

Managing cows in tropical Australia

Maintaining cow comfort and production while using local feed resources efficiently



Home in Queensland, Australia



Where is subtropical dairy production in Australia



Pasture land in the upland area



Father and son with a mixed beef and dairy herd



Two generations of pasture farming in the upland





Lowland

Lowland during winter-
irrigated temperate pastures
e.g. ryegrass



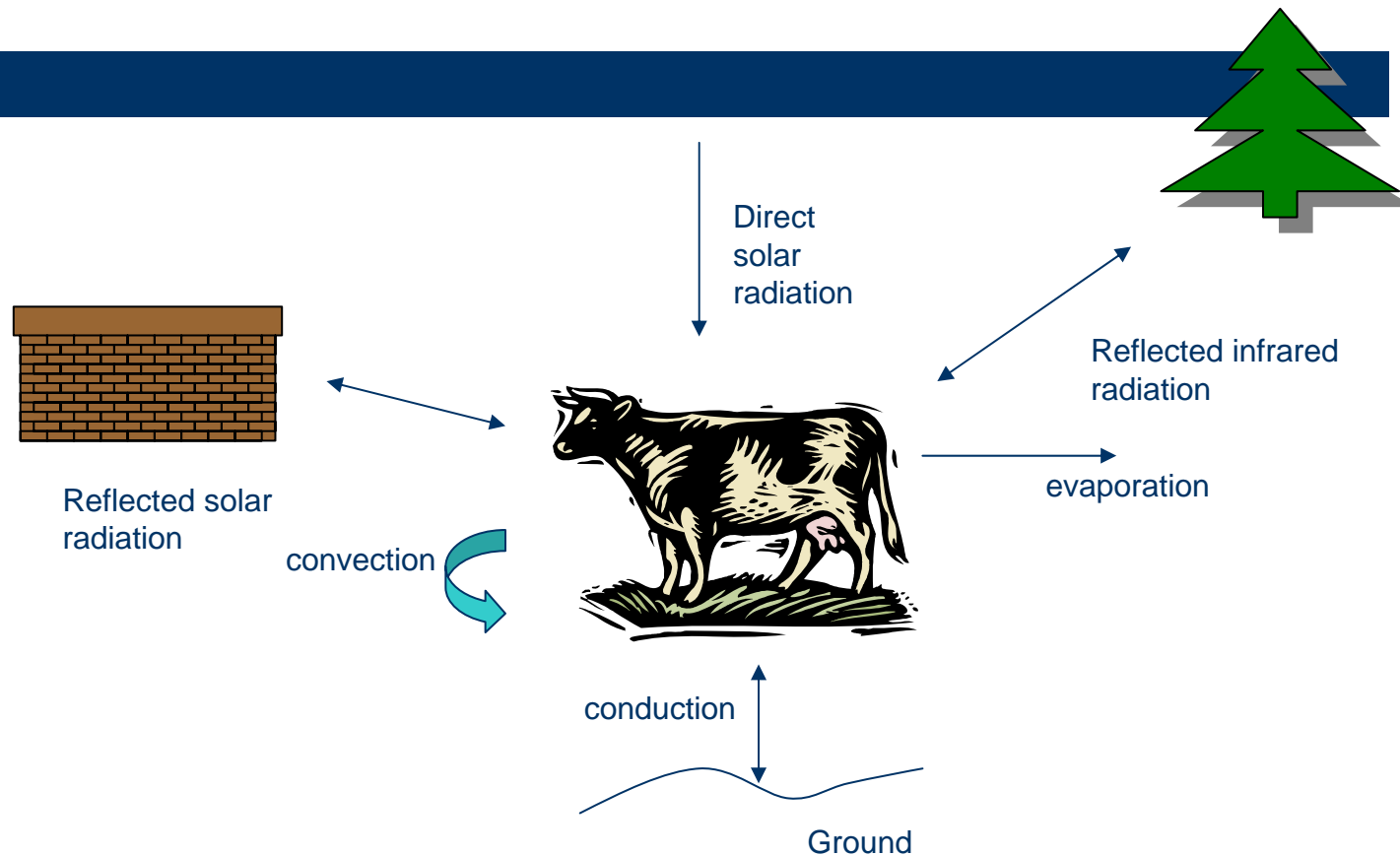


Cows in the lowland on a summer day – typically 35°C, >50% Relative Humidity (RH)

