ After birth, move freely and feed often 	<p><i>A sick/unhealthy sheep or goat:</i></p> <ul style="list-style-type: none"> ▪ has reduced appetite ▪ has breathing that is too fast or too slow ▪ sits or lies separated from the flock/herd ▪ has an ill-appearance with a dull, matted coat, hunched-up stance and tail and ears that droop down ▪ has a dry nose or has discharge from the nose, eyes, and/or mouth <p><i>Unhealthy lambs/kids are:</i></p> <ul style="list-style-type: none"> ▪ often unwilling to move or feed. ▪ appear weak, cold, lazy and hunched up

GOOD MANAGEMENT PRACTICES AND DISEASE PREVENTION

All good management practices, or management best practices, assist in the reduction of diseases in the flock. Implementation of these actions help protect animals from disease on a day-to-day basis. Because the animal is in overall good health, they help animals fight off or survive other health challenges (drought, disease outbreaks) over the long-term.

Health protecting good management practices include:

Housing and feeding

- Housing that provides protection from wind and rain, is easily cleaned and is well ventilated. This is preferred over hot/warm, wet and airless conditions
- Feed racks prevent contamination of feed with feces and urine

Drenching and spraying

When sheep and goats are kept in intensive conditions, parasites in the herd and soils will build-up as animals continually re-infect themselves. Ideally, animals will not be kept in such conditions. However, if it unavoidable, it is crucial the farmer have a strict routine of manure removal and/or rotation of grazing areas or paddocks for disease control. In addition, the farmer should consider:

- Regular treatment with effective anti-parasitic drugs to reduce intestinal parasite burdens.

The same approach is required with external parasites such as ticks, lice and flies:

- Spraying or dipping of animals will reduce external parasites during periods of high infestation and break the reproductive cycle of the parasites in the soils, vegetation, herd.

Hoof trimming

In management systems where sheep and goats are mostly confined and do not walk daily on hard groundcover or climb rocks, abrasion of the hoof is not balanced with hoof growth. This will affect mobility and could lead to reduced intake from grazing. It may additionally lead to diseases such as foot rot.

- To avoid these problems, hooves need to be examined regularly and trimmed as needed (Figure 18). Do not let hooves grow longer than shown below, cut and trim carefully.

Disease prevention program

Disease prevention programs can be developed by the animal health staff and the *Kebele* Development Agent (KDA). By working with the KDA the farmer is guaranteed to include local information on disease occurrence and epidemiological information into his/her program

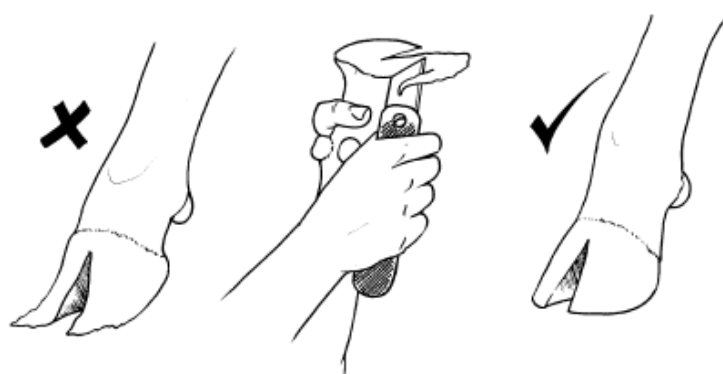


Figure 18: Achieving the correct angle of the hoof

In addition to following the recommendations (management and husbandry practices) provided in this training manual, vaccinations are also necessary and highly recommended. A herd-vaccination program will include the following elements

- Routine vaccination using locally appropriate vaccines:
 - Pasteurellosis
 - Sheep and goat pox
 - Anthrax
 - Pest des petits ruminants (PPR)
- Ring vaccination as recommended by local health authorities. These are carried out during outbreaks of Contagious Caprine Pleuropneumonia (CCPP).
 - Goats found around the outbreak areas are included in the mass-vaccination program. This serves as a barrier to halt the spread of infection.

