



## Housing of Sheep and Goat Under Different Management Systems

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### Abstract:

Sheep and goats are raised in both temperate and tropical climates. In India, more than 70% of small ruminant population is found in arid and semi-arid areas of western and southern peninsular regions. Each climatic condition has its own requirements for the design and construction of ideal animal housing. The basic requirement of adequate animal shelter is that it can be easily modifiable for the benefit of animals and provide protection against predators and thieves. Animal housing should shield the animals from extreme climatic conditions to minimize stress allowing optimal performance in terms of growth, health and reproduction. Animals need major protection from high/low ambient temperatures, humidity, solar radiations, wind and precipitation. In addition to that proper housing aid effective breeding management along with proper feeding and watering provisions. Housing should meet animal requirements but at the same time it should be cost effective.

**Keywords:** Housing, Sheep, Goat, Management

### Introduction:

Livestock systems based on grazing and mixed farming system will be more affected by global warming than industrialized system. This will be due to negative effect of lower rainfall and more droughts on crop and on pasture growth and of the direct effects of high temperature and solar radiation on the animals (Nardone *et al.*, 2010). These changing climatic condition demand appropriate housing to improve the production potential of small ruminants. However, the majority of farmers in our Indian condition are poor and marginal, and they rely on small flock size for their livelihood security (Nagpal *et al.*, 2005). Hence, there is less elaborate housing involved for small ruminants. Many traditional housing systems have been developed eventually. They need to be assessed in the view of changing climatic conditions and shift in the production system by progressive farmers.

### Different Managemental Systems of Sheep & Goat Rearing:

#### Extensive System:

This system is commonly practiced by landless, small and marginal farmers where animals are grazed on common property resources. By this way cost of feeding is reduced. This system is useful for either dry regions or less rainfall areas. Main feeding sources are pastures, rangelands or grasslands. In this system, there

is less elaborate housing requirements. Major drawback under this management system is higher incidences of parasitic infestations among animals. 90% of small ruminant are exclusively reared under extensive management in pasture, fallow land, native ranges and forest (Shinde *et al.*, 2020).

### **Semi-intensive System:**

Under this system, animals graze in grazing lands nearby to their villages and supplemented fodder and concentrate at stall after returning from grazing. It results in increased fertility of soil, higher crop yield, good growth rate of animals and easier management of flock. Proper night shelter is required along with feeding and watering provisions in the stall.

### **Intensive System:**

It involves stall feeding on roughages and concentrates for commercial production purpose. This system is prevalent in urban and peri-urban areas where land resource is limited. This offers greater protection of flock from predators and parasites. This system is usually practiced under organized farm conditions involving higher labor and capital investment. It requires well planned and elaborate housing.

### **Recommended Housing for Different Agro-Ecological Regions as per (Steele *et al.*, 1996):**

<b>Highland Areas</b>	<b>Mid-altitude Areas</b>	<b>Lowland Areas</b>
These are generally characterized by high rainfall and low temperature. Under these circumstances, houses with raised floors, gable roofs with sufficient overhang and solid lower walls are preferred. Upper portion of walls provide sufficient ventilation. Dampness should be prevented in the house as small ruminants are susceptible for pneumonia. In some highland areas where there is low rainfall, a well-drained packed earth or concrete floor can be used.	Here the climate is generally of humid nature. Most preferred housing system under these conditions is raised floors having slatted appearance. This helps in maintaining good ventilation and also minimizes parasitic problems by proper disposal of urine and dung. In dry areas, concrete floor can be used keeping in view proper ventilation measures.	It includes arid and semi-arid regions having hot dry climate for most of the year. Mostly comprises pastoral and agro-pastoral production systems. Here traditional housing systems are more common where there is requirement of night shelters only. Trees and shrubs provide natural protection against intense heat during day time. Packed earth is suitable under this since moisture build up is not a problem.

### **Points To Be Considered While Setting Up of Shelter for Sheep and Goat:**

**Low-cost housing materials:** As most sheep rearing farmers are poor financially so the focus should be on choosing low-cost material for housing. Generally, locally available material is preferred.

**Topography:** Shed should be constructed in an elevated area so as to prevent water stagnation. It favors better managemental interventions since there is better drainage. There are less chances of disease spread among flock.

**Micro-climatic conditions:** Fodder trees and grasses around the shed should be grown. This prevents damage to shelter and also provides feeding source. Sheds should be constructed with proper ventilation measures. Floor should be firm, have capacity to absorb water and can be easily cleaned.

**Nearby to owner house:** Shelter for sheep and goat should be approachable for owner so as to keep close watch on animals. It also aids in proper management of animals.