The basics of heat gain and loss by the COW

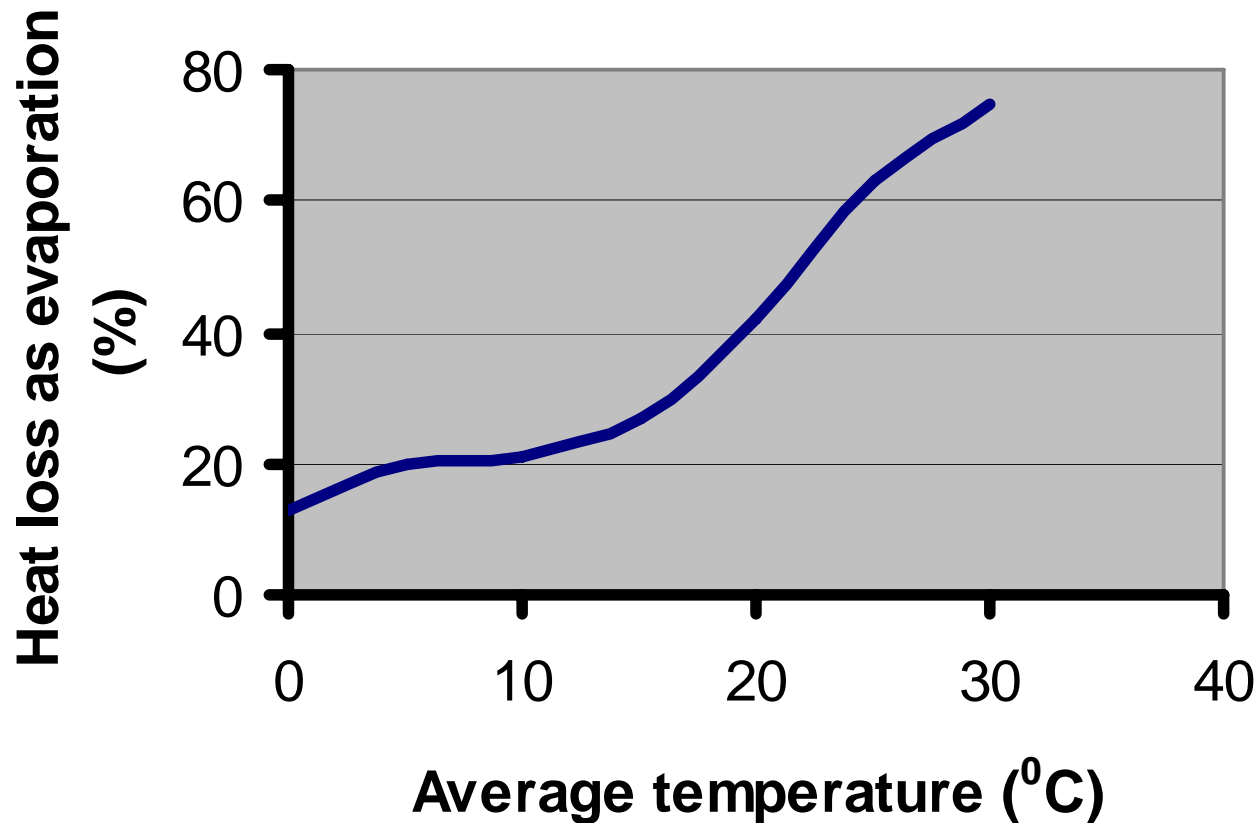


Sources of heat gain and loss in the COW



High milk production also generates extra heat in the cow – about 5MJ/L

Cows depend more and more on evaporation to cool themselves as the temperature rises



Some effects of heat stress on the cow

- Reduced
 - Feed intake
 - Milk yield
 - Milk protein content
 - Conception rate
- Increased
 - Somatic cell counts
 - Weight loss
 - Rectal temperature
 - Respiration rate