Importance of vaccination programs

- Properly conducted and managed vaccination programs are critical to enhancing the immune status of the herd
- Proper timing of vaccinations and booster immunizations will assist in combating disease and minimize the severity of any disease outbreak

Figure 19: Locally available vaccines for bacterial and viral sheep and goat disease including administration schedule.



Disease	Vaccines	Dosage, administration, revaccination, and precaution	Package
Peste des petits ruminants (PPR)	PPR 75/1, Vero 76	Sheep and goats, inject 1 ml under skin; immunity lasts 1 year, revaccinate annually	Vial of 100 doses
Ovine pasteurellosis	<i>Pasteurella multocida</i> type "A"	Sheep and goats, inject 1 ml under skin; immunity lasts 1 year, revaccinate annually	Vial of 50 doses
Anthrax	Sterne 34 F ² strain of <i>Bacillus anthracis</i>	Sheep and goats, inject 0.5 ml under skin; immunity lasts for one year, revaccinate annually	Vial of 100 doses
Sheep & goat pox	Sheep & goat pox ksgp-0180	Sheep and goats, inject 1ml under skin, immunity lasts for one year, revaccinate annually	Vial of 100 doses
Contagious Caprine Pleuropneumonia (CCPP)	F38	Goat, inject 1 ml under skin, immunity lasts for one year, revaccinate annually	

Source: National Veterinary Institute, Debre Zeit.

VIRAL AND BACTERIAL DISEASES OF SHEEP AND GOATS


Peste des Petites Ruminants (PPR)

Affects sheep and goat and also causes limited cases in camels

Stages	Case Definition
<p>Stage 1: Clinical Case Definition</p>  <p><i>Purulent eye and nose discharges in a goat (FAO)</i></p>  <p><i>Early mouth lesions showing areas of dead cells (FAO)</i></p>	<ul style="list-style-type: none"> • PPR should be suspected when a combination of the following signs are observed in sheep and goat flocks: <ul style="list-style-type: none"> - Acute diarrhea - Coughing - High morbidity (can be low in endemic areas) - High mortality (can be low in endemic areas) • Differential diagnosis of PPR include: <ul style="list-style-type: none"> - FMD, blue tongue & contagious ecthyma or orf (due to mouth lesion) - Pasteurellosis & CCPP (due to difficulty of breathing)
<p>Stage 2: Post-Mortem Case Definition</p>	<ul style="list-style-type: none"> • Necrotic lesions in the mouth and nose • Engorgement and blackening of folds of the large intestine (zebra striping)



Contagious Caprine Pleuro-pneumonia (CCPP)

A disease of goats only.

Stages	Case Definition
<p data-bbox="156 394 667 432">Stage 1: Clinical Case Definition</p>  <p data-bbox="156 909 746 994"><i>A distended neck of goat due to difficulty of breathing (Solomon Nega/FAO)</i></p>	<ul data-bbox="810 394 1422 763" style="list-style-type: none">• Laboured breathing (dyspnoea)• Nasal discharge• In the terminal stages, animals are unable to move – they stand with their front legs wide apart, the neck is stiff and extended, and sometimes saliva continuously drips from the mouth.
<p data-bbox="156 1050 767 1088">Stage 2: Post-Mortem Case Definition</p>	<ul data-bbox="810 1050 1378 1346" style="list-style-type: none">• Fibrinous pleuropneumonia• Massive lung hepatisation• Large volume of straw-coloured pleural fluid• Enlarged and edematous mediastinal lymph nodes
<p data-bbox="156 1408 639 1491">Stage 3: Epidemiological Case Definition</p>	<ul data-bbox="810 1408 1422 1615" style="list-style-type: none">• High morbidity (about 100%) and high mortality of about 70% affecting all ages and both sexes in a susceptible flock may lead to a suspicion of CCPP.

