

Livestock Welfare Coordinating Committee

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GUIDELINE

SHELTER OF LIVESTOCK IN EXTREME WEATHER CONDITIONS

Extreme heat and severe cold snaps can have a negative impact on livestock on pastures. These conditions can also affect housed livestock (poultry, pigs) but this article focuses on pasture animals.

With the expected world-wide increase in ambient temperatures, livestock production will be negatively affected. Average daily temperatures ($^{\circ}\text{C}$) and relative humidity (%), where livestock start to experience heat stress effects, may be adjusted downwards: for cattle from 23°C to 21°C . Also, weather patterns are expected to shift, with longer periods of sun and heat, between shorter and heavier rain periods. To ensure that livestock is not exposed to the sun's radiation and high temperatures, they must have access to shade and other cooling strategies. In beef cattle, the threshold temperature above which dry matter intake is adversely affected is 30°C , with a relative humidity of below 80%; if the relative humidity is above 80%, the threshold temperature drops to 27°C (Hahn, 1999, Figure 1). Cattle that are heat stressed will show increased respiration rates as they try to cool themselves. If cows are breathing at more than 60 breaths per minute, action is needed.

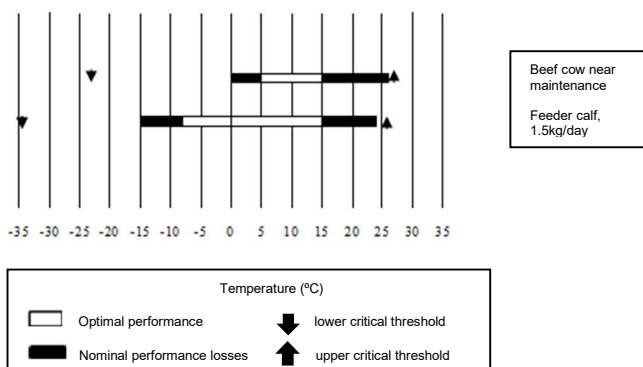


Figure 1: Critical ambient temperatures and zones for optimal performance and nominal performance losses in beef cows and feeder calves (adapted from Hahn, 1999).

During winter, we must ensure that livestock are protected from the cold winds that accompany the cold fronts that move in over southern Africa at this time.

Summer shade:

Extreme heat causes significant stress for all animals. This in turn can result in performance losses, severe discomfort and in extreme cases, abortions or death. Animals consume water to reduce metabolic heat and it is important that they have access to fresh, cool and clean water that is available in sufficient quantities, and that their water troughs fill quickly. Cattle can easily drink 10 litres each in just a few minutes. Animals should not be handled during periods of high ambient temperatures as this can increase their metabolic heat load. The ideal time to work with animals in summer is just after sunrise (6am-8am).

The metabolic heat load in livestock can be reduced by providing more nutrient-dense feeds and feeds that have a positive stronger cat-ion to an-ion balance in the feeds (Leeuw and Scholtz, 45th SASAS congress, 2012). During times of heat stress, livestock, especially ruminants, tend to eat more during the cooler night and early morning hours. This knowledge can be used by farmers to provide more feed during the night and in the early morning.

We can identify heat stress by observing livestock and looking for the following behaviour and symptoms:

- Panting (open-mouth breathing)
- increased respiration rate (>60 breaths per minute)
- increased water intake
- loss of appetite
- listlessness or lethargy
- increased salivation
- in severe cases the animal may become unconscious

Livestock that are kept on pastures can be protected from sun radiation and high temperatures in different ways. Protection can include trees and structures.

- **Shade trees:** these are the cheapest solution. Although local indigenous tree varieties are recommended, evergreen non-invasive exotic trees can also be considered. The moisture evaporating from their leaves cools the surrounding air, so livestock prefer trees to anything their owners can construct. Where trees are used and planted, a tree maintenance programme on the farm is advised, as continuous congregation under a tree may lead to soil degradation and to the tree dying. A risk factor is severe thunderstorms, where lightning may strike these trees and kill livestock underneath.
- **Shade structures:** various materials can be used to create shade structures. These can be zinc roofing sheets, shade cloth material, wooden planks, reeds or tree branches. The height of these structures plays an important role in their use by livestock. The upper 1 to 1.5 metres under the roofing material is the hottest part under the shade structure. With 80% shade cloth material, this trapped heat can be less as heat can escape through the shade cloth. It is therefore recommended that a shade structure with a height of 3 to 4 metres be used for cattle, and 2 to 3 metres for small stock and free-range pigs.