Tools to use in assessing likely level of heat stress in cows



Tools for assessment of heat stress in cows – THI (Temperature Humidity Index)

$$\text{THI} = (1.8 \cdot T_{\text{db}} + 32) - (0.55 - 0.55 \cdot \text{RH})(1.8 \cdot T_{\text{db}} - 26) \text{ or}$$

$$\text{THI} = T_{\text{db}} + 0.36T_{\text{dp}} + 41.2$$

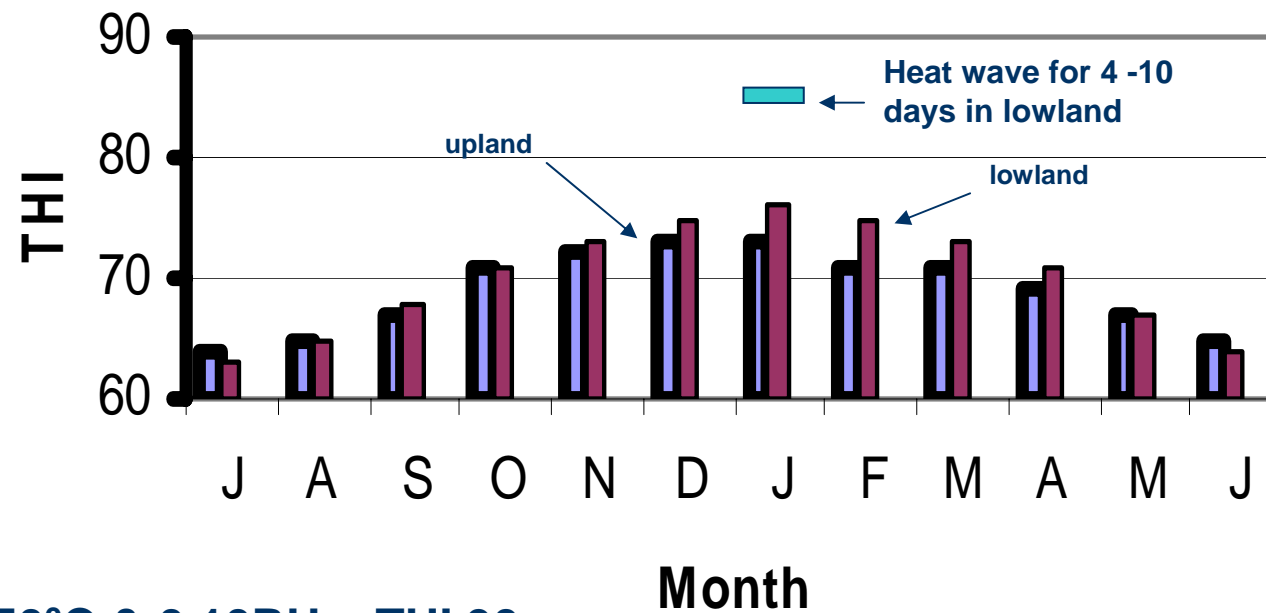
- T is °C, db dry bulb, dp dew point, RH is a fraction e.g. 0.4,

In Holstein Friesian cows

- < 73 comfortable
- 73-78 mild stress
- 78-83 severe stress
- >83 potential death

