Livestock

1. Apiculture
2. Broiler
3. Egg Production
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TECHNOLOGY PACKS

SMALL RUMINANT PRODUCTION

November 2015

Background

Production decisions concerning how much effort and resources to invest and which farming practices to follow, have consequences and create opportunities for the farm affecting production levels, input costs, time constraints, and the potentially size of the operation. They also may have implications for resource use and environmental quality.

Numerous information exist on the various aspects of production and handling/ marketing of crops and livestock, the majority of which are outdated, not easily understood and lacking the where with all for addressing present day challenges such as good agricultural practices (GAPs) and food safety and climate change that impact on the environment and rural livelihoods. These issues are also closely related to the importance of the role of primary producers in increasing the earnings of all actors along the value chain in supporting the development of a commercially viable and sustainable agricultural industry.

The production of high quality and easily understood information packages is critical as this forms a basis for farmers to obtain financing from lending institutions and to efficiently increase their production through the availability of modern technology. This will also result in a reduction of rural unemployment and will greatly help in alleviating poverty and other associated social ills.

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November 2015

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Introduction

This Technological Package (Tech Pack) deals with the production of small ruminants; it seeks to guide farmers in the management and care of these animals for high profit. Also included as an Appendix are examples of Health and Ewe/Doe Record Cards.

Small ruminants (sheep and goats) are a major source of animal protein in the Caribbean as reflected by the large demand. The animals are providers of food, *fibre* and income to many farming families. Investment costs are lower when compared to cattle, making small ruminants suitable for resource poor farmers.

Appropriate Breeds and Selection of Breeding Stock

In recent years, the genetic potential of breeds found locally has been improving through the introduction and widespread use of superior breeds.

The growth, reproduction and lactation potential of these superior breeds combined with disease resistance and survival characteristics of the indigenous (local) population allow for the production of offspring with good quality performance ability. Presently, the Livestock Division of the Ministry of Agriculture promotes the use of three sheep and two goat breeds. Table 1 shows details of these breeds.

The Division can be contacted for information on its breed improvement program; there are also a few breeder farmers from whom improved animals can be sourced.

Selecting breeding stock

Select breeding stock based on body conformation and performance information. When reviewing performance information, look at the records of the parents, offspring (if any) and individual records.

Table 1. Selected production parameters for selected breeds of sheep and goat.

Species	Breeds	Average litter size	Average birth weight/ animal lb (kg)	Distinguishing marks
Sheep	Plate 1 Barbados Black belly 	2.3	6 (2.7)	Rams and ewes are polled. Medium to thick hair (no wool). Colour ranges from light brown to dark reddish-brown (tan) with black underparts extending down the inside of the legs. There are black points on the nose and forehead, and inside of the ears are black. Rams have a neckpiece of thick hair, which extends down the neck to the brisket; some may cover to the shoulder. Average daily gains (ADG) of around 180g

Species	Breeds	Average litter size	Average birth weight/ animal lb (kg)	Distinguishing marks
Sheep	Plate 2 Virgin Island White 	1.76	6.8 (3.7)	Also known as the St. Croix. It is white in colour. Some animals may be solid tan, brown, black or white with brown or black spots. Both sexes are polled. ADG of around 225 g
Sheep	Plate 3 Katahdin 	1.75	7.9 (3.6)	Coat is usually white. It varies in length and texture but the outer fibres are usually coarse. It has a much meatier appearance than the Virgin Island White. ADG of around 258 g
Goat	Plate 4 Boer 	1.64	8.4 (3.8)	The Boer goat is primarily a meat goat with horns and short, smooth, glossy hair. It has lop (droopy) ears and shows a variety of colour patterns. The most common pattern is white with a red head and ears and white facial markings with fully pigmented skin. Some may have a fully read head. The Red Boer or Kalahari has a completely red coat.

Species	Breeds	Average litter size	Average birth weight/ animal lb (kg)	Distinguishing marks
Goat	Plate 5 Anglo Nubian 	1.57	6.2 (2.8)	A dual purpose animal. It has long pendulous ears that hang close to the head. The animal also has a distinctive "Roman nose". The coat is has short hair with variable colour including black, tan, red, any of which may be in combination with white.
Goat (Dairy)	Saanen 	2	7.4	Coat is white or light cream in colour. Dark spots on skin or udder occur in some populations. Hair is short and fine. Ears are erect and usually points forward. The bridge of nose is straight or slightly dished. Performs best under cooler conditions – not very tolerant to heat. Does have large, well developed udders, and are milk producers. High milk producers – in excess of 1000 kg of milk in a lactation (275 to 300 days).