Sheep and goat pox

A disease of sheep and goat

Stages	Case Definition
<p data-bbox="156 392 667 427">Stage 1: Clinical Case Definition</p>  <p data-bbox="156 882 718 918"><i>Papules in the mouth of sheep (DEFRA)</i></p>  <p data-bbox="156 1382 785 1451"><i>Necrotic (gray) lesions in the skin of a goat (DEFRA)</i></p>	<ul data-bbox="810 465 1434 1070" style="list-style-type: none">• Hard swellings (papules) may cover the body, or may be restricted to the groin, axilla and perineum.• Lachrymation and nasal discharge occur• Laboured and noisy breathing may occur• Enlargement of superficial lymph nodes, especially prescapular lymph nodes• Lesions develop on mucous membranes of the eyes, mouth and nose
<p data-bbox="156 1518 766 1554">Stage 2: Post-Mortem Case Definition</p>	<ul data-bbox="810 1518 1434 1742" style="list-style-type: none">• Lung lesions: severe and extensive pox lesions• Enlargement, congestion, oedema and haemorrhages of mediastinal lymph nodes

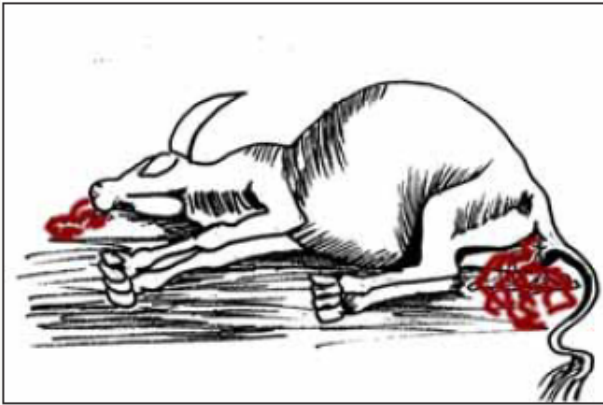
Pneumonic Pasteurellosis (Ovine and Caprine Pasteurellosis)

Disease that affects both sheep and goats. This disease occurs following stress related triggers such as transport, feed shortage, climatic change and other management factors

Stages	Case Definition
Stage 1: Clinical Case Definition	<ul style="list-style-type: none">• Respiratory signs such as coughing and nasal discharge
Stage 2: Post-Mortem Case Definition	<ul style="list-style-type: none">• Subcutaneous haemorrhage; epithelial necrosis of the tongue, pharynx, oesophagus, or occasionally the abomasum and intestine; enlargement of tonsils and retropharyngeal lymph nodes• The following lesions may appear in the lungs of affected animals:<ul style="list-style-type: none">- The cranioventral lung lobes may appear red to purple and feel firm from consolidation.- The pleural cavity may contain variable amounts of straw-coloured fluid.- Yellow fibrin may cover the pleural surface of affected lung lobes from pleuritis.- Chronic cases may have extensive pleural adhesions and multiple abscesses of variable size.


Anthrax

This disease affects all animals, including humans, except birds. Because of its high-risk to people, it is a concern to national and international public health officials.



Stages	Case Definition
<p data-bbox="181 461 692 499">Stage 1: Clinical Case Definition</p>  <p data-bbox="186 533 791 936">A black and white line drawing of a dead animal, possibly a cow or goat, lying on its side. Red, unclotted blood is shown being discharged from the animal's mouth and anus. The animal's legs are splayed out, and its body is rigid.</p>	<ul data-bbox="839 461 1457 1048" style="list-style-type: none">• Anthrax should be suspected and reported by an AHP and/ or a CAHW either to the woreda veterinary office or kebele veterinary personnel if s/he observes the following:<ul data-bbox="903 725 1457 891" style="list-style-type: none">- Sudden death of an animal- Un-clotted blood-stained discharges through the mouth, nose and anus• Differential diagnosis includes:<ul data-bbox="975 972 1457 1048" style="list-style-type: none">▪ Any sudden death should be considered as anthrax
<p data-bbox="181 1122 791 1160">Stage 2: Post-Mortem Case Definition</p>	<ul data-bbox="839 1122 1457 1339" style="list-style-type: none">• DO NOT OPEN a suspected anthrax case• If accidentally opened, dark, unclotted blood is characteristic to anthrax