- Higher values are tolerated by e.g. AFS, Jerseys, Sahiwal

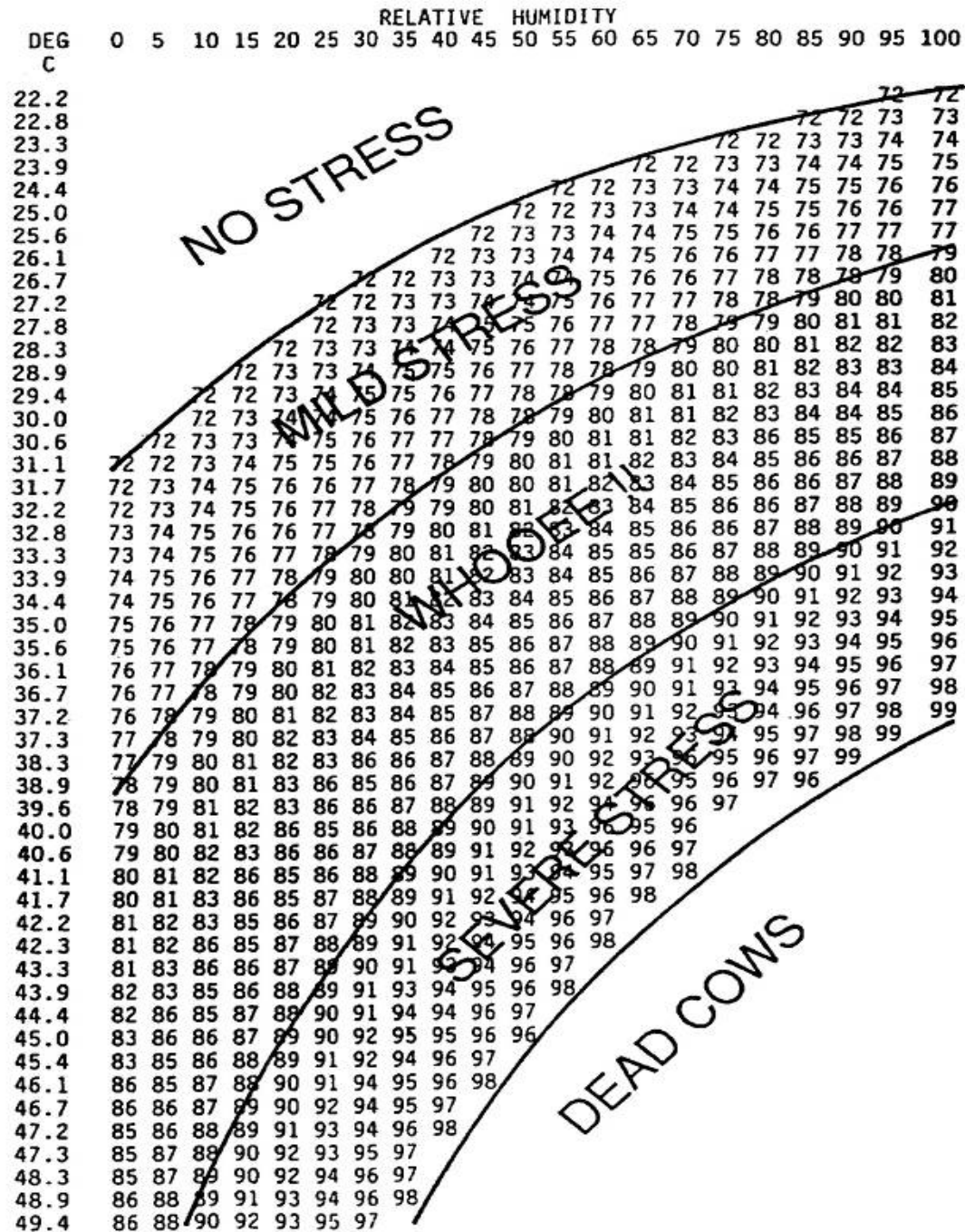
The THI in the 2 milk production zones in Queensland



50°C & 0.10RH = THI 90

The impact of temperature and humidity on heat stress in HF cows

Temperature (°C)	Relative humidity (%)			
	20	40	60	80
25	none	none	mild	mild
31	mild	mild	strong	strong
38	strong	strong	severe	severe
44	strong	severe	severe	death



Source: Dr Frank Wiersama (1990) Dept of Ag Eng, The University of Arizona, Tuscon, Arizona.

Other tools for assessing heat load on COWS

- Cow behaviour
 - Shade seeking
 - Not eating
 - Salivating/drooling/open mouth
- Respiration rate
 - >70/minute is uncomfortable
- Rectal temperature
 - >39°C is uncomfortable
 - >42°C is lethal
- Atmospheric temperature
 - >26°C is uncomfortable
 - Linked to humidity

Research results for grazing cows



Effect of tree shade on HF cows

Maximum Temperature = 31°C, RH = 60%

Measure	No trees	Tree shade
Rectal temperature pm (°C)	40.0	39.6
Milk yield (L/cow)	15.8	17.2