**Durability:** Shed should be made in consideration of local climatic conditions. The material selected should be durable, able to withstand extreme climatic conditions and should be cost effective.

### Traditional Methods of Housing:

#### Open Type Shed:

It comprises of a roof and fence to protect the animal from direct solar radiation, precipitation, predators and theft. It provides optimum natural light and free ventilation. This type of shed is suitable for hot arid and semi-arid regions with little rainfall and high seasonal fluctuations in air temperature. In semi-arid regions of India, temperature ranges from 4-48°C. Summer and monsoon seasons are most stressful for small ruminants in semi-arid region. Animals kept in open with a corner covered area with locally available material thatch is better than the asbestos-roofed shed during summer and monsoon. Heart rate, skin temperature, respiration rate and energy expenditure are higher in asbestos-roofed shed as compared to thatch roofed (Bhatta et al., 2005). Sometimes housing and management can be a source of stress for sheep (Vandenheede and Bouisson 1993). Adequate environment enrichment reduces the negative emotional states like fear and stress related with adaptation to the new environment (Nicote 1992).

#### Semi-Open Shed:

Here either one side walled shed or all sided walled shed up to the level of animal's height and remaining portion is left open till the roof. It is suitable for hot-semi arid region with reasonable monsoon rainfall. With certain modifications such as raised and slatted floor, this type of shed may also be suitable for hot and humid region. The animal shelter should buffer the extreme climatic conditions to reduce heat stress and protect the animal from inclement weather.

#### Lean-to-Type Shed:

It comprises of the traditional hut type shelter which is an extension of human residence. In hot arid and semi-arid regions of India small ruminant keepers follow this type of housing. This constitutes mud hut attached to the side wall of owner's house having thatched roof with long grass. Low cost is the principal factor for the traditional small ruminant producer to build a thatched type shed in attachment to the residential building.

### Shortcomings of Traditional Housing System:

#### Poor Lightning Provisions:

Under traditional housing system very less emphasis is given on the lightning provisions. Generally, these types of sheds are poorly lit leading to the disruption in the physiological activities and there may be reproductive loss due to inadequate light available to the animals.

**Inadequate Ventilation:**

As these houses are constructed keeping in view economic considerations hence there is no proper ventilation measures. Due to this there might be air borne diseases or less heat loss from the animal body.

**Drainage Problems:**

Drainage remains the serious concern as far as traditional housing system is concerned. Due to poor drainage planning, there are chances of vector borne diseases.

**Planning, Designing and Construction of Sheep and Goat Farm:****Legal Considerations:**

Land used for construction of farm should not be within the prohibited area. Construction should meet the regulations laid by the environmental authorities and pollution control board.

**Site Selection:**

Shed should be located on a well-drained area having adequate elevation approximately 1-1.5m above the ground level. Preferably it should have good approach roads so as to have easy access for deliveries and manure handling. Water and electricity services in that area should be sound so as to have smooth functioning of farm.

**Orientation:**

It is important aspect for ventilation measures and sunlight availability on farm. In tropical region East-West direction (longitudinal axis) is preferable so as to prevent the sun from heating up the stall too much. Whereas in temperate areas North-South direction (longitudinal axis) should be desirable as the sun shine on the floor for the maximum times keeping the floor dry and killing the parasites.

**Ventilation:**

It is of utmost importance to maintain desirable conditions in the stall. The main purpose is to provide desired amount of fresh air to all parts of the shelter, to maintain desired temperature levels and to control the increasing levels of toxic gases. If the animals cannot get rid of heat it hampers their feeding and ultimately production abilities. It is necessary to make the shed sufficiently high and ensure the openings for ventilation in the roof or walls. The ventilation openings should be placed high enough so that air does not blow directly past the animals. In warm climates, where the stalls are fairly open, a low wall of about 1m on the side where wind comes from is sufficient.

**Constructional Details:**

**Floor:** It can be either of packed earth/moorum, concrete type, litter floor, slatted wooden floor or bamboo/plastic floor. The right choice of floor is a key as unsuitable flooring may cause structural defects as well as vector-borne diseases. Packed earth or concrete floors should have a slope of about 5% for good drainage. In temperate regions and area having higher annual rainfall slatted wooden floor is recommended so as to facilitate disposal of dung and urine. This type of floor is constructed at height of 1m above the level of ground. The gap between the slats should be 1.4-1.6 cm so as to facilitate easy passage for fecal material and safe footing. Newborn and young lambs should not be put on slatted floors. The main disadvantage of raised

slatted floor is the high construction cost.