PARASITIC DISEASES OF SHEEP AND GOATS

Internal Parasitic Infestations in sheep and goats

Stages	Case Definitions
<p>Stage 1: Clinical case definition</p> 	<ul style="list-style-type: none"> ▪ Sheep and goats get worms from fodder at which hold many worm eggs or larvae ▪ Sheep and goats can suffer very severe disease ▪ Adult sheep and goats suffer as young ones ▪ Usually can be source of stress in sheep and goats ▪ Internal parasites potentially cause: <ul style="list-style-type: none"> ○ an animal is thin, probably being well-fed; ○ an animal is not growing well; ○ an animal eats less than normal; ○ an animal is weak, tires easily and lags behind the flock; ○ an animal has rough coats; ○ you observe a number of animals with diarrhea and dehydration; and ○ you observe swellings or edema (e.g., bottle jaw) or see animals with pale mucous membranes
<p>Stage 2: Post mortem case definition</p> <ul style="list-style-type: none"> ▪ Usually you see the parasites in the internal body part and lesions on the predilection site of the internal parasite 	<p>Stage 3: Prevention methods</p> <ul style="list-style-type: none"> ▪ Avoid contaminated feeds ▪ Deworm before the rains and immediately after ▪ Good housing that prevents contamination of feeds with feces

External parasitic infestation in sheep and goats

Stages	Case Definitions
<p>Stage 1: Clinical case definition</p> <p>Ticks</p>   	<p>Effects of External Parasites:</p> <p>External parasites are responsible for a great diversity of animal health problems:</p> <ul style="list-style-type: none"> ▪ Attachment to the host causes irritation of the skin with subsequent ulceration and secondary infections ▪ The wounds attract screw worms and other flies, and myiasis can develop ▪ Heavy infestations are associated with anemia, since adult female ticks can suck up to 10 ml of blood ▪ The presence of large numbers causes annoyance and animals become restless. This may cause loss of weight and condition ▪ Bites can damage sensitive areas of skin (teats, vagina, eyes, etc.) ▪ Tick attachment between the claws of the feet may cause severe lameness ▪ External parasites transmit additional diseases to their hosts. Some of these are serious with fatal consequences. ▪ Causes tick-paralysis

Stage 2: Prevention and control methods

If parasites are seen on an animal, it should be treated immediately

- Check recently purchased or borrowed animals for parasites.
- Treat with acaricides only where parasites are present in large numbers. **READ INSTRUCTIONS BEFORE TREATING.**
 - Some insecticides should not be used when animal is pregnant or lactating
 - Some insecticides should not be used in combination with other products.
 - Wear protective clothing
- When tick numbers are not large, it is possible to kill them by hand using a needle or thorn.
- If using an insecticide, shear the animal's hair and then use an insecticide such as Amitraz
- Solutions can be sprayed on the animal, used as a dip or pour-on
- After treating, place the animal in the sun.
- Mothers should be separated from nursing young until all insecticide is dry

Some traditional methods of external parasite control include:

- Washing the animal with salt water
- Smearing the animal's body with spent oil
- Using repellent herbs

Using kerosene to rub the predilection sites

SECTION - TWO

CHAPTER SEVEN: SHEEP AND GOAT ECONOMICS OF PRODUCTION AND MARKETING

SHEEP AND GOAT FARMING AS A BUSINESS

Sheep and goat production as an economic strengthening activity must be demand driven and market based in order to succeed. The major objective of engaging in sheep and goat production is to make profit. The key factors that determine profit in sheep and goat enterprise are feed costs, percent lamb/kids, and market price. Financial success usually begins with business planning. To obtain the largest possible benefit from sheep and goat businesses, producers need to conduct an enterprise analysis that includes production, marketing and financial analyses that is part of business planning process.

PRODUCTION PLAN

Sheep and goat production can be a beneficial enterprise because small ruminants are easily managed, require relatively small initial investment, and their short generation interval lends itself to a fast return on investment. For most farmers, goats and sheep are raised for meat and immediate cash income.

Before he/she can start any farming business, he/she must answer four basic questions:

- What should the farm produce?
- How much should be produced?
- How should it be produced?
- How should it be marketed?

