

Chapter 9: Guidelines for Sheep and Goat Husbandry

Sheep and goats are small ruminants that share many characteristics, but certain aspects of facility design and husbandry must take into account their differences in behavior and physiology. For optimal results, the people who care for these animals should be well-trained and have good observational skills.

FACILITIES AND ENVIRONMENT

Sheep and goats used in agricultural research and teaching may be maintained under a wide variety of conditions, ranging from pasture or range to intensive production systems. The management system employed should be appropriate for the research or teaching objectives while providing resources for the proper care of the animals.

Artificial shelter for sheep and goats is not always necessary because of their adaptability and the insulating value of dry wool and hair. For shelter from wind, sheep and goats naturally take advantage of surrounding terrain such as trees and ridges. Trees and shrubs also serve as shade. When barns or sheds are provided, adequate ventilation and clean, dry surroundings reduce bacterial and viral build-up and increase animal comfort. In many cases, local environmental standards for manure handling and disposal are in existence and must be met. Guidelines for facilities layout and housing can be found in the *Sheep Production Handbook* (Sheep Industry Development Program, 1992) and in the *Sheep Housing and Equipment Handbook* (MWPS, 1994). Shelter to provide warmth, shade, and protection from wind and precipitation is important for goats. Fiber-producing goats require special care after shearing.

In range, pasture, or outdoor drylot conditions, area requirements are determined by available feed and forage as well as prevailing weather conditions. Thus, area requirements vary considerably among locations, depending on conditions, husbandry, and management. Minimum area recommendations for confined sheep are listed in Table 9-1. (MWPS, 1994). These recommendations are based on freedom of movement, animal safety, and waste management. The amount of barn space actually required depends on the intent of the research and teaching, type and slope of pen surface, weather conditions and exposure, and group size. Acceptable floor surfaces include well-drained compacted soil, concrete, composition mats, wood, and expanded-metal flooring. When goats have access to

outside lots or pastures, an adequate sheltered area is 0.5 m² (5.4 ft²) per goat (Kilgour and Dalton, 1984). Stall feeding of dairy goats requires 1.5 m² (16 ft²)/goat (Kilgour and Dalton, 1984). Sheep and goats are relatively intolerant of mud, so access to well-drained shelter is desirable. Paving of heavy traffic areas and outdoor pen areas may be desirable. Dust control in pens assists in the control of respiratory problems, health, and fleece quality.

Provision of additional feed and protection from wind and precipitation should be provided if the animals may experience hypothermy. In intensive production facilities, ventilation and structural design should prevent moisture condensation during cold weather and excessively high temperature during hot weather. Newborn lambs and kids and recently shorn sheep and goats are susceptible to hypothermy, hyperthermy, and sunburn, so frequency of observation should be increased and appropriate shelter should be provided if natural conditions do not offer sufficient protection. The water requirement of sheep and goats increases during hot and humid weather, and it is essential that animals have access to an adequate water supply to reduce the possibility of hyperthermia. Shade may be necessary in some situations. If exposure to stressful environmental conditions is prolonged in intensively managed facilities, animal density and ventilation rate within the facility should be adjusted. During hot weather handling or driving sheep or goats should be restricted to the early morning and evening, the cooler parts of the day.

Intensive Laboratory Environments

Some agricultural research and teaching situations require that sheep be housed under intensive laboratory conditions. Sheep that are subjected to intensive procedures requiring prolonged restraint, frequent sampling, complete collection of feces and urine, or other procedures experience less stress if they are trained and adapted to their intensively managed environments. Sheep may be kept in pens, metabolism stalls, stanchions, respiration chambers, or environmental chambers to facilitate these procedures. Sheep should not be housed alone in intensive environments and should be able to maintain visual contact with other animals.

Unless the experimental protocol has special light requirements, illumination in all animal rooms should be uniform to minimize the physiological effects of variation in light intensity. The diurnal cycle of light and darkness may

TABLE 9-1. Minimum Floor Area and Feeder Space Recommendations for Confined Sheep Used in Agricultural Research and Teaching,a,b