Species	Breeds	Average litter size	Average birth weight/ animal lb (kg)	Distinguishing marks
Sheep	**Dorper**  **Photo source: https://www.pinterest.com/cronjedorpers/cronje-dorper-sheep/** **White Dorper**  **Photo source: http://www.spryswhitedorpers.com.au/dorpers/news**	1.5	8.4	Barrel shaped, white body with either a black (Dorper) or white head (White Dorper). Hornless. Tolerates drought conditions. The thick skin is usually covered with a mixture of hair and wool with the wool predominating on the forequarter.

Characteristics of a good ram/buck:

- Be a good representative of the breed/breed type.
- Good size with a deep body and well sprung ribs.
- Active or alert.
- A masculine head with a strong, wide muzzle and wide between the eyes.
- Strong chest.
- Legs should be well spaced, strong, and straight with no defects.
- Well-developed sexual organs, with well hung testicles and no deformities.
- A straight top line.

Characteristics of good ewe/doe:

- Be a good representative of the breed/breed type.
- Healthy.

- Docile.
- Feminine head.
- Soft pliable udder with two well developed teats.
- Strong pasterns.
- A deep body with a large barrel and well sprung ribs.
- Straight top line.
- Well-developed external genitalia.

Production Practices

SITE SELECTION

The small ruminant production site must have access to good quality water and be elevated to facilitate proper drainage. Access roads must be in good condition for transportation of inputs and outputs. Ensure that sufficient land is available for the establishment of pastures.

HOUSING AND EQUIPMENT

Predators are wide ranging and do not recognize property boundaries, hence any structure must be secure to prevent animals from escaping and to prevent predators entering the area. Movable BRC of a reasonable size mesh can be designed and knocked into the ground along the fence to limit dog aggression on animals while on pasture. A more expensive approach is the application of concrete along the base of the fence. Trees such as gliricidia and leucaena can be used as posts for the perimeter fencing, while barbed and sheep fencing wire can be used as permanent fencing. Be wary of the size of mesh. Avoid mesh sizes which could lead to lambs/kids escaping or the possibility of adult animals being trapped by their horns.

Ensure that pens are well ventilated, well drained, easily cleaned and kept dry. Poor ventilation will result in respiratory problems and heat stress. If the scent of ammonia is high in the barn, sanitation and ventilation is likely inadequate. Good ventilation can be achieved through natural means or by using fans.

Concrete floors should be gently sloping. Regular cleaning of waste is important to prevent problems associated with parasite infestation.

New pens do not need to be built if there are old dairy, swine or poultry barns. These can be easily converted to house sheep or goats.

Plate 6 Boer kids reared on concrete floor

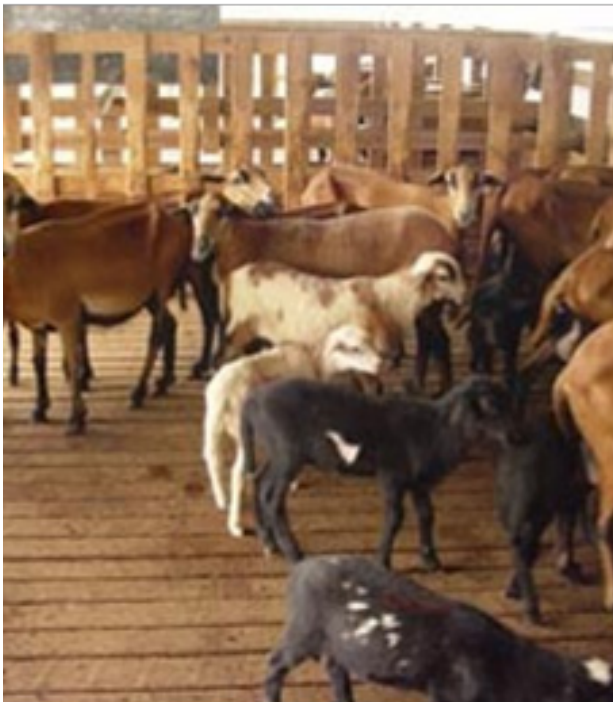

Plate 7 Sheep reared on wooden slatted floors

Orient the pens so that long walls have an east to west orientation. This will allow for proper ventilation and prevent large swathes of direct sunlight in the pen, hence allowing animals to be cool during the hottest time of the day.

The roof of the pen should be high and of a split top gable or vented gable design to reduce temperatures within the pen.

Table 2. Recommended Floor and Trough Space for Sheep/ Goats in intensive Production Related to Live Weight (Source FAO. 1988).