Many farmers do not take the time to answer these questions. Smallholder farmers commonly take their subsistence farming approaches and think they can quickly become a businessperson. Farmers obtain outputs when they use inputs. The amount and quality of the sheep and goat outputs (meat, milk, skin, etc.) is directly related to the type and amount of inputs (feed, medicaments, etc) the farmer invests in.

Production analysis: A farmer should have an understanding of their current production as well as their production potential. To assess this physical performance measures % lamb/kid crop, lambs/kids produced per ewe/doe, weight of weaning lambs/kids, feed consumed per head, are measured. These topics have been addressed in previous chapters. In production analysis, production efficiency is the main goal. To assess this, the farmer looks at the details of his/her flock more closely – looking at an individual animal's contribution to the overall flock production:

- The number of lambs that ewe gives birth will be varies by her age, genetics, body condition, nutrition and season. (peak production age is between 3 to 6 years and fertility is high in fall months))
- Ewes with better body condition will ovulate more eggs
- Farmers need to know the relative price differences between alternative input and output prices to determine the combination of inputs to use to produce a certain level of input

MARKETING

When one takes sheep and goat farming as a business, the major objective is to make a profit. One can make a profit by providing a quality product that meets the market requirements. Therefore in simple terms, Marketing is identifying the needs of the customers/ buyers and then supply a product (sheep/goats) that meets the required needs in the right quantities at the right time and place.

Understanding sheep/goat marketing

Identifying needs: Buyers require sheep/goats of different ages, size, breeds, etc. Some buyers such as the local traders are much concerned about the size while some buyers from the urban, high value markets emphasize on quality.

Specific group of customers: Some of the specific sheep and goat markets are individual traders, abattoirs, ethnic groups and export market.

Product: In the sheep/goat business the products that we can sell to the market are live sheep/goats, meat, skins, milk, mohair and manure.

Right quantities: It is also important for farmers to be able to plan their production so that they consistently supply the required quantities at specified time intervals This is key in business as this helps towards building longstanding and mutually beneficial (win-win) relationships with your buyers.

Right time and place: When we start our goats to organized high value markets, we need to plan our production and logistics to meet the market requirements.

Obviously high market price will increase profitability. The price of sheep and goat is determined by the interplay of demand and supply that may vary weekly, seasonally as well as religious festivals and holidays.

Marketing analysis

Market analysis is used by beneficiaries to identify products and services, market demand, consumers and competition to assess the feasibility of their business. In order to market a product or service, it is necessary to tailor marketing and sales efforts to reach the specific segment of the population that will most likely buy the product or service. Success depends on the ability to understand the market and the needs and desires of customers. Conducting a market assessment will facilitate sound decisions before starting a business and help in successfully selling products

- Rapid market assessment can be made by the beneficiary to decide the price and when to sell.
- Related to the availability of markets for inputs and products, market calendar, market facilities and market information on sheep and goat transactions

Marketing Tips

- Sheep and Goat farmers should be able to negotiate for prices that are commensurate with the quality of the animal.
- Farmers can come together as a group to strengthen their bargaining power.
- Farmers should gather up to date information about market trends.
- Produce good quality goats in the right quantities (optimum production).
- Farmers should avoid desperate/ distress selling.
- The farmer can sell directly or sell at an auction.

FINANCING SHEEP AND GOAT BUSINESS

Farmers should have an estimate of how much they require for start up costs and operating expenses. They must produce a financial plan/budget. This will help the farmer to source for funding. The plan should state how much money is needed for the following items:

- Infrastructure
- Breeding stock
- Feeds
- Labour

- Veterinary supplies
- Transport

It should also estimate income from the business.

Sources of Finance

- Family/Personal savings
- Loan from MFI
- Peer/Social group lending
- Credit scheme
- Donors

ASSUMPTIONS FOR SHEEP/GOAT PRODUCTION:

- Lambing/Kidding once per year
- Lambing/kidding: 150%
- Mortality: 10%
- Replacement of breeding stock: 20 %
- Adult Death Rate 5%
- Young male sheep/goats to be sold at 1 year (average age)

FINANCIAL ANALYSIS

Deals with the analysis of the profitability of the sheep/goat enterprises

To make money in a business you must make sure that the selling price of your product is more than the cost of producing it

When you are running any business venture it is very important for any businessperson to understand how much it costs to source or produce their products. The cost of the product (sheep/goat) will assist you calculate a good selling price for it. Many people do not know the cost of their products and sometimes the selling price of their products is too low, so that they do not make money from their businesses.