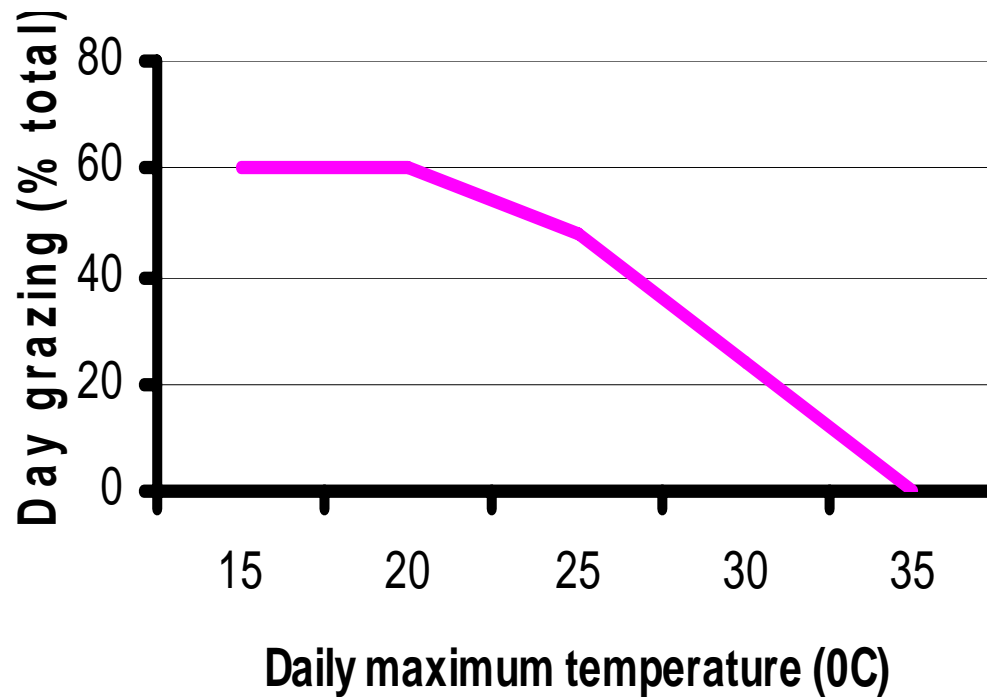
Trees are needed for paddock shade. Can use movable shade structures. Difficult with large herds.



Night grazing is important in hot weather

- Queensland
- Best pastures are used at night during summer
- Graze 80% of farm at night
 - Increase milk yield per cow 16% compared with using 20% (night paddocks)

Effect of daily maximum temperature on grazing during the day

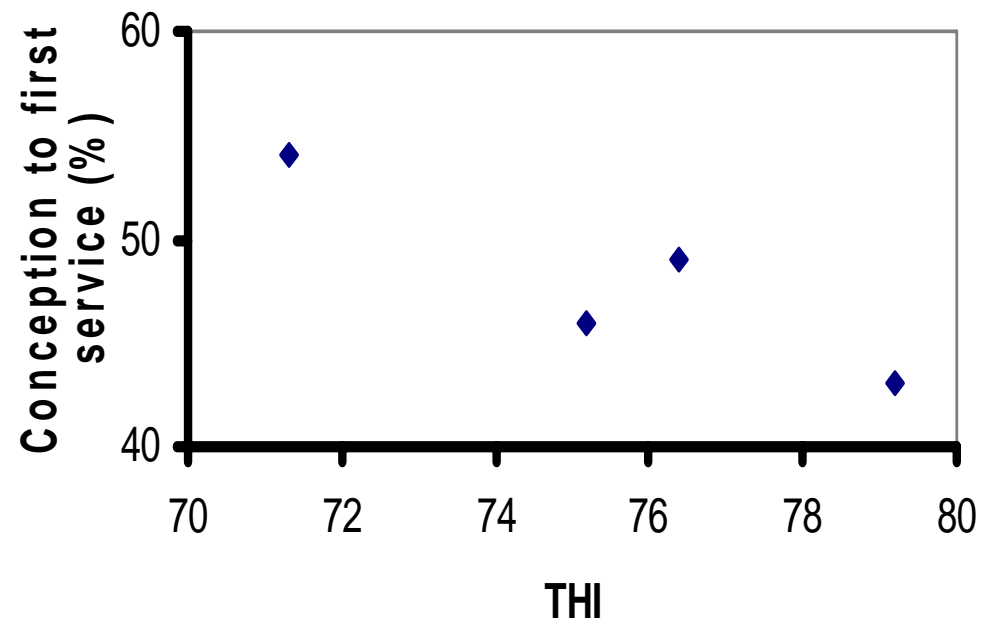


The effects of walking on heat load on cows

- Thermoneutral environment (5 – 20⁰C)
 - 1.2 MJ/km horizontal
 - + 0.02 MJ/m altitude
 - Some authorities have higher values, 2-6MJ/km
- Walking under heat stress would increase these values