	Weight	Floor space			Trough space
		Solid floor	Slatted floor	Open yard	
	lb	sq feet/animal	sq feet/animal	sq feet/animal	feet/animal
Ewe/ Doe	75	8.6	7.5	21.5	1.15
Ewe/ Doe	110	11.8	9.7	26.9	1.3
Ewe/ Doe	150	15.1	11.8	32.3	1.5
Lamb/ Kid		4.3 - 5.4	3.2 - 4.3	-	0.82 - 0.98
Ram/ Buck		32.3	26.9	-	1.64

Conversion factors: 1 lb = 0.45 kg, 1 foot = 30 cm, 1 square foot = 900 cm^2

There is a growing trend to construct raised slatted floor housing systems for small ruminants, particularly in high rainfall areas. These stilted houses are built with a wooden slatted floor which

is raised 36 - 48 inches (1 – 1.2 m) above the ground to facilitate cleaning and the collection of dung and urine. Some slatted floors are removable. Slats should be 3 – 4 inches (7.5 – 10 cm) wide, 1 inch (2.5 cm) thick and laid with ¾ - 1 inch (1.75 – 2.5 cm) spaces for adults, ½ - ¾ inch (1 – 1.75 cm) for growing stock and ½ inch (1 cm) for lambs/kids. Individual lambing pens should be 15 - 25 square feet (1.5 – 2.5 m2), depending on the weight of the ewe and number of lambs expected. A feed trough should be 12 - 14 inches (30 – 35 cm) deep from front to back, with a 20 - 36 inch (50 – 90 cm) high front wall facing the feed alley.

Plate 8 Raised slatted floor pens under construction with high roofing and adequate ventilation

Plate 9 Sheep reared on raised slatted floors with feeding trough installed outside of the pens for easier feeding of animals.

Some equipment necessary for farm operations are:

- Feed mixer: This could be acquired later on as the size of flock develops. Old cement mixers can be modified to mix feed.
- Forage chopper: Small portable choppers are available from commercial suppliers (Plate 10). It is possible to modify a lawn mower and place it on a table frame.
- Tagging and hoof clipping equipment: Tagging equipment is required for identification purposes and for maintaining accurate records. Hoof clippers are used for maintaining a healthy hoof.
- Scales: A scale is required for weighing live animals and another for weighing feed.
- Knapsack sprayer.
- Restraining equipment: A shepherd's hook.
- Ram harness and markers.
- Feeding troughs: These can be constructed using wood.
- Waterers: Buckets can be used. Automatic waterers are also easy to build using PVC and a system of floats and valves.

Plate 10 Portable Forage Chopper

Establish a quarantine area downwind from the main pens. New arrivals or returning animals will spend 1 month in the quarantine area. Service quarantine pens (cleaning, feeding, etc.) last to prevent possible contamination from quarantined animals to the main flock.

BREEDING

Before breeding, trim hooves, deworm and treat animals for external parasites. Don't expect young rams to serve a large number of females. Harness rams so that served females can be easily identified. Also, conduct a physical examination of the ram. Testicular circumference should be between 12 – 15 inches (30 - 38 cm). Palpate the ram's testicles to ensure a firm testicular tone.

Estrous cycle

Estrus or heat is the period of sexual receptivity in the female. Signs of heat include:
The animal stands to be mounted.

- May mount other animals
- Frequent phonation
- Irritability
- Seeks out male
- Mucus discharge in the genital area
- Tail twitching.

The oestrous cycle of sheep is between 14 - 19 days (average 17 days) heat lasting between 18 - 48 hours (average 30 hours). The oestrous cycle of goats is between 19 - 21 days (average 20 days) heat lasting between 24 - 36 hours (average 30 hours). Tables 3 and 4 list the targets for different parameters of reproductive performance in sheep and goats, respectively.

Table 3 General target reproductive performance coefficients for goats (variations may exist depending on breed)

Parameter	Target coefficient
Age at first mating	7 - 9 months
Weight at first mating	65 – 75 lb (30 - 35 kg)
Age at first lambing	12 - 14 months
Lambing interval	8 months (three lambings in two years)
Litter size	1.8 - 2.3
Length of gestation	143 - 152 days (5 months)
Flock mating – ram:ewe ratio Hand mating – ram:ewe ratio	1:30 1:50
Mortality rate: lambs replacements adults	10 - 15% 3 - 5% 3%
Birth weight	7 – 9 lb (2.7 - 3.6 kg)
Culling rate : mature ewes	20 - 25%
Age at slaughter	6 - 8 months
Weight at slaughter	70 – 90 lb (32 - 40 kg)

Age at first mating	8 - 10 months
Weight at first mating	65 – 75 lb (30 - 35 kg)
Age at first kidding	13 - 17 months
Kidding interval	8 months (three kiddings every 2 years)
Length of gestation	143 - 152 days (5 months)
Litter size	1.6 - 2.0
Buck:doe ratio – Young bucks (< 12 months) Mature bucks	 1:12 1:30
Mortality rate: kids weaners adults	10 - 15% 3 - 5% 2 - 3%
Birth weight	5 – 7 lb (2.5-3 kg)
Lactation length (dairy goats)	180 - 270 days, up to 300 days for higher producing grades
Lactation yield (dairy goats)	150 – 220 gallons (600 - 900 kg)
Average daily doe milk yield (dairy goats)	4½ to 6 pints (2.3 - 3 kg)/day
Age at slaughter (meat goats)	6 - 8 months
Weight at slaughter (meat goats)	70 – 80 lb (32 - 36 kg)

Mating systems

Random mating: This is not recommended. In this system, all animals have equal opportunity to mate with any other animal. This may lead to a high degree of inbreeding in smaller flocks. No good records can be kept in this system.