Planning and budgeting of sheep and goat production

- Sheep and goat production planning is a program outlining all production activities drawn up in advance
- Sheep and goat production planning includes taking an inventory of resources (feeds, land, labor and capital), devising alternate uses for these resources, estimating costs and returns associated with the alternate uses of these resources, and choosing the best alternative of producing sheep and goats
- Budgeting is the process of estimating costs, returns and net profit of sheep and goat enterprises. A budget is simply the plan translated into monetary form
- **Costs** are the total amount of funds used for the production of sheep and goats. Costs can be categorized as variable and fixed costs
- **Variable costs** are costs incurred directly to the enterprise being budgeted, such as feed, fuel, and hired labor. These costs vary with the level of output. Example, feed costs to produce three sheep are less than feed costs to produce five sheep
- **Fixed costs** are costs that occur whether the enterprise is operated or not, so long as one continues to maintain the production. Housing, equipment, land and depreciation are examples of fixed costs
- **Feed costs:** Concentrates, grass and hay, mineral/supplements, grain, water, etc.

- **Other variable costs:** Medicines/vaccines, breeding fees, supplies, marketing, transportation, utilities, labor, stock replacement, etc.
- **The minimum price can be calculated in two ways:**

1. The minimum price for the entire farming period, by taking into account the initial capital, fixed costs and the cost of raising the animals

$$\text{Minimum price per animal} = \frac{\text{initial capital (Birr)} + \text{Fixed Costs (Birr)} + \text{Production Cost (Birr)}}{\text{Total Number of animal for sale}}$$

2. The price for one production process, for instance in the case of fattening, includes all costs from buying the animals to selling them

$$\text{Minimum price per animal} = \frac{\text{Production cost (Birr)}}{\text{Total Number of animal for sale}}$$

Cashflow statement

The cash flow statement lists the inflows (revenue generated by the business) and the outflows (expenses incurred by the business). The difference between the inflows and outflows give the net cash flow. This net cash flow can be positive or negative. If it is positive that means the project is making money but if it is negative it means the business is not generating enough income. It should be noted that this net cash flow could initially be negative but increase gradually to become a positive cash flow.

Table 3: Sample cash flow sheet

Month:	1	2	3	4	5	6	7	8	9	10	11	12	Total
Sales:													
Does													
Bucks													
Kids													
Total Inflows													
Capital Expenditure													
Feed Costs:													
Salt													
Supplements													
Health Program													
Deforming Adults													
Deworming Kids													
Transport													
Supplies													
Labour													
Total Expenditures:													
Opening Balance													
Closing Balance													

CHAPTER EIGHT: BENEFITS OF SHEEP AND GOAT FOR HUMAN NUTRITION AND HEALTH

NUTRITION AND HEALTH BENEFITS

Sheep and goat kept by the poor can produce a regular supply of nutrient-rich Animal-Source Food (ASF) that provides a critical supplement and diversity to staple plant-based diets. There is great need to increase household understanding and increase of ASFs in children and women’s diet. Goat and sheep ASF is a good source for these populations.