**Roof:** The selection of roof material should be evident based on the geographical conditions as roof gives protection to animal against varying environmental conditions. Roof can be of a shed, gable or a modified style. Slope is important as it aids in removal of rain. The roof should be waterproof with sufficient overhang to prevent rain from blowing in to the shed. Roofs can be constructed from iron sheet, grass/bushes, wood, asbestos sheets/tiles stone/brick or moorum/soil depending on production system, material availability and climate. Nowadays asbestos sheets/tiles are more common in organized farms. For Indian conditions thatched roof is the most suitable one looking at the financial condition of small ruminant farmers. Gable roofing, in which two roof sections slope in opposite directions is suitable for temperate and high rainfall regions. For hot arid regions roof should be placed at higher side so as to keep ventilation proper in shed. Length of overhang should be 75 cm to 1 m.

**Wall:** These are of two types namely – outer wall and inner wall. Outer walls are designed for biosecurity measures as it protects animals from external influences whereas inner walls aid in proper management at organized farm. Wall of 4-5 feet is generally sufficient for proper ventilation measures.

**Gate:** At organized farm level each shed should be provided with gates either on long or broad sides of the shed. Recommended dimension of gate is about 1m height and 0.8 m broad.

**Manger & Water Trough:** Manger should preferably be of cement concrete or wood with two compartments. Water trough may be made of cement concrete or galvanized steel buckets and they may be fixed or hung from a hook fixed to the walls.

**Dipping Tank:** Dipping is the periodic farm operation done for the eradication of ectoparasites. Dipping tank is made up of either galvanized steel sheets or stone/brick in cement mortar. It is generally located at the one side of the yard covering all the buildings in an organized farm.

**Footbath:** It is provided at the entrance of farm to protect the animals from foot rot. It is usually made of galvanized steel sheets or brick in cement mortar. It should be embedded in the soil suitably.

### Recommended Floor Space Requirements for Sheep & Goat (Indian Conditions):

Age Group	Covered Space (sq. m.)	Open Space (sq. m.)
Up to 3 months	0.2-0.25	0.4-0.5
3 months – 6 months	0.5-0.75	1.0-1.5
6 months – 12 months	0.75-1.0	1.5-2.0
Adult Animal	1.5	3.0
Male, Pregnant or Lactating Ewe/Doe	1.5-2.0	3.0-4.0

### Floor Space Requirement per animal – BIS Standard:

Type of animals	Minimum floor space/animal (sq. m.)
Ram or buck in groups	1.8
Ram or buck - individual	3.2
Lamb or kid – in groups	0.4
Weaner – in groups	0.8
Yearling or goatling	0.9
Ewe or doe – in groups	1.0
Ewe with lamb	1.5

**Feeding and Watering Space Requirement (BIS Standard):**

Type of animal	Space per animal (cm)	Width of manger/water trough (cm)	Depth of manger/water trough (cm)	Height of inner wall of manger/water trough (cm)
Sheep & Goat	40-50	50	30	35
Kid/Lamb	30-35	50	20	25

**Recommended Floor and Trough Space for Sheep/Goats in Intensive Production (FAO):**

Type of Animal	Weight (Kg)	Solid floor (sq. m)	Slatted floor (sq. m)	Open yard (sq.m)	Trough space (m/animal)
Ewe/Doe	35	0.8	0.7	2	0.35
Ewe/Doe	50	1.1	0.9	2.5	0.40
Ewe/Doe	70	1.4	1.1	3	0.45
Lamb/Kid	-	0.4-0.5	0.3-0.4	-	0.25-0.30
Ram/Buck	-	3.0	2.5	-	0.5

**Organized Sheep (Wool & Mutton Purpose) & Goat (Chevon) Farm:**

Small Ruminant industry is gaining momentum nowadays in India. Sheep and Goat farms are now operated at large scale. For large scale operations farm is divided into units which coordinate and allow smooth working of the farm. Various units involved in organized sheep and goat farm are as follows:

**Sheds:** Run or coral at the rate of 2 sq.m/animal and 1.2 m above the ground should be provided to each shed. Shed shall be fenced. The sheds of the following types are required for housing the sheep and goats:

- Ewe/Doe shed:** These sheds are used exclusively for housing ewes and does kept for breeding purpose. The shed shall be 15 x 4 m size and 3 m high and should accommodate not more than 60 ewe or doe.
- Ram/Buck shed:** This shed is used for housing rams or bucks kept for breeding purpose. The shed shall be 4x2.5 m size and 3m high and should not accommodate more than three animals.
- Lambing or kidding shed:** These sheds shall be used as maternity room for ewes and does. The shed shall be 1.5 x 1.2 m size and 3 m high. A manger for holding feed, hay and a bucket for keeping water shall be provided in the shed.
- Lamb or Kid shed:** The lamb or kid shed shall be used for housing lambs or kids until they attain maturity. The shed shall be 7.5 x 4 m in size and 3 m high to accommodate not more than 75 animals. The shed shall be partitioned breadthwise dividing it into two compartments.
- Sick Animal shed:** There shall be a sick shed for segregating ailing and disabled animals. The shed shall be 3x2m<sup>2</sup> size & 3 m high. There shall be a door 1 m wide x 2 m high on one of the broad sides of the shed.
- Shearing shed & Store room:** The shearing and store room may consist of two compartments with a dividing wall. One room may be exclusively meant for storing wool and shearing equipment and the other for keeping feed and medicines. The room may be 6 x 2.5 m size and 3 m high.
- Shepherd's house/Caretaker house:** The shepherd's house meant for the caretaker shall be located at a convenient place in the yard. The house may be 6 x 4 m size and 3 m high.



### Housing for Goats kept for Milk Production:

Rearing goat for milk production is becoming more famous nowadays due to its unique medicinal properties and easy digestibility. Various units are required in an organized Goat farm which are:

1. **Dairy goat shed:** The shed shall consist of stalls for keeping milking doe. The stalls may be arranged in two rows with a passage in between them. The dimensions of each stall meant to keep a single milking doe may be 1.2 m wide and 1.4 m long.
2. **Buck shed:** The shed shall be meant to keep bucks. There shall be partitions made of either wooden plank to divide the shed into two equal compartments for housing two bucks. The buck shed shall be away from the milk room as it can cause goaty odour in milk.
3. **Kid shed:** A shed used to accommodate young goats or kid.
4. **Kidding shed:** A shed used as maternity enclosure for doe.
5. **Milk Room:** A room where the excess of milk is kept for disposal and sometimes also used for milking doe.
6. **Store Room:** A store room should be provided in the shed for keeping feed and other material.

### Shelter Design Modifications Pertaining to Different Climatic Conditions:

1. **Development of Conceptual Design for Plastic Based 2-Tier Housing Model for Goats-** CIRG (Central Institute for Research on Goats) developed this housing system with an objective to increase the number of goats to be reared by landless farmers for improving their livelihood. Here adult goats reared in ground floor whereas new born and growing kids reared at the first floor. First floor is perforated plastic slatted floor with gradient of 1:40 towards outside.
2. **Yagya type shed:** ICAR-NICRA (National Initiative on Climate Resilient Agriculture) which is a network project has devised this type of shed for summer management in tropical and sub-tropical areas. This type of shed facilitate heat dissipation and maintain relative lower temperature at the ground level. Structure of shed is similar to Yagya which is performed in Hindu rituals and is made up of bamboo which is 3 storied. Walls are made up of 2 layers of brick with hollow space at middle which is filled with sand. Wall is kept cool by dripping water in sand layer of wall. This intervention helps in reducing stress.
3. **Bamboo dome:** Under NICRA project, bamboo dome type shed is recommended as it prevents lambs from cold stress for maintaining higher minimum temperature during extreme cold. As it is easy to carry hence a useful recommendation for migratory flock as well.
4. **Thermocol based shed:** Also recommended under ICAR-NICRA project. In this type of modified housing system floor is at the lower level than outside to maintain temperature. Roof is composed of thermocol enclosed with PV(Polyvinyl) sheets. This helps in maintaining lower maximum temperature and higher minimum temperature than conventional shed.
5. **Modified shed with grass mats:** CSWRI (Central Sheep and Wool Research Institute) recommended modified shed of grass mats for providing evaporative cooling to the growing lamb during summer in semi-

arid tropical environment. Wall of shed made with locally available water grass mats and they should be sprinkled with water for 3-4 times a day to enhance evaporative cooling.

## Conclusion:

Housing and shelter are very important aspect of animal management and welfare. It directly hampers animal production and performance under different climatic conditions. Under Indian scenario sheep and goat contribute livelihood to small, landless and marginal farmers. Keeping in view their financial condition there is need to devise certain shelter modifications which should be cheap, easily available and fit suitably in a particular geographical condition. Certain significant shelters were devised by our scientists working at CIRG, CSWRI such as raised slatted floor system for coastal areas keeping in view of humid conditions there. Shelter modification researches are still going on and scientists are exploring more improvements in this area.

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