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Good housing is important for quality milk production. A well-designed shed provides a clean, comfortable home for the herd and a pleasant, efficient workplace for the operator. A dairy building should be carefully planned for the storage and handling of milk, feed, bedding and manure, as these accounts for most of the labour. A good dairy building must satisfy a number of regulations & must investigate these before construction begins. Make sure a plentiful, dependable supply of good water should be made available 24 h a day. Supply pipes buried deep in the ground will help keep water cool in summer and prevent freezing in winter. A large, mechanized operation also needs dependable electrical power plus a standby system.

**Site selection**

Select a high, levelled, well-drained site that will allow future building expansion. Build the floor above ground level to keep out runoff water. Where possible, pick a site that allows chill and hot control. Wind-breaks chill hot and wind-control fences should be used. Construct the milk parlour on the north or east side of the barn to reduce the summer heat load. Locate yards where they are exposed to winter sunlight those facing south or southeast thaw and dry faster, so are easier to manage. The barn should be served by a good all-weather driveway, or border a high, well-drained service yard with a good gravel base. Consider a circular driveway if milk is shipped in bulk. The truck driver should not have to open or close gates or back up to load. Build the barn close to pasture lanes and where it gives easy access to the house and other work areas.

**Housing system**

Shed must protect animals from wind, moisture and extreme temperatures. The warm or cold housing, or loose tie-stall or free-stall management depends on the size of operation, availability of bedding, climate, existing facilities, the degree of mechanization and personal preferences. Removes excess moisture in the winter and excess heat in the summer. Shed in winter is only slightly warmer than...
outdoors. Natural ventilation removes moisture and keeps the barn temperature about 5-10°C above that outside. Insulation under the roof reduces condensation in winter and heat buildup in the summer. Shed for protecting animal from cold cost less than warm barns but their watering systems must be protected against freezing. **Housing facilities**

The housing system should accommodate the need for animals to have shade in the summer, wind protection in the winter, and a clean, dry hair coat. Cold temperatures can be managed with nutritional management and protection from the wind along with a dry bedded resting area. Hot temperatures can cause heat stress, realized in reduced milk production and reproduction problems. Exotic and crossbred cattle and Buffalo should have access to natural or artificial shade during the hottest part of the day and easy access to water at all times. Muddy conditions usually result and the hair coat is constantly wet causing stress on the animals and high somatic cell counts. Wind Breaks Natural tree lines and wooded areas can act as windbreaks to protect animals. Temporary windbreaks can be constructed from large square or round bale packages of hay or bedding or forage boxes. The windbreak height of 8'-10' can be accomplished with a stack of 2-3 bales high. The bales are also stacked side by side to provide a solid windbreak barrier. A windbreak fence can also be constructed from wood posts and boards or synthetic cloth. Buffalo and crossbred cattle are highly productive animals and are able to perform even under very poor conditions of nutrition and management. However if they are provided with better conditions their productive efficiency could be improved. **Housing and management in organised farms**

In organised dairy farms the routines are similar to the backyard farms, except the animals are not let out for wallowing. Generally one labour takes care of about ten lactating animals. The animals are mainly kept tied up in a head-to-head or tail-to-tail system, with a raised manger in which the animals are fed. There would be a centrally located water trough for drinking water and potentially crossbred cattle and buffaloes are washed here once or twice a day. Depending upon the ambient condition the barns are washed and cleaned with water at least once a day and dung are picked up and dumped into manure pits outside the barns. These farm activities are very labour intensive. Now a day's dairy farmers have moved out of the cities and relocated in larger farms in rural areas, where they can produce fodder and make optimum use of manure, improving their profits by 30 to 40%. These farms have adapted improved technology in feeding and milking and they have also been able to bring down the replacement rate to about 10 to 15% while restricting calf mortality to around 10%.
Improved housing and management

The productivity of lactating cattle and buffaloes in closed housing and in loose housing were studied, and the result proved beyond doubt that loose housing was more profitable, with increased milk yield. Giving the animals some protection from hot and cold seasons has provided some valuable information. A higher conception rate of around 80% was obtained in animals given showers in addition to wallowing facilities. This may also prevent early calf mortality. If loose housing cannot be practised, animals should be tied up in a conventional half-walled shed during the daytime (after milking) from April to June. Over-herding of cattle or buffaloes in the shed should be avoided, with a maximum 25 animals in a floor space of 25 ft x 50 ft. The animals should be let out into an open paddock or yard overnight, for exercise and to provide opportunity for natural breeding behaviour. Care should be taken to empty and disinfect the ponds at least once week otherwise they can spread a variety of contagious diseases. With proper management dairy farming is indeed profitable.

Housing in warm and temperate regions

Good shelter/shed should protect the animals against thermal stress – mainly from direct sun exposure, rains and cold weather. It must allow good ventilation. Due to variations in climatic conditions under different agroclimatic zones/conditions, housing may therefore be different in different areas, but all housing should allow enough space for each animals. The open space of the shed should be covered with grass or concrete, just to prevent it from becoming an unhygienic mud hole in rainy seasons. Buffaloes and crossbred cattle are more susceptible to high ambient temperature/temperature humidity index (THI) and required protection from direct sunlight during hot dry and hot humid season, partly because the animals can maintain their normal body temperature without extra energy expenditure. High yielding animals thus have a disadvantage over lower yielding animals and need more cooling facilities. If animals are not provided proper shelters, wallows or showers, their feed intake and growth rate declines. Water intake increases and in the case of lactating animals there could be a drop in milk production. There is a significant decrease in conception rate and a rise in anestrus conditions, artificial insemination/conception, inter calving period, age of puberty and maturity during heat stress. The overall deterioration in the semen quality of breeding bulls was also reported.