Controlled mating systems: there are several options.

- Flock or herd mating—large number of females mated to two or more sires.
- Single sire groups—specific males are mated to a specific group of females.
- Hand mating— ewes in oestrus are identified and placed with a specific ram.
- Artificial insemination—allows widespread use of superior bucks.

Pregnancy diagnosis

This can be done using ultrasonography as early as 25 days after conception. It will reduce costs associated with open ewes and also ensure feeding strategies are well timed.

Reducing lamb/kid mortality

Caring for the lamb begins with the pregnant ewe. Adequate nutrition and exercise are essential during this time. Ensure ewes also have access to clean fresh water at all times.

During pregnancy, exercise is important and the farm manager should allow his pregnant animals to graze at some time during the day.

Preparation for lambing

- Someone must be present at lambing.
- Ensure a clean comfortable dry environment is available to the ewe/doe.
- If the lamb/kid does not appear 30 minutes after the emergence of the water bag, the stockman must provide assistance.
- On slatted floor systems, during this time, cover the slats with plywood to reduce injuries to lamb.
- After birth, clean, mucus from the nose and mouth of lambs/kids, allow the dam and lambs/kids to bond. The doe/ewe will also clean offspring.
- Dip the navel of each lamb/kid in iodine to prevent joint-ill.
- Ensure the lamb/kid receive colostrum (first milk) from the ewe/doe within 24 hours of birth. Excess colostrum can be stored in the freezer. New-born lambs can be fed colostrum using a baby bottle (Plate 11).

Plate 11 Bottle feeding a lamb

In cases where colostrum is not sufficient, possible in multiple births, or where colostrum is not available, a substitute can be made using the following formula (Garcia, University of the West Indies):

26 ounces (0.7 kg) whole milk
1 tablespoon (5 cc) castor or cod liver oil
1 tablespoon (5 cc) sugar
1 beaten egg yolk

Mix well and feed at the rate of 1½ - 2 ounces (40 – 50 g) per feeding, allowing 2 hours between feedings. On the second day the feed should be increased to 3 ounces (90 g) every 2 hours for 6 feedings. At 2 days old, gradually begin to substitute the artificial colostrum with lamb milk replacer. This can be started at the last feed on day 2. Carefully follow the manufacturer's instructions on feeding milk replacer to new-born lambs.

NUTRITION AND FEEDING

Farmers must improve the utilization of local forages and agricultural by-products. Concentrate feed can be used to supplement the main diet of forages.

The nutrients required by small ruminants are:

Carbohydrates: Most sheep and goat feed are of plant origin and therefore have high levels of carbohydrates, which are used by the animal to provide energy. Excess carbohydrates are stored as fat.

Fats: Commonly used to increase the energy density of diets and provides essential fatty acids. The normal fat level in the diet is around 2 - 5% with the dietary limit being 8%.

Protein: The recommended level of crude protein in rations for weaned small ruminants is between 12 - 16 %.

Minerals: There are a number of mineral elements essential for small ruminants. A suitable mineral mixture should contain calcium and phosphorous in the ratio of 2:1; commercial mineral mix should be provided for consumption *ad lib*. A mineral deficiency will result in poor growth and reproduction.

Vitamins: The fat soluble vitamins are required in small ruminant diet. These are vitamins A, D, E and K. Vitamins A and E are made from compounds found in green forage. Therefore if fresh, green forage is being offered to the animals, no supplemental vitamin A or E is required. However, if animals are being fed mature and old forages, then these vitamins should be added to the ration. Corn silage and stalks will also result in inadequate Vitamin A levels. The B vitamins and vitamin K are produced in the rumen, and are therefore not normally needed in the ration. Vitamin B complex and vitamin C are water soluble. Vitamin C is synthesized in the tissues. Vitamin D is made from exposure to sunshine. In cases where animals are reared indoors for more than 2 - 4 weeks, Vitamin D should be included in the diet. Vitamin and mineral blocks are commercially available. These blocks usually contain Vitamins A, D and E.

Water: Cool, clean water must always be available. Animals consume about 3 - 4 quarts/litres of water for every 2.2 lb (l kg) of dry feed eaten. Reducing the access to water will negatively affect animal performance. The amount of water consumed increases during pregnancy, lactation and heat stress.

