

## Heat Stress in Southland – Kirsty Verhoek DairyNZ

### Do cows in Southland get heat stressed?

Heat stress in cows is a significant seasonal challenge in some regions, and hotter weather is expected to become more common in New Zealand.

Like people, cows also feel the effects of hot weather, but cows begin to experience heat stress at much lower temperatures than humans, preferring temperatures below 20°C. This is partly because cows generate heat by digesting feed and producing milk. They absorb solar heat when out in the sun. Heat stress occurs when cows have more heat than they can shed, which creates discomfort and reduces milk production and fertility.

### Identifying heat stress

The key changes to look for when identifying heat stress include:

- Cows breathing faster. See **Figure 7** which explains how to check a cow's breathing rate. Less than 7 breaths in 10 seconds means cows are comfortable, and  $\geq 10$  breaths in 10 seconds are an indication that cows need cooling opportunities.
- Cows standing more but grazing less.
- Cows crowding in shade.
- Increased water intake and cows hanging around troughs.
- Cows walking slower to and from the shed.
- Less milk in the vat.

### Checking breathing rate

The earliest indicator of heat stress is increased breathing rate. Ideally, observe 10 cows on a warm summer afternoon, but you could start with just one – a high producing black cow will be most at risk.



**Figure 7.** Checking breathing rate. Sourced from DairyNZ [www.dairynz.co.nz](http://www.dairynz.co.nz)

### Understanding heat load

Managing heat stress in cows is crucial for their well-being and to maintain milk production. To do this, it is important to know how hot your cows are feeling (i.e., their heat load). You can do this by watching for fast breathing, drool and sometimes with the mouth open (see an example in **Figure 8**). It is even better if you can use a combination of weather forecasts and cow-specific factors for assessing heat stress risk.



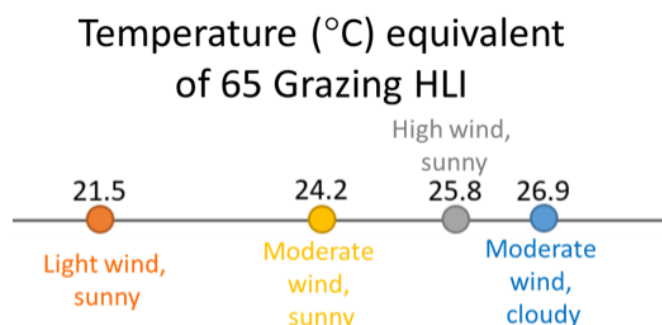
**Figure 8.** Cow at Southern Dairy Hub exhibiting signs of heat stress on a hot day with mouth open, panting and tongue sticking out.

If you are in a place where it is not very humid, just looking at air temperature can help. But in more humid areas, you also need to think about the humidity because it makes it harder for cows to cool down by sweating and breathing faster.

The Temperature Humidity Index (THI) is a well-researched global indicator which combines air temperature and humidity to have a better understanding of how hot it really feels. For example, if the THI is 68, it is like having a temperature of 22°C and 50% humidity.

However, cows on pasture are also exposed to solar radiation and wind, which means that THI may not be accurate for New Zealand cows that are grazing outdoors.

In New Zealand, researchers have been developing a tool called the Grazing Heat Load Index (GHLI) to assess heat stress in cows while they are out grazing. This index helps to gauge the impact of heat on cows' well-being. This index considers not only the temperature and humidity, but also factors like how sunny and windy it is, and related it to cow respiration rate, which is a common indicator of heat stress. Work so far has reported a GHLI threshold of 70 when dairy cow welfare is compromised due to heat, although cows do increase their breathing rate more steeply before this threshold, at around a GHLI of 65 (**Figure 9**). For example, if the GHLI is 65, this is like having a temperature 21.5°C, with light winds and sunny conditions (**Figure 9**).