The effects of pasture and temperature on conception rates in HF heifers

- High ambient temperature reduced conception rate
 - $> 26^{\circ}\text{C}$



Research results for shade and sprinklers



A feedpad on a 1200 cow dairy



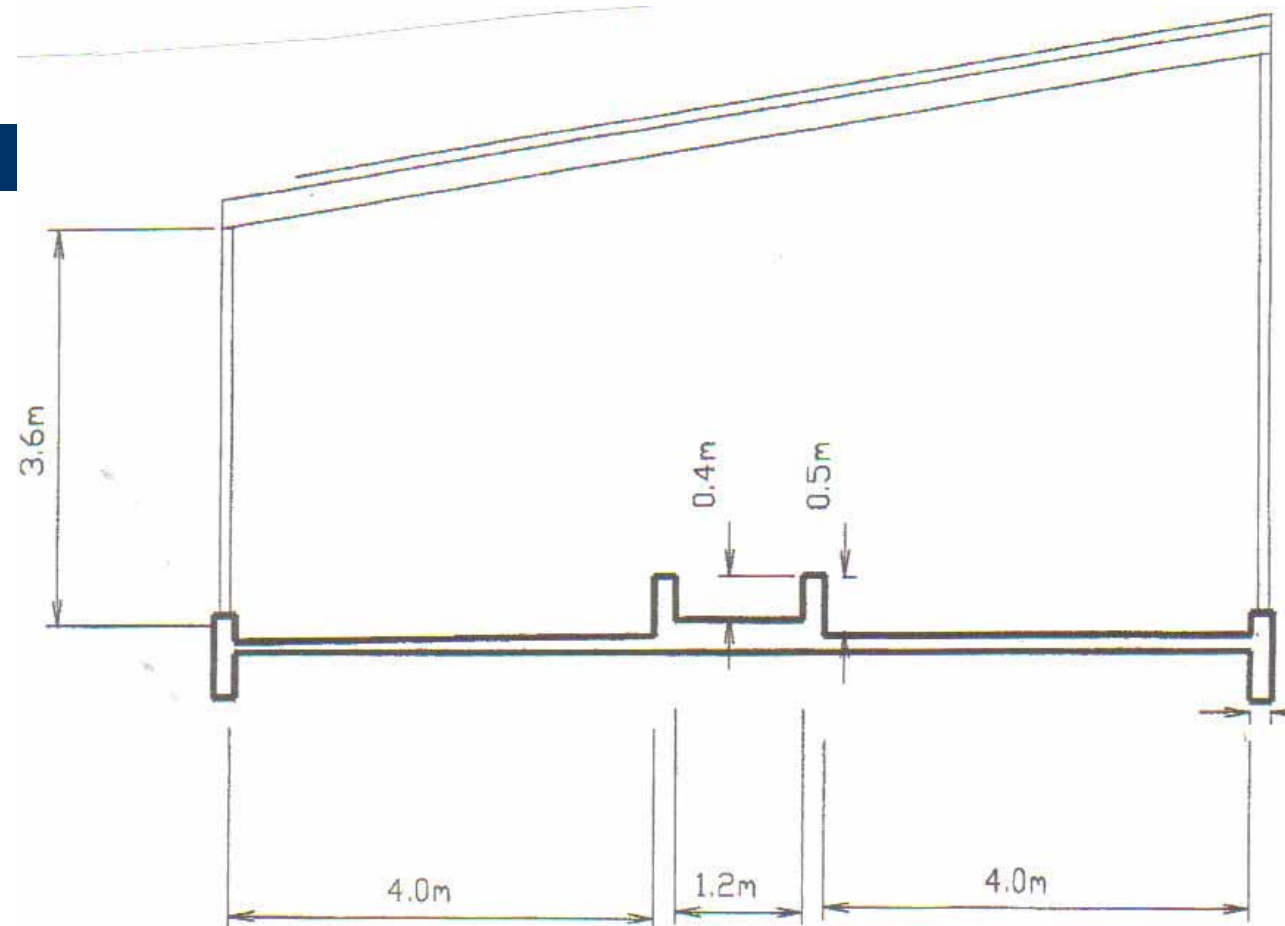
A low cost feedpad for 100 cows



A high cost feedpad for 300 cows



Side plan for a special built feed pad



Design

Allow 700 mm per cow in length. Ideal lengthway fall 2-3% and 25 mm fall cross-ways away from the feed troughs. Alleys minimum 125 mm reinforced concrete. Storm water drainage direct to concrete (no gutters). Designed for 2500 mm annual rainfall environment.