Energy: This is not a nutrient but is a property possessed by some nutrients such as carbohydrates, fats and protein. Animals will consume about 3 - 5% of its body weight in dry matter. A low level of energy intake is often the result of inadequate amount of feed or poor quality feed, which affects animal performance and their resistance to disease.

The following feeds and supplements can be used for small ruminants:

- Pasture grasses and legumes (e.g. pangola, elephant, guinea, African star, blue peas, rabbit vine; tree legumes (e.g. leucaena, gliricidia)
- Conserved forage (e.g. hay, silage)
- Crops and crops residues (e.g. banana, potato vine, cassava)
- Protein sources for concentrate (e.g. soybean meal, cotton seed, urea, fish meal, coconut meal, spent grain, yeast)

- Energy sources (e.g. wheat middling, rice brand, molasses)
- Mineral supplements
- Vitamin supplements.

The nutrient requirement will vary depending on the age, sex, level of activity and stage of production of the animal and the environment to which the animal is being subjected. All feed changes must be done gradually.

Creep feeding

Provide creep feed to lamb/kids from 1 week old to weaning. Together with good quality forage, the diet will encourage the development of the digestive system of the animal. As a general rule, lambs/kids require a diet that has 2 - 4% more crude protein than the ewes/does. A creep feed will therefore contain around 17 - 21% crude protein. When this is not available, an 18% crude protein dairy or broiler ration may be used.

Plate 12 Lambs in creep area

Feeding the ewe

Body condition scoring (BCS) is critical when determining feeding strategies. Freshen the ewe/doe at a BCS of 3. In early and mid-pregnancy do not over feed the ewe/doe, as problems could arise at lambing and during lactation. During the last trimester, increase the plane of nutrition (steaming up) as 70% of foetal weight is added during this period. Feed will also need to be more energy dense. Poor quality feed during this time could predispose the animal to pregnancy toxaemia. Adequate and clean drinking water along with mineral supplements are important. Figure 1 shows the BCS for sheep and goats.

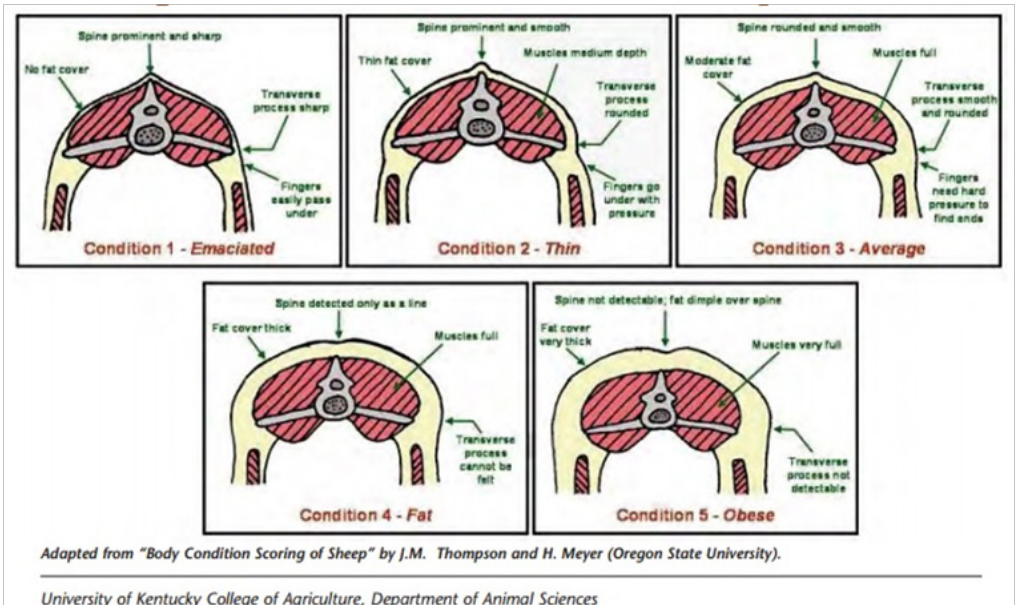

Figure 1 Body condition scores (BCS) - sheep/goats

Guides for feeding the breeding ewes/does and growing lambs/kids are presented in Tables 5 and 6, respectively. Breeding does are fed similar to ewes except during lactation. Feed 1 lb of feed (16% crude protein) for the first 1 lb of milk produced (1 kg feed for 1 kg milk produced) and an additional ½lb for each additional 1 lb milk produced (250 g feed for 0.5 kg milk). Supplement with minerals.

Does suckling kids for meat: feed 2½ lb (1 kg)/day.

It must be appreciated that feeding levels will depend, among other things, on the nutrient content of the feed offered.