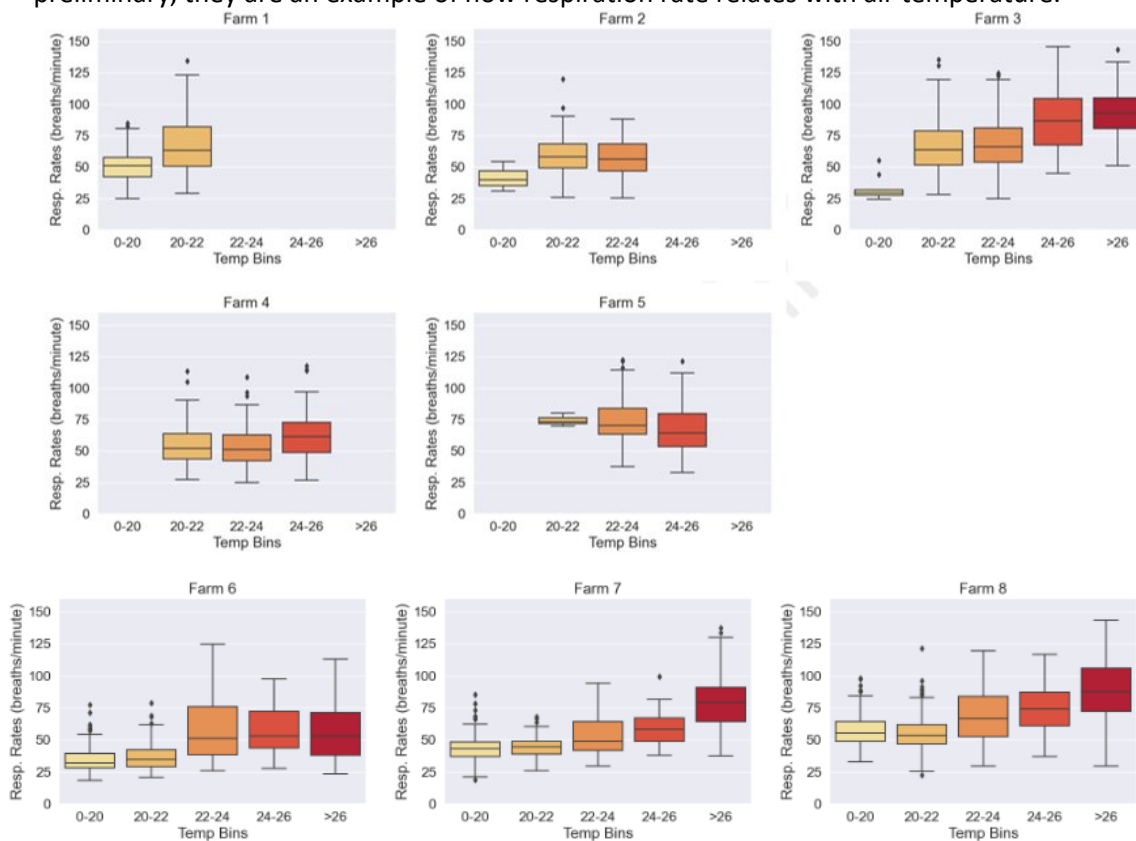
**Figure 9.** Grazing Heat Load Index (HLI) assesses heat stress in cows while they are out grazing. This index considers not only temperature and humidity, but also how sunny and windy conditions are. Cow respiration rate starts to increase steeply from a GHLI of 65, which can be equivalent to a range of conditions such as that pictured here.

### Our current research

DairyNZ, in collaboration with AgResearch and Fonterra, are working together to better understand heat stress in New Zealand as part of the New Zealand Bioeconomy in the Digital Age (NZBIDA) research programme. We want to make sure that the GHLI we use in New Zealand is as accurate as possible.

To do this, we have gathered data from research and commercial farms all over the country. We are also exploring technology like rumen boluses and collars to monitor factors like rumen temperature and how much cows are panting. These are signs that can tell us if a cow is getting too hot. In the summer of 2023, we watched cows on eight farms in different regions, including Northland, Waikato, Canterbury, and Southland. We looked at how fast cows were breathing, whether they were panting, and used sensors to collect additional information such as rumen temperature. We also monitored milk production and recorded weather data at each site.

This was the first-time we have collected so much data from cows in the South Island. The North Island had a wetter summer and did not get as hot as the South Island, but it meant the weather was quite different from one place to another (**Figure 10**). Cows were observed to have respiration rates over 60-70 breaths per minute which is an indication that heat stress is starting to occur. In the South Island, cows were observed to have respiration rates up to 100 breaths per minute indicative of heat stress. While these results are preliminary, they are an example of how respiration rate relates with air temperature.



**Figure 10.** Cow respiration rate (breaths per minute) observations plotted against air temperature bins (degrees Celsius) for farms located in the North Island (farms 1 to 5) and South Island (farms 6 to 8).

### How do we manage heat stress into the future?

Changes in our climate and how we farm increase heat stress risks for our dairy cows. It is not just an issue in warm places like Northland; even in Southland, there is a risk of cows getting too hot.

To tackle this, it is recommended that when the temperature goes above 20°C (depending on how humid it is and whether it is sunny or windy), farmers should look at their cows and consider providing cooling opportunities.

Farmers are already using various strategies to mitigate heat stress:

- Providing shade from trees or buildings (**Figure 11**)
- Making sure there is plenty of water troughs with clean, palatable water, and good water pressure to refill troughs.
- Adjusting milking routines to avoid walking in peak heat.
- Using sprinklers and fans in the dairy shed at milking.
- Carefully choosing where the cows graze to reduce their heat load (i.e., maximise shade, minimise walking distance etc).



**Figure 11.** Provision of shade to reduce heat load in cows. Photo credit: Karin Schutz

With the data we are collecting and learning about, we are getting better at predicting when cows might start to feel too hot. This means that we can use these strategies even more effectively in the future.

Looking ahead, we want to learn more about how factors like the cow's breed, coat colour, and the farm's set up affect heat stress. In New Zealand, where cows graze outdoors, we need to understand how this heat affects their milk production and what the other signs of heat stress might be so we can better predict it. We also want to understand if the "too hot" threshold might change as our climate changes, especially in different parts of the country.

To achieve this, technology will play a key role in data collection. This means we will not have to rely on manually counting how fast cows breathe, which is how we do it now. The goal is that by using technology, farmers will ultimately be able to make decisions that improve cow well-being and, consequently, milk production.

**Call to action:**

- 1. Identify when your cows might be heat stressed.**
- 2. Have strategies to deal with it.**