Facility	Floor type	Rams (65–90 kg, 180–300 lb)		Dry ewes (65–90 kg, 150–200 lb)		Ewes and lambs (additional creep area required)		Lamb creep area (12–14 kg, 5–30 lb)		Feeder lambs (14–50 kg, 30–110 lb)	
		(m ²)	(ft ²)	(m ²)	(ft ²)	(m ²)	(ft ²)	(m ²)	(ft ²)	(m ²)	(ft ²)
Building floor area	Solid	1.86–2.79	(20–30)	1.12–1.49	(12–16)	1.39–1.86	(15–20) ^c	.14–.19	(1.5–2.0)	.74–.93	(8–10)
	Slotted	1.30–1.86	(14–20)	.74–.93	(8–10)	.93–1.12	(10–12) ^c	.14–.19	(1.5–2.0)	.37–.46	(4–5)
Lot area	Dirt	2.32–3.72	(25–40)	2.32–3.72	(25–40)	2.79–4.65	(30–50)	1.86–2.79	(20–30)
	Paved	1.49	(16)	1.49	(16)	1.86	(20)93	(10)
Feeder space	Limit-fed	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)
	Self-fed	30.48	(12)	40.64–50.80	(16–20)	40.64–50.80	(16–20)	22.86–30.48	(9–12)	22.86–30.48	(9–12)
		15.24	(6)	10.16–15.24	(4–6)	15.24–20.30	(6–8)	2.54–5.08	(1–2)	2.54–5.08	(1–2)

^aAdapted from MWPS (1994).

^bSpace requirements should be increased for fully fleeced or horned sheep and during hot weather.

^cIncrease space if lambing rate is ≥ 170%.

also affect the performance of sheep, and, therefore, maintaining a photoperiod similar to that of natural daylight is recommended.

Sheep housed in intensive laboratory environments should be kept clean, and excreta should be removed at least once daily. Pens and stalls should be washed thoroughly at the outset of every trial and as needed thereafter. Collection vessels for feces and urine depend on the design and construction of the units. Cleanliness should be maintained, and fly infestations should be avoided. It is recommended that sheep be shorn prior to being maintained in these facilities to reduce fly and hygiene problems. Pens, stalls, and stanchions should be large enough to allow sheep to stand up and lie down without difficulty and to maintain normal standing and lying postures.

Sheep maintained in intensive laboratory environments have their activity restricted more than when managed under typical production settings; therefore, sheep in these facilities should be monitored more closely and should be observed more frequently. The length of time sheep may be maintained in these environments before removal to a pen for additional exercise should be based on professional judgment and experience. Studies that require housing sheep in such environments should be carefully evaluated by the ACUC; particular attention should be given to the length of time activity is restricted. Opportunities for regular exercise should be provided if exercise does not affect the experimental protocol. Sheep housed in these intensive environments for extensive periods (>3 wk) should be closely monitored, and particular attention should be given to appetite, fecal and urinary output, and soundness of feet and legs.

Fencing

Because there are many production situations and many sizes and ages of sheep and goats, the optimum fence construction varies (Miller, 1984). To contain most sheep and goat breeds, a 1.1-m (42-in) high board or wire fence is generally sufficient if adequate feed and water are provided and startle (caused by sporadic loud sound, flashing lights, dogs, and predators) is minimal. Boards, planks, high tensile wire, chain-link, and woven wire fence material with 2- to 5-m (6- to 16-ft) spacing of posts are typical for permanent pasture and yard fences. High tensile wire is stronger and stiffer than woven wire, and it breaks sooner when repeatedly bent. Plastic net or wood-slat snow fence materials are useful for portable, temporary pens. A 1.12-m (48-in) high fence is needed for goats. Goats are more agile than sheep; goats climb and jump more, jump higher, and habitually dig and crawl under fence wire. A four-wire electric fence is effective, but the goats should be given time to recognize and respect the electric wire before they are herded in the vicinity of the fence (Selders, 1981). Barbed wires, spaced 15 to 20 cm (6 to 8 in) apart and tightly strung on 2-m (6-ft) high posts, can contain mature goats on good pasture (Miller, 1984). Sheep and, especially, horned goats can get their heads and legs trapped in an inappropriate

fence. A goat fence of woven or net wires should have vertical wires spaced 30 cm (12 in) apart and horizontal wires spaced more than 15 cm (6 in) apart to allow the animals space to withdraw their heads. During the breeding season, it is difficult to keep bucks in pens separated from does that are coming into estrus. An electric wire around the inside of a net wire can provide an effective buck pen.

Lighting

Sheep or goats confined in a barn should experience diurnal cycles of light and dark. Photoperiod and light intensity should be adequate for inspection, maintenance of activity patterns, and physiological control of reproductive functions in breeding animals (Ortavant, 1977). An illumination of 220 lux is recommended (MWPS, 1994). A window area of .5 m² (5.4 ft²) per goat can provide adequate light and ventilation (Colby, 1972). Although natural daylight ordinarily is sufficient for sheep in most situations, supplemental light of 170 lux is recommended for ease of observation during lambing or kidding. In outdoor pens, lighting deters predators. Either natural or artificial light may be used to control reproduction by manipulating the photoperiod to which ewes are exposed.