Table 5 A guide for feeding breeding ewes/does
***14 percent crude protein ration with good quality forage being offered ad lib**
**** The maintenance level in animals refer to that level of feeding required by the animal to maintain its body weight only**

Time	Quantity/head/day*
2 weeks before breeding	½ - 1 lb (0.25 - 0.45 kg)
During pregnancy	
First trimester (6 - 7 weeks)	About 5 - 10% above the maintenance level**
Second trimester	20 - 30% above the maintenance level
Last trimester (last 6 weeks prior tolambing)	35 - 40% above the maintenance level

Time	Quantity/head/day*
2 weeks before breeding	½ - 1 lb (0.25 - 0.45 kg)
Early lactation: up to 1 week after lambing	3 lb (1.4 kg)
5–6 weeks after lambing	1½ - 2 lb (0.7 – 1 kg)
At weaning (50–60 days)	Not more than 1 lb (0.45 kg)

Table 6 Average feeding levels for growing lambs/kids
Conversion factors: 1 lb = 0.45 kg or 450 g, 1 ounce = 28 g

Live-weight (lb)	Estimated total forage intake (lb)	Recommended minimum fresh forage intake (lb)	Rec. Maximum supplement (concentrate feed) intake (14% crude protein) (ounces)
10	1.5	0.5	3.5
22	3.5	1.5	5.0
35	5.0	3.0	7.0
45	6.5	4.0	9.0
55	8.5	5.5	9.0
65	10.0	6.5	10.0
80	11.5	8.5	10.0

Feeding non-protein nitrogen (NPN)

Urea is a non-protein nitrogen source component of the urea block. Urea blocks are used as a supplement to slow down the loss of condition in small ruminants when the protein requirement cannot be met. Molasses is commonly used as the energy source and is an excellent carrier for the urea. A formula for making a molasses urea block is given in Table 7. After making the block, allow to dry in the sun for at least 7 days before using.

Guidelines when feeding NPN:

- Do not include NPN more than 1% of total diet or 3% of concentrate portion. Urea molasses block should never form the main diet
- Do not feed urea to pre-weaned lambs
- Gradually introduce NPN over a 2 - 3 week period
- Feed at regular intervals for efficient utilization
- Never feed molasses urea block to an emaciated animal especially with an empty stomach
- Minimum forage in rumen is essential
- Never supply NPN in ground or dissolved form
- Do not exceed 3½ ounces (100 grams)/day for sheep and goats
- Ensure clean, fresh water is available.

Table 7 Formula for making Molasses Urea block

Ingredient	%
Molasses	40
Urea	10
Bran	25
Cement	10
Oilcake	10
Mineral mix	1
Salt	4
Total	100
Water (to mix cement)	4

GENERAL HUSBANDRY PRACTICES

Castration

Castration is the removal of the testicles. Because the male can be sexually mature at an early age, castration may be necessary before 6 months of age to avoid uncontrolled mating. The common method consists of crushing the major blood vessels to the testicle using an instrument called a burdizzo. This can be done at 3 weeks old. Other methods include banding/elastrator or using a knife.

Hoof trimming

Keeping hooves short and in good condition is very important. Where animals are reared on hard and stony soil their hooves tend to be short and do not require trimming. Trim hooves with a sharp knife or a hoof trimmer and have an antibiotic spray ready to prevent contamination of the wound in case there is any bleeding. This spray should be used for at least for 3 days. Routinely trim hooves and implement foot baths using zinc or copper sulphate every 5 - 7 days as prevention.

Dehorning or disbudding

This is the process of removing or stopping the growth of the horns. This can be done at 1 week of age. Ensure that an antiseptic is available to treat the area if necessary. The horn bud can be felt on top of the head of the lamb/kid. Dehorning/disbudding can be done through cauterization, use of a knife, a dehorning wire or dehorning (potassium hydroxide) paste. Seek the assistance of a veterinarian before dehorning animals.

HEALTH AND DISEASE MANAGEMENT

Good routine husbandry is extremely important for good health management. Choice of farm location, proper housing (adequate floor space, floor construction and yards, proper ventilation and dry clean pens), sanitary handling of small ruminant, adequate supply of clean water, clean

quality feed supply are very important measures for dis¬ease prevention and control in the flock.
Observe animals daily for signs of illness
Some factors which may indicate illness

- Temperature can be taken if necessary with the use of a thermometer. The normal temperature of sheep and goats is between 101 - 104°F (38.5 - 40°C).
- Feel over the animal to locate any swelling or sign of pain.
- Note any unusual sound (wheezing or coughing).
- Roll back the eyelids and lips of the mouth to observe colour of mucous membrane. Pink is the nor¬mal colour, except when dark skin colour extends into the mouth. The paleness of the inside of the eyelids, lips of the mouth and vulva serve as indi¬cators of the unhealthy condition of anaemia.
- For lactating animals, check the udder; feel for hardness, pain, milk consistency and colour.
- Look for mucous coming from the nose or vagina.
- Observe the nature of faeces and appetite.
- A smooth hair coat is an indication of a healthy animal.
- An isolated animal may suggest that something is wrong.