- Meat and milk are guaranteed sources of high-quality protein and essential structural fats
- Meat and milk are major source of highly bio-available (that is, easily absorbed and used by the body) **essential micronutrients, such as iron, zinc, vitamin A, and calcium**, that are either lacking or not as bio-available in many rural families’ diets that are predominantly composed of cereals
 - Micronutrients also protect against infectious diseases and mortality
 - Deficiency in some micronutrients increases vulnerability to some chronic diseases
- Nutrients from ASF are essential to maintain adequate human growth and development
 - Sufficient intake of meat and milk is strongly associated with significant improvement in health, growth, and cognitive function (crucial to development of young and school age children).
- Milk and meat can also help mitigate the effects of often large seasonal fluctuations in grain availability
- Meat and milk are a dense source of high quality energy.
 - Milk comprises all eight essential amino acids making it a high-quality protein.
- Meat and milk prevents malnutrition related disorders include:

Prevent from	Essential Micro-Nutrients	Source
Growth faltering, impaired development, impaired vision, blindness, impaired pregnant women	Vitamin A	Milk, liver
Young children: impaired growth poor cognitive development, and impaired immune function	Iron	Meats contain heme iron (facilitates non-heme iron absorption)
Pregnancy complications, low birth weight, impaired immune function, maternal and being at risk , infant mortality and morbidity, growth faltering in infancy and childhood	Zink	Meat
Bone disease called nutritional rickets	Calcium	Milk
Stunted growth, skin lesions, soreness, burning of the lips, mouth and tongue, burning and itching of the eyes, fear of light, anemia, and disease of nerves system	Riboflavin	Milk, organ meats
Anemia with large red blood cells, loss of nerve-fiber covering of the central nerves system	Vitamin B12	Animal source foods of meat and meat organs are only source except some algae

FAMILY-MEMBER FOCUS

Children between 6-24 months and pregnant and lactating women are more vulnerable groups for under-nutrition and need to be prioritized to meat and milk.

- Children 6-24 months require sufficient calories, proteins, and nutrients to drive their rapid rate of physical and mental growth. Studies have shown that even at this early age, children who receive nutritious diets will:
 - have healthy growth and development
 - have better performance at school
 - won't be easily affected by different diseases; and
 - will become productive citizens
- Pregnant and lactating women
 - A pregnant women needs additional food for her and for her fetus
 - A lactating women needs additional calories and nutrients to produce milk for her infant

Households owning sheep and goats, or any livestock including poultry, need to prioritize the caloric and nutritional needs of young children and pregnant and lactating women for the overall success of the family.

INCOME, CHOICES AND FOOD SECURITY / NUTRITION

Availability of food is not sufficient for good nutrition. Good nutrition for all household members requires:

- Appropriate choices about foods to consume
- Equitable distribution to all household members
- Understanding of children's, pregnant and lactating women's nutritional needs
- Appropriate feeding practices for children, pregnant and lactating women

When selling a goat or a sheep, how should a household prioritize these needs?

- Purchase diversified food that includes fruits, vegetables and legumes currently not available in the house?
- Housing improvements?
- Tobacco?
- Electronic goods?

CHAPTER NINE: GENDER IN LIVESTOCK MANAGEMENT

GENDER ROLES AND THE DIVISION OF LABOR

Gender roles are the roles women and men fulfill in the society as defined by their virtue of being female or male. In any society, men and women receive messages about their role and division of labor from family, schools, media and society at large. Gender roles show society's rule for how men and women are supposed to behave. These rules are sometimes called gender norms. They dictate what is "normal" for men to think, feel and act and what is "normal" for women.

Many of these differences are constructed by society, and are not part of our nature or biological make-up. Many expectations are completely fine and help us enjoy our identities as either a man or a woman. However, some of these expectations limit us from using our full potentials as human being.

For example: If and how a father is involved in child feeding and care is not linked exclusively to biological characteristics. Rather, it depends on how they themselves and women and men in their society are raised. If they are raised to believe that men can also take care of children, they will probably participate and enjoy rearing their own children.

Both men and women play multiple roles in society. These roles can be broadly categorized into three;

- I) **Productive roles:** Tasks that contribute to the economic welfare of the household through production of goods. Women's role as producers is usually undermined and undervalued.
- II) **Reproductive role:** Activities performed for reproduction and caring for the household, water & fuel wood collection, childcare health care, washing, cleaning etc.
- III) **Community management or socio-cultural activities:** Activities primarily carried by men & women to ensure the co-existence of themselves as well as their family in their social environment. Examples of such activities include, iddir, mutual help among neighbors/ relatives, community groups etc which boosts their social capital (FEMNET, 2006)

Men commonly focus on filling the productive roles and play their multiple roles sequentially. Women in contrast to men, must play their roles simultaneously, and balance competing on time for each of them. Because of this, women are routinely overburdened with triple roles. There is a high probability that they face time related constraints in providing adequate care for the children and seeking health care.