FEED AND WATER

Sheep and goats should be fed and watered according to established nutrient requirements to provide for proper growth in young animals and long-term maintenance of body weight, body condition, and reproduction of adults (NRC, 1981, 1985). The body condition of sheep and goats may vary considerably during different parts of the grazing and reproductive cycles (Engle, 1994). Feeding programs should make it possible for animals to regain body weight following the normal periods of weight loss.

A wide variety of feedstuffs may be fed to sheep and goats, but changes in the roughage and concentrate composition of the diet should be made gradually. The animals should be managed during the transition period to avoid development of digestive disorders such as acidosis, enterotoxemia, and polio encephalomalacia. When nontraditional feedstuffs are fed, composition of the feeds should be evaluated, and attention should be paid to correcting potential nutrient toxicities or deficiencies.

Feeding and watering equipment should be constructed and located to be available for ready access, to prevent injury to animals, and to prevent contamination of feed with excreta. Feedbunks and water sources should be monitored regularly and contaminants should be removed.

SOCIAL ENVIRONMENT

Because sheep and goats are highly social animals, they should, when possible, be maintained in groups to avoid unnecessary stress (Kilgour and de Langen, 1970). Individ-

uals that are isolated from the flock or that have recently been separated from close social companions (e.g., at weaning) should be monitored frequently to reduce the possibility of injury following separation.

New individuals may be introduced into sheep flocks with relatively little social strife. However, unacquainted rams or bucks may severely injure each other. Care should be taken to prevent excessive fighting among males when they are newly mixed. Goats have a strong social hierarchy, and the addition of several goats to an established group is generally less stressful and more successful than the addition of an individual. Although horned and polled animals may be penned together, care should be taken to protect the polled animals. Sufficient space and multiple feeders should be provided to prevent individuals from dominating feed and water supplies.

In intensive production conditions, survival of the newborn lambs or kids can be enhanced by dividing larger flocks or herds into smaller groups, modifying facility design, increasing the frequency of observation, and using lambing pens or jugs. These procedures facilitate the development of the bond between dam and offspring.

HUSBANDRY

Managers and animal handlers should be trained and skilled in performing a variety of routine management procedures on sheep and goats. Ear-notching, ear-tattooing, tail web-tattooing, ear-tagging, shearing, and hoof-trimming are among the routine husbandry procedures that may be performed on sheep and goats at any age. Correction of entropia should be performed as soon as possible. Immunization should be provided against pertinent diseases (e.g., enterotoxemia). Colostrum should be provided as a source of antibodies soon after birth to avoid disease during the perinatal period. Further information on management procedures of sheep and lambs are described in detail in the *Sheep Production Handbook* (Sheep Industry Development Program, 1992) and the *Sheep Care Guide* (Sheep Industry Development Program, 1995).

Parasite Control

Parasite control is extremely important, especially when sheep and goats are on pasture. Frequent observation is necessary during periods of high risk from fly strike. Parasite control programs should be devised for each particular facility with the recognition that programs that work for sheep may not be effective for goats at the same facility.

Shearing

Because sheep do not shed wool naturally, shearing is necessary for their physical well-being. Shearing lambs during hot weather improves performance and stimulates feed intake. Shearing ewes prior to the lambing season provides a more favorable environment for newborn lambs and

makes it easier for lambs to suckle. Crutching, the practice of shearing the wool from around the dock and udder, is an acceptable alternative when ewes are not shorn.

The shearing facility should be clean and dry. To minimize the spread of infectious disease (e.g., caseous lymphadenitis) between flocks, shearing equipment should be disinfected after each flock. When infectious disease conditions are present, equipment should be disinfected between sheep. A good shearer is a skilled professional. A proper shearing technique restrains and positions the sheep correctly to ensure both control and comfort of the animal. Pregnant ewes may be shorn if handled properly. To facilitate the comfort of sheep during shearing, sheep should be held off feed and water for 6 to 12 hr before shearing. Sheep should be dry when shorn. Sheared sheep need shelter from severe cold, windy, or wet conditions. Raised or stubble combs, which leave some wool on the sheep, may be used if sheep are likely to be exposed to inclement winter weather conditions. In hot weather, shade is necessary for recently shorn sheep to prevent sunburn.

Other husbandry and health practices used in sheep and goat research and teaching that require special technical training and advanced skill levels include artificial insemination, electroejaculation, pregnancy detection, ultrasound evaluations, embryo flushing and transfer, and venipuncture.