The best way to detect when an animal is unhealthy is to know how the animal looks, eats and behaves when healthy. Handle sick animals with caution avoiding stress and immediately isolate from the rest of the flock.

General signs of possible health problems include:

- Animal seen standing apart from the rest of the flock
- Poor appetite
- Abnormal walking
- Hunched back
- Diarrhoea
- Abnormal respiration
- Teeth grinding.

Some common diseases and health issues are described in Table 8.

Table 8: Common health issues of sheep and goats

Condition	Symptoms	Control/Management
Plate 13 Coccidiosis  Source:https://www.famu.edu/cesta/main/assets/File/coop_extension/herds/Practical_Management_Internal_Parasites_in_Goats1_7-23-2007.pdf	Commonly seen in young and growing animals. Diarrhoea (sometimes with blood clots), loss of appetite and loss of weight. The animals may become dehydrated and show signs of anaemia. Death is seen frequently in young animals.	Avoid stressful conditions such as overcrowding and unclean pens. Avoid feed and water being contaminated with manure. Con¬tact the Veterinary Services for assistance. Sulfa drugs and amprolium are very effective in treatment.
Plate 14 Liver Fluke  Source: http://www.floridameatgoats.com/Anemia.htm	Bottle jaw, swollen or painful abdomen, reduced production, poor growth, anaemia and death. The disease is confirmed by identifying the parasite eggs in faecal examination and/or post-mortem examination of the liver.	The disease can be treated using specialized drugs, but prevention measures are very important and consist of interrupting the life cycle of the parasite by eliminating wet/swampy conditions (under which snails survive), keeping animals away from such environments when possible and rotational grazing of pastures.

Condition	Symptoms	Control/Management
Plate 15 Tetanus  **Source: http://microbiologyfall2010.wikispaces.com/Melissa**	General stiffness or hardness of muscle. Animals may show stiff gait with difficulty in turning or even standing. The neck and head are extended, and the tail is erect. The body temperature will rise on the daily basis. Animal is unable to open mouth; can hardly drink.	Over 80% of the infected animals will die. It is advisable that valuable ani¬mals should be vaccinated as a preventative measure. Prevent occurrence through good sanitary measures. Any wounds found on the animal have to be treated properly. All surgical procedures should be performed under strict sanitation. If infection is likely, vaccinating with tetanus antitoxin provides protection for about 2 weeks. Always seek veterinary advice.
Plate 16 Navel Ill/Joint Ill  **Source: http://www.nadis.org.uk/bulletins/lambing/lambing-part-5-%E2%80%93-diseases-of-newborn-lambs.aspx**	Fever, lethargy, swollen joints which are hot and painful, weakness, dull and unthrifty appearance, pneumonia or meningitis.	Prevention involves sanitary environment for parturition and proper treatment of the navel immedi¬ately after birth using antiseptic solution such as iodine. Make sure the new-born access the first milk.

Condition	Symptoms	Control/Management
Plate 17 Mastitis  **Source: http://www.vivekamfarms.com/goat_farming/goat_diseases**	Swelling of the udder, pain, heat and abnormal milk (colour, texture and thick¬ness). May not allow kid/lamb to nurse	Intra-mammary infusion of antibiotics. Seek veterinary assistance. Prevent by good management and sanitation. Avoid prolonged periods in muddy yards.
Plate 18 Bloat  **Photo source: http://www.sheepmagazine.com/27-2/laurie_ball-gisch/**	The area on the left side of the animal behind the last rib appears distended (excess gas), respiratory difficulty and restlessness.	Insert stomach tube, trochar or needle into the rumen. Oils such as mineral oil (1 cup) have been used successfully to treat such cases. Consult a veterinarian.
Plate 19 Pregnancy Toxaemia (Twin Lamb Disease)  **Source: http://grannysbest.blogspot.com/2010/01/dealing-with-pregnancy-toxemia-and.html**	• Unnatural neck position • Disinclination to move • Staggering gait • Impaired vision.	Prevention • Provide quality forage and fresh water particularly in the last trimester of pregnancy • Exercise if possible • Include corn in the diet. Treatment • If animal is close to lambing, inject with cortisone and vitamin B+ • Oral drench of molasses and propylene glycol.