GENDER ANALYSIS

Gender analysis is a systematic effort to identify and understand the roles, needs, opportunities and life circumstances of men and women, in a changing socio- economic context.

- It examines the differences in women's and men's lives, including those which lead to social and economic inequity for women, and applies this understanding to policy development and service delivery
- It is concerned with the underlying causes of these inequities
- It aims to achieve positive change for women (FAO, 1997)

There are different frameworks of gender analysis. These frameworks are applicable to different situations based on the contexts since they have their unique features and relevance to specific contexts.

The Harvard framework is one of the widely used gender analysis framework for collecting and analysing data's on gender relations. This framework has four interrelated components:

- **Activity Profile (Who does what?):** What men and women (adults, children, and elders) do, and where and when these activities take place
- **Access and control Profile (Who has what?):** Who has access to and control of resources and services and services and decision-making, e.g. agricultural resources, extension services, credit services etc
- **Analysis of factors and trends (What is the socio-economic context?):** How activity, access and control patterns are shaped by structural factors (demographic, economic, legal and institutional) by cultural, religious and attitudinal ones
- **Program cycle analysis (What gender considerations are needed for the project):** Gender-sensitive project planning, design, implementation, and monitoring and post evaluation.

One of the manifestations of power imbalance between men and women in any society relates to the disparity in access to and control over resources. This has implication on women's decision-making power/ability both within the household as well as in community structures outside of the household.

- **Access:** to resources means having the opportunity to use resources without having the authority to decide on the output and the exploitation methods
- **Control:** over resources or benefits means having full right to use and authority to decide what the outputs should be and how it should be used.

GENDER CONSIDERATIONS IN LIVESTOCK MANAGEMENT

- I) Identification of women's role: as livestock owner, animal health care provider, feed gatherer, birth attendant, and user of livestock products and support to their decision-making capacity are central to the effective implementation of gender responsive interventions.
- II) Women's safety: Gender roles in the provision of water and feed for livestock should be considered. For instance, poor women and girls may not have equitable access to water, or they could suffer exploitation or risk violent assault if they have to travel distances to fetch water.
- III) Women as animal health care providers. Women (and girls) are often responsible for small and/or young stock, including the diagnosis and treatment of livestock diseases. They should therefore be involved in animal health interventions and training
- IV) Women's workload: Although the position of women livestock keepers can be improved through income-generating activities (i.e. processing and selling livestock products, trees and forage products, and wildlife products), women's daily workload is already extremely heavy, leaving little time to diversify or enhance their livelihoods. Consequently, labour- and time-saving opportunities merit special attention.
- V) Women's access to assets: Women's economic and social empowerment is linked to their access to productive resources and basic assets (water, land, fuelwood, markets and knowledge), their participation in small-scale dairying and their role in decision-making
- VI) Women and market: Women need to become more market-oriented and identify new economic opportunities. Their role in community decision making needs to be strengthened.
- VII) Role of social networks: Women's status and decision-making role within the family depends on their access to and control of land, livestock and income and on the presence of social support networks

VIII) Role of farmers' organizations: It is important to increase women's negotiating power and decision-making role in farmers' organizations. Women's organizations and the role of women in farmers' organizations should receive special support

KEY QUESTIONS FOR UNDERSTANDING THE ROLE GENDER PLAYS IN LIVESTOCK MANAGEMENT

- Which types of livestock do men and women own? What does ownership mean in your home, community, culture, laws?
- How does women's access to livestock affect their decision-making power?
- Does owning land affect women's ability to own livestock?
- Which activities do men and women carry out, with which animals, and which products are they responsible?
- What are the roles and responsibilities of men and women in the livestock system?
- Do women control the income generated by production and marketing of livestock products?
- Does access to livestock affect women's access to other resources (such as credit, pasture, water)?
- Do women have access to veterinary services?