- How much shade: The recommended shaded area per animal is suggested in the table below.

Suggested shaded area requirements for beef, dairy cattle (75% of optimum amount), and small stock:

Beef calves ($\pm 200\text{kg}$) ¹	1.5 – 2 m ²
Beef cows ¹	3 – 4 m ²
Dairy cows ¹	4 – 5 m ²
Small stock ²	1 – 2 m ²

Note: These recommendations are based upon limited UK research results and previous experience; additional research is needed regarding the benefits and optimum size to improve production, welfare, and economics.

¹ <http://www2.ca.uky.edu/agcomm/pubs/aen/aen99/aen99.pdf>

² https://www.cansheep.ca/documents/VTB_Housing%20Section%202.pdf

This may seem a lot, but as the sun moves overhead, the shaded area also moves.

- Where to put up the shade structures: As airflow is important to ensure limited heat build-up beneath a shade structure, shade structures should be at least 30m away from farm buildings and placed in such way that wind can move through the structure.
- Fixed shade structures: these cannot be moved and are not always placed where they are needed. This can become costly for the farmer. Fixed structures are most suited to feedlots and dry-lots – on pastures they may cause livestock to congregate close to the shaded area which can result in over-use of the pasture near the shaded area and cause it to become severely trampled and muddy.
- Portable shade Frames: these could have a ski-type base for easier transport. The frame can be 3m wide, 6m long and 3m high, with 6-7cm tubing towing triangle with a hook that can be connected to a tractor. The frame can then be moved where it is required. An 80% shade cloth is recommended, preferably in a light colour that reflects sun and reduces heat. Corrugated zinc sheets can also be used.
- Shade requirements: A well-designed portable shade structure can reduce total heat load by 30-50% for livestock. As cattle are not always under the shaded areas and it will be impractical to provide 100% shade to livestock, a practical compromise is to provide 75% of this requirement to your livestock. As an example, if the herd size is 100 LSU, and you need about 3m² per animal, a shaded area of 300m² (15m x 20m) will be required. This is large and 75% of this will be a shaded area of 225m², or 15m x 15m. It will be difficult to construct a single portable structure of this size, and using the 3m x 6m structure proposed above, about 10 or 12 of these will be required for 100 LSU which will not be possible for most farmers. Therefore, shade trees would be a more practical solution.

Winter shelter:

During winter we also need to ensure that livestock are protected from the cold winds and freezing temperatures. The cold weather warnings are issued to farmers to ensure that the livestock is protected from the cold snaps.

- Tree lines, shrubs and high grass: if livestock are to remain on the pastures during the winter, they could be exposed to cold winds. Providing wind breaks behind which livestock can lie down and not be exposed can improve welfare for the livestock and also reduce maintenance requirements (less energy is spent on keeping warm). Where camp systems are used, non-invasive shrubs or tall grasses can be planted along the fences to provide protection against cold, windy conditions in winter.

Benefits of providing shade and shelter to pasture animals:

- **Weight gain:** researchers at the University of Arkansas have found that providing cattle with artificial shade resulted in an average daily gain of more than 20% compared with cattle without shade, and cattle with tree shade showed a nearly 60% increase compared with those with no shade.
- **Milk production:** others (University of Florida) indicated that dairy cows provided with shade produced 10-19% more milk than cows without shade.
- **Fertility:** researchers (University of Missouri) found that shade increased the overall pregnancy rate of cows by nearly 40%.
- **Improves water quality:** livestock tend to drink more to cool down when heat stress occurs – standing in streams or dams can be a familiar sight. Putting up a functional shaded area away from the stream or dam can reduce this behaviour and reduce the stirring up of the water (which becomes less muddy) and trampling of the grass or ground around the water source.

Pictures from Google of animals seeking shelter and the types of shelter that could be provided:



Picture 1. Cattle utilizing shade from large advertising boards, no shade trees in the paddock.



Picture 2. Portable shade structure for larger groups of animals.



Picture 3. Portable shade structure for a few animals.



Picture 4: Portable shade structure being moved.

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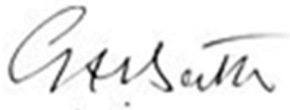
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