Condition	Symptoms	Control/Management
Plate 20 External parasites or ectoparasites (lice, mites and ticks)  **Source: https://commons.wikimedia.org/wiki/File:Sarcoptic-mange-goat.jpg**	Severe itching, loss of hair, irritation of the skin, loss of weight, anaemia and mange.	Good sanitation measures are very important and effective treatment must be applied to the entire flock. Pour on treatments available are amitraz, organophosphates, cypermethrin and ivermectin. Always consult the Veterinary Services for guidance on the selection of best products. Always read and follow the manufacturer's recommendation in terms of dilution and the handling and application of chemicals. Insecticides should be used with caution.
Plate 21 Endoparasites (Haemonchus, Ostertagia and Trichostrongylous)  **Source: http://www.goatwisdom.com/ch-4parasites/parinternal.html**	Anaemia Weakness Loss of appetite Sudden death Weight loss Rough coat Pneumonia Diarrhoea Bottle jaw	Never graze pastures below a height of 3 inches (7.5 cm), avoid wet pastures, avoid over stocking, protect feed and water from contamination with manure. Rotate pastures.

Condition	Symptoms	Control/Management
Plate 22 Foot Rot  Source: http://www.vivekamfarms.com/goat_farming/goat_diseases	Animal shows signs of pain when walking, lameness, hoof appears rotten and may have a foul odour.	Routinely trim feet and implement foot baths using zinc or copper sulphate every 5 -7 days as prevention. Soak infected hooves in copper sulphate and water 3 - 4 times per week. Antibiotic treatments are also recommended.

SLAUGHTERING AND POST SLAUGHTERING MANAGEMENT

- Animals selected for slaughter should be rested and fasted 12 - 24 hours prior to slaughter.
- Ensure animals have access to adequate drinking water.
- The meat inspector must inspect animals before slaughter.
- Stun animals using a captive bolt and then bleed either hoisted or in a horizontal position.
- Holding the jaw or ear with one hand, insert the knife behind the jaw with the sharpened edge outward, and then draw it out through the pelt, thereby cutting the animal's throat.
- Bleeding time should be about 5 minutes.
- Suspend by the hind legs from a hoist or hanger.
- Removal the pelt (skin) using a knife or hands in a process known as fisting.
- When skinning, wash hands frequently to avoid cross-contamination.
- Cut through the belly muscle from the bung end up the breast bone.
- Cut open the breast bone with a knife.
- Free the gut using hands.

- Squeeze kidneys out of the kidney fat for inspection.
- Lamb carcasses are usually not split.
- Trim carcass of any undesirable materials including blood clots, bruises or areas contaminated by faeces, gut contents or bile.
- Do not try to wash off surface contaminants, trim them off instead.
- After trimming is complete, wash carcass using clean (potable) water to remove any blood splashes and loose fat.
- Wash from the hind to the fore at an angle to prevent particles from being pushed deeper into the tissues.
- The inspector will then place his stamp of approval on the carcass.
- Weigh carcass and place in the chiller at about 34 ^{0}F (1^{0}C) for 12 - 24 hours.
- After slaughtering, clean slaughter area to prevent the build-up of bacteria. Wash floor, walls and equipment. Use cleaning agents which help dissolve fats and proteins. Hand scrub areas such as sinks, knives, saws and sterilizers. Sanitize the slaughter area with approved agent(s).

RECORD KEEPING

Farmers can establish a farm schedule which details day to day activities to ensure that all necessary tasks are performed and completed on time.

These activities are:

- Daily inspection to identify an animal with un¬usual behaviour among the flock and the immedi¬ate isolation for investigation.
- Provide clean environment, feed and water.
- Record of important data.

The systematic collection of production and financial data is indispensable for effective management of the farm and recording of important data such as expenditure and in¬come will guide management in decision-making.

Individual records to be kept include sex, birth type (single, twin), quantity feed consumption, birth weight, date of breeding, sire number, ewe number, number of offspring and fortnightly live weights. Also, include a column for general comments.

Each animal should have a record card.

Also keep a veterinary diary to record incidence of diseases, treatment and mortality.

The identification and analysis of individual productive and reproductive performance of the flock allows for:

- Selection of the best replacement animals.
- Culling of inferior performers.
- Analysis of the performance of the breed¬ing stock: (Bucks, Rams, Ewes and Does) along with their progeny, preventing in¬breeding.
- Reproductive efficiency, improve feed conversion.
- Financial management.

The most commons form of identification used is ear tagging. Ear tags and tag applicators are commercially available.

APPENDIX

APPENDIX: EXAMPLES OF SHEEP AND GOAT RECORD CARDS

Health record

Date	Animal ID	Condition and symptoms	Treatment (Name of medication and dosage)	Method of administration	Withdrawal period	Notes

Ewe/Doe record card

Ewe/Doe ID: Breed: Sire: ID:

Date of Birth: Birth weight: Dam ID:

Type of birth (single, twins etc.) Weaning weight:

Date lambed/ kidded	Sire	Sex of lambs/kids	Birth weight	Type of birth	Lamb/kid ID	Date weaned	Weaning weight	Comments