Housing in cold regions

The shelter may be a simple construction with a roof and three walls. This system will allow the animals to go outside when the weather conditions are favourable. There should be a feeding manger inside the
shelter. A separate heated milking area is recommended. Dry and clean bedding is important during winter season to maintain animal healthy. Ventilation systems in livestock housing serve an important function, maintaining a comfortable micro environment. An adult dairy cow/buffalo will breathe out four to five gallons of water per day as water vapor and produce 2000 to 2400 BTU/hr. Ventilation systems continuously remove the heat, moisture, and odors created by livestock, and replenish the oxygen supply by bringing in drier, cooler outside air. Proper air exchange also removes gases such as ammonia (NH₃), hydrogen sulphide (H₂S), and methane (CH₄) which can be harmful to both animal and operator health.

Ventilation System Requirements

The good ventilation system should provide the following features.

1. **Air exchange.** Sufficient air exchange is accomplished by the natural driving forces of wind.
2. **Control.** Ventilation rates required adjustment depending on the inside and outside ambient conditions. This can be achieved by opening and closing curtains, doors, or ventilation panels manually.
3. **Flexibility.** Ventilation requires different operating conditions depending upon different seasons/climatic conditions. At least three operating conditions must be provided.
4. **Continuous minimum air exchange** is required to remove moisture constantly produced by the animals.
5. **Temperature control** which is needed during hot and mild weather conditions to remove excess heat from the building.
6. **High air exchange rates and air velocity** surrounding the animals is needed during hot weather to remove heat from the animal’s body.
7. **Proper barn construction.** Naturally ventilated barns must have sufficient and properly located openings that can be adjusted to take advantage of wind forces and direction.

**Shade:** Shade is the basic requirement during summer for protecting animals from direct solar radiation during the day. The most effective source of shades are trees. They provide not only protection from sunlight, but also create a cooling effect through the evaporation of moisture from their leaves. Shade has a beneficial effect during heat stress by lowering/maintaining the physiological responses of dairy animals within physiological limits.

**Fans:** Air movement increases the rate of heat loss from animal body surface, as long as the air temperature is lower than the animal skin temperature. Higher wind velocity reduced the body temperature, respiration rate and improved the weight gain, milk yield and milk composition. However, if the air temperature
is higher than the skin temperature, the skin will gain heat from the surrounding air. The THI more than 72 becomes a source of heat stress for dairy animals.

**Mist and Fan System:** The mist particles are sprayed on to the animal’s body to wet. A high velocity/ blasting fans are used to evaporate the moisture for cooling the animals. The results showed an increase in milk production of 0.66 - 1.90 kg/day for cows producing 20 - 25 kg/day.

**The milking byre:** The milking byre should be neat and clean, efficient place to milk the animal and handle, cool and hold milk. Sanitation regulations differed in different agro eco regions, therefore before construction of a shelter, should contact to the local health or dairy officials. The milk byre must meet strict sanitary requirements. Make sure that the bulk tank can move in and out, by installing double doors or removable panels that extend to the floor. The milking parlour is used for regular milking. It reduces labour by bringing the animals to the operator. Layout will depend upon required capacity, personal preferences, economics and design. Parlours can be as simple as a few stanchion milking stalls beside the milk house, with the milk carried out by hand, to something as complex as a rotary system with automated equipment and transfer systems. The animals wait to be milked in the holding area. This may be part of the regular animal traffic area or a separate space used only for this purpose.

**Dung management:** The common method to remove the dung from the animal shed in India is by manually. The dung is lifted in the tractor trolley and so transfer into the manure pit in the field away from the shelter for preparation of FYM. In organised dairy farms, the manure is either moved directly into a spreader for field spreading, or stacked outside on a paved slab that has low curbs or earth banks to confine runoff. Locate the proper storage area so prevailing winds carry odours should be away from the animal shelter.

**Points to be remembered for better animal management:**

1. The feeding, watering and milking place should always provide shade and protection from rains, either by trees or by a roof.
2. Cool drinking water either from a pond/hand pump/tube well helps the animals to maintain their body temperature. Drinking buckets are used extensively for animals as an effective way to provide clean, cool, fresh water at all times. Water troughs should always be placed in the shade.
3. Paddock with good leafy trees gives very effective protection to the animals from direct sun radiations. The trees should also be protected from the wild animals.
4. Under hot humid climatic conditions it is better not to built
walls, because walls may lead to inadequate ventilation, favour ing bacteria and mould growth which makes the shed unhygienic. To protect the interior from sunshine (or heavy rain), curtains made from straw, textile or other suitable material can be used.

5. Particularly for buffaloes, if possible provide wallowing, but the water of the pond should be clean and not far from the farm. Spending more time in walking during direct sun exposure and from the wallow costs more than it saves.

6. Intermittent showering of cattle and buffaloes with cool water has proven to be an efficient way for them to get rid of excess heat.