



Housing Management of Dairy Cattle under Diverse Climatic Conditions



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INTRODUCTION

India, being a subcontinent, features a variety of climatic zones with year-round variations in temperature, humidity, and rainfall. As is well known, even though India has produced crossbreeds with high milk yields and good adaptability, the output is directly correlated with the availability of suitable shelter in line with the local climate. So this topic will cover the specific needs of housing that includes the type of housing system, orientation, roofing, flooring and flooring materials that are specific to the different climatic zones like

- ✓ Hot, Humid
- ✓ High Rainfall,
- ✓ Temperate (cold),
- ✓ Coastal and Cyclone prone areas

1. Space allowance

Cows are unable to evaporative cool themselves as the temperature and humidity levels rise. At the same time only less space may be provided for the animal in cold conditions as they benefit from being close to each other which eventually helps in heat retention. The following space must be provided in order to maintain the animals' productivity:



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Housing Area	Hot/Humid climate/animal	Temperate/cold climate/animal
Covered area	5.0- 6.0 m ²	3.5- 4.5 m ²
Open area	10.0- 12.0 m ²	7.0- 8.0 m ²
Feeding Manger Length	75 cm	60 cm
Water Trough Space	15 cm	10 cm

2. Type of Housing

Hot, Humid regions	Loose Housing system
Temperate and High rainfall regions	Conventional Barns (can also be used in other regions with open or semi open sides to allow greater ventilation)
Dry regions	Ranching can be followed.

3. Orientation of a Dairy House

Orientation in Different types of climatic conditions

- a. In coastal area, cool wind current moves from the sea towards the land during daytime. So, the long axis of the house should be the parallel to the sea to take advantage of the breeze that keeps the house cool during day.

- b. In Hot, Humid, Dry and composite type of climates, the orientation should be in East to West for the long axis of house to prevent the direct entry of sunlight into the house.
- c. In Cold climatic conditions, the long axis of the house should face the sun directly to the house to encourage soil warming and drying.

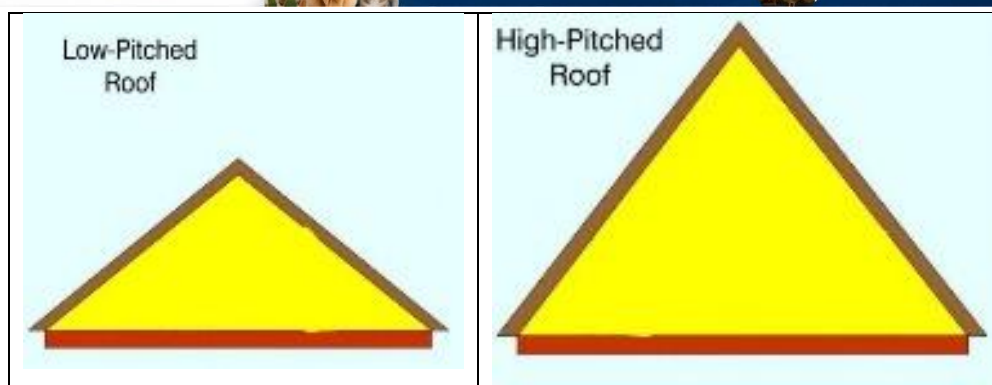
Type of Climate	Long Axis
Coastal Areas	Oriented across the prevailing winds
Hot, Humid and Composite climate	East to West
Cold climates	North to South

4. Roofing

(a) Roofing type and angles for different climatic condition:

Hot, Humid	Double sloped roof/Monitor roof (with sufficient ridge ventilation gap)
Cyclone prone coastal areas	Hip roof/Four sided roof is ideal
High rainfall areas	Gable roof is preferred

Hot and humid	Cold Climates
Thatched roof - 35° Tiled roof - 25 to 30° Sheet roof - 12 to 18° (Not more than 45°)	May be equal to or greater than 45°



(b) Roofing materials Hot, Humid, Dry and composite

- ✓ In tropical rural areas, the best materials for roofing animal shelters, according to FAO (2004), are thatch, followed by clay tiles, wood, reinforced concrete, galvanized metal sheets, PVC sheets, and asbestos sheets.
- ✓ Insulating materials like paddy straw thatch, EPE sheets, glass wool, rock wool, mineral wool, thermacol, and other local materials are used for false ceilings in animal shelters. These materials help keep the inside cool and protect against weather.
- ✓ The roof height should be 16 feet at the center and 8 feet at the edges.

Coastal and cyclone prone areas:

- ✓ Good roofing is important because of the harsh weather conditions like high winds, salt air (which can corrode roof), intense sunlight, heavy rain which can damage roof easily.
- ✓ Metal roofing is a good choice for coastal areas because it's durable and weather tight, can help prevent water, withstand gusts up to 140 mph.
- ✓ Aluminum and galvanized steel are particularly good choices because they resist rust.

The ways of protecting roofs in cyclone prone areas are:

- ✓ Install hip roofs with a slope between 25 and 40 degrees.
- ✓ Keep overhangs at the edges no more than 18 inches.
- ✓ Build patio roofs and verandahs as separate structures from the main roof.
- ✓ Attach the main ridge securely using gussets, collar ties, and metal straps.
- ✓ Use screws that are driven at least 50 mm into the purlin.