STANDARD AGRICULTURAL PRACTICES

Tail-Docking

Tail-docking of lambs is performed to reduce the possibility of soiling the long tail with urine and feces and the subsequent development of fly strike, a potentially fatal condition. Kids have an erect tail that is not docked. Tail-docking of lambs is necessary unless the life span is limited to a season when fly infestations are unlikely and when the feed used does not result in a heavily contaminated fleece. Docking may be accomplished by several means including rubber rings, hot iron cautery, surgical removal, and surgical removal following the application of an emasculator (Battaglia and Mayrose, 1981; Smith et al., 1983; Ross, 1989). Very short docking is discouraged because it probably contributes to the occurrence of rectal and vaginal prolapses. Tail-docking should be done at as early an age as possible, preferably before 2 wk of age. Removal of the tail after 2 mo of age should be performed under local anesthesia with special care taken to prevent heavy blood loss.

Castration

Castration is performed to prevent indiscriminate breeding, thus exercising genetic control, and to regulate the lambing season. Castration also prevents the breeding of young female flockmates that may become pregnant but are not in adequate physical condition to undergo pregnancy

and lactation as well as the development of aggressive behavior in maturing males and the resulting injuries that frequently accompany this behavior. Castration is usually performed by application of rubber rings, by crushing the spermatic cord with an emasculator (the Burdizzo method), or by surgical removal of the testicles. Tetanus antitoxin should be given at castration when there is risk of tetanus. When a surgical method of castration is used, lambs and kids should be less than 2 mo of age; anesthesia should be used and special care taken to minimize hemorrhage and infection. The most appropriate method of castration depends partly on prevailing conditions.

Recommendations as to when docking and castration should be carried out are somewhat contradictory (Shutt et al., 1988; Lester et al., 1991; Wood and Moloney, 1992). However, docking or castration performed on lambs less than 24 hr old may disrupt the critical bonding process and the normal suckling activity of the lamb that are so important in securing adequate colostrum. Performing these procedures as early in life as possible, considering weather, nutritional stress, environment, and the presence of complicating disease processes, promotes overall lamb well-being.

Dehorning

Disbudding of goats should be performed at less than 1 mo of age. Cautery should be used when possible. Removal of horns of an adult animal should be done under general anesthesia or sedation and local anesthesia.

HANDLING AND TRANSPORTATION

Sheep show strong flocking behavior in pens as well as on pasture. Breed, stocking rate, topography, vegetation, shelter, and distance to water may affect the strength of this behavior. Isolation of individual sheep usually brings about signs of anxiety. Separation from the flock is a primary factor causing sheep to try to escape. Sheep tend to follow one another even in such activities as grazing, bedding down, reacting to obstacles, and feeding (Hutson, 1993). When handling sheep, these characteristic behaviors should be considered and used advantageously.

Transportation of sheep and goats should take into consideration the climatic conditions and productive stage of the animals. Care should be exercised in the transport of animals, and special consideration should be given during conditions of temperature extremes and high humidity. Appropriate measures should be taken to reduce the risk of pregnancy toxemia and transport tetany when sheep and goats are transported by supplying an adequate supply of nutrients immediately prior to long distance transport. Transportation of ewes and does during late gestation should be avoided. When possible, animals should be gated off into smaller groups during transport to prevent pileups and death losses.

EUTHANASIA

Severely injured sheep or sheep that are ill and have a very low chance of survival should be euthanatized. The AVMA Panel on Euthanasia (1993) identifies several appropriate methods for sheep, including overdose of anesthetic or injection with a euthanasia solution, penetrating captive bolt and exsanguination, or careful gunshot to the head. Other methods recommended by the AVMA may be used if proper equipment and expertise are available.

The carcasses of animals euthanatized by barbiturates may contain potentially harmful residues, and such carcasses should be disposed of in a manner that prevents them from being consumed by human beings or animals. In all cases, euthanasia should be performed by trained individuals who are skilled in the method used.

SPECIAL CONSIDERATIONS

Predator Control

In certain geographic locations and during certain seasons, protection from predators (e.g., dogs and coyotes) is an important part of providing adequate care for sheep and goats. Nonlethal means of predator control (e.g., guard animals, lights, noise, and fencing) are preferable but may be inadequate. Special fencing may be used to exclude some predators from livestock pastures (Sheep Industry Development Program, 1992). Lethal means of control are appropriate when necessary to reduce injury and loss of sheep and goats. State and local ordinances must be followed.

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