A comparison of 4 different cooling strategies between morning and afternoon milkings for HF cows

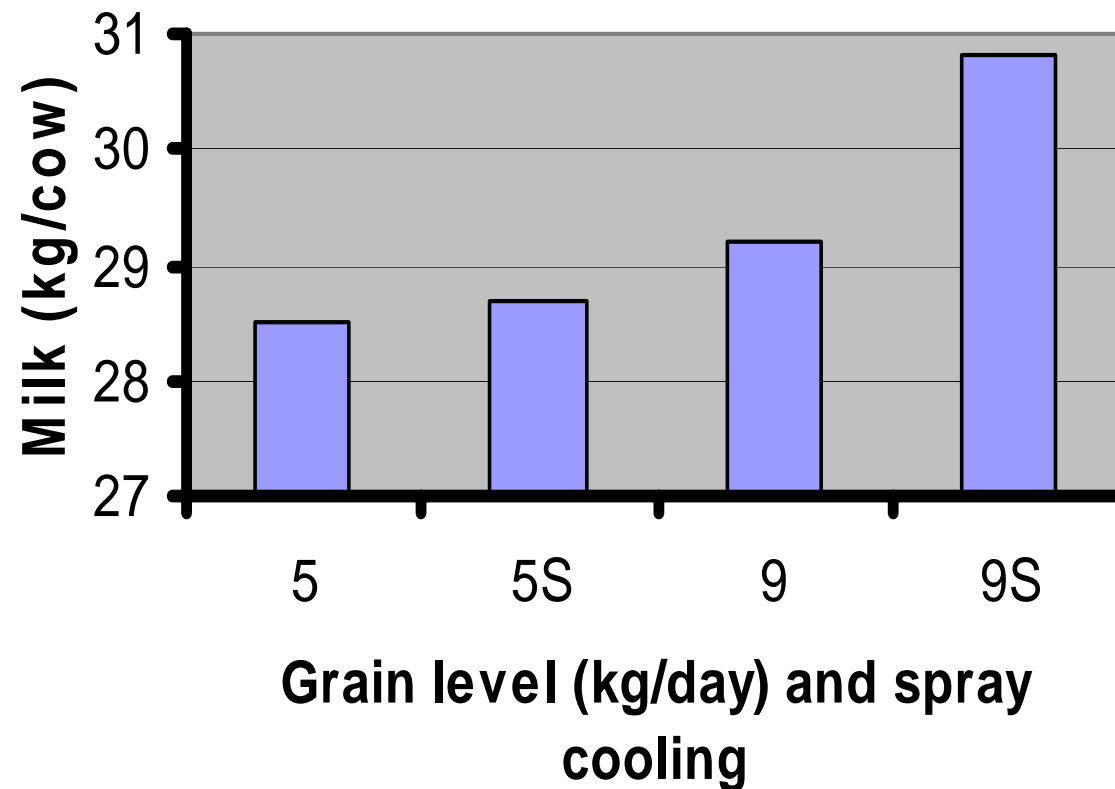
- 4 were
 - CSp - Corrugated iron shade with sprinklers
 - C - Corrugated iron shade, no sprinklers
 - Sp - No shade, with sprinklers
 - SCI – 65% shade cloth, no sprinklers

Results of 4 cooling strategies

(C, corrugated iron: Sp, sprinklers: SCI, 65% shade cloth)

Measure	CSp	C	Sp	SCI
DMI (kg/day)	14.8	14.6	13.7	13.6
Respiration rate (No./min)	61	70	73	70
Rectal temperature(°C)	38.8	39.2	39.4	39.5
Milk yield (L/cow)	24.2	23.4	22.5	22.5
Economic benefit (\$/cow)	38	16	19	20

Feed level and spray cooling – milk yield of HF cows



Reducing heat stress improves the quality of the milk with high (HQ) and low (LQ) quality forage