Ranking of roofs according to Thermal insulation from radiation: (Thomas and Sastry)

- ✓ Thatch
- ✓ Clay Tile
- ✓ Wood
- ✓ Reinforced Cement Concrete (RCC)
- ✓ Galvanized Sheets
- ✓ Asbestos

Cold Climatic conditions

Well-insulated roofing should provide heat retention, moisture control and durability.

Examples are

- I. Galvanized iron (GI) sheets and
- II. Reinforced concrete sheets (RCC) can provide comfort in the cold climatic condition.

5. Flooring

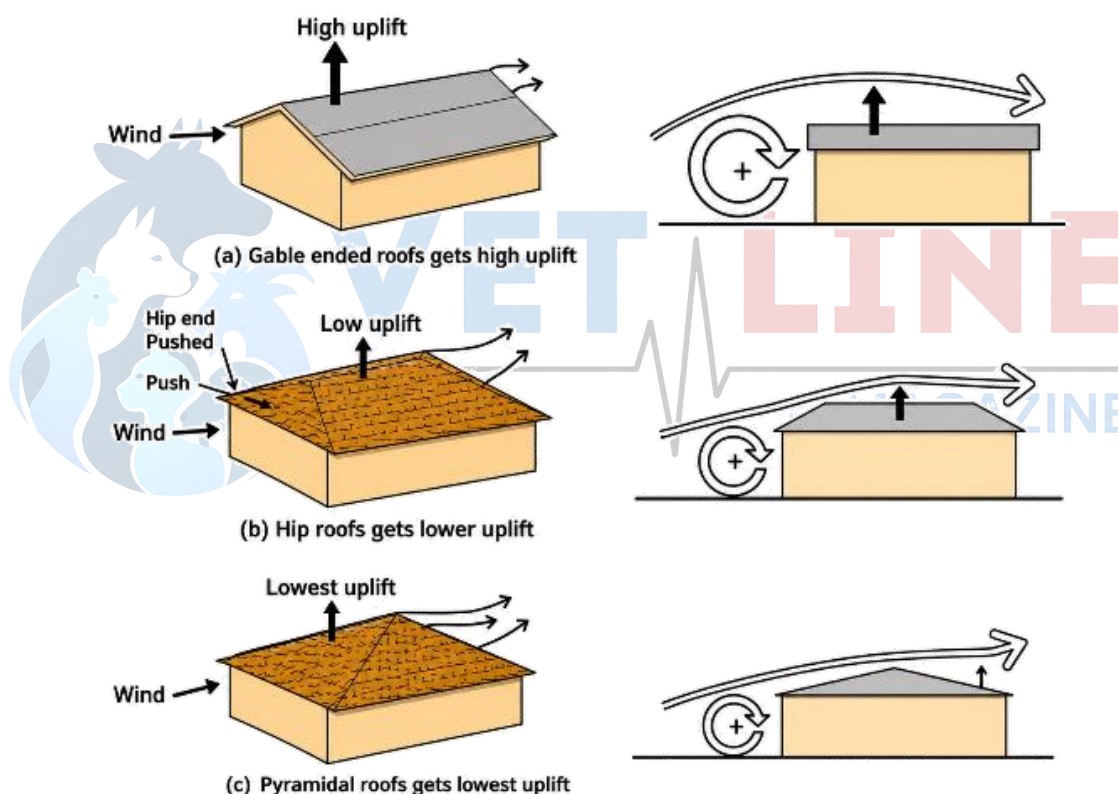
In any weather or climate, the floors in dairy buildings must be non-slip, not absorb water, and strong against wear, hits, damage from chemicals, and acid. The floors should not break, chip, or create dust and must last a

long time. To keep people and animals healthy and comfortable, the floors should have a damp proof treatment. They should also help transfer heat from the animals' bodies and protect against extreme cold or heat outside.

Slope	1:40 to 1:60 towards the drain
Plinth height	45 to 90 cm (can be more in damper areas)
Height from the ground	30 to 45 cm (even more in high rainfall areas)

Concrete

- ✓ It is pretty strong and costs less.



- ✓ Also, it can be made with a textured or grooved top when laid down to stop people from slipping.

Concrete Slatted floor

- ✓ Well-made slatted floors let cattle be kept in high numbers without needing bedding, and they stay fairly clean.

- ✓ The best width for each slat is around 150 mm, and there should be 40 mm spaces between them. The concrete slats should be shaped like a T so that the dung can easily fall into the pit underneath.

Other flooring materials

- ✓ Stone slab floor and
- ✓ Brick on Edge floor

(b) Flooring/bedding Materials

As Kains et al.(1998) suggested, the bedding should be soft, help animals rest, be cheap, have fewer germs, and support the health and performance of dairy cows. When cows lie down more, it shows they are resting, but when they stand up more, it means they might not be comfortable with their living conditions.

According to Calamari et al. (2009), the most lying time was seen with sand, then straw, mattress, and rubber mat. In colder weather, materials like straw (from rice or wheat) or wood shavings can help keep cows warm. But in hot weather, materials that let air pass through, like inorganic sand or rubber mats, are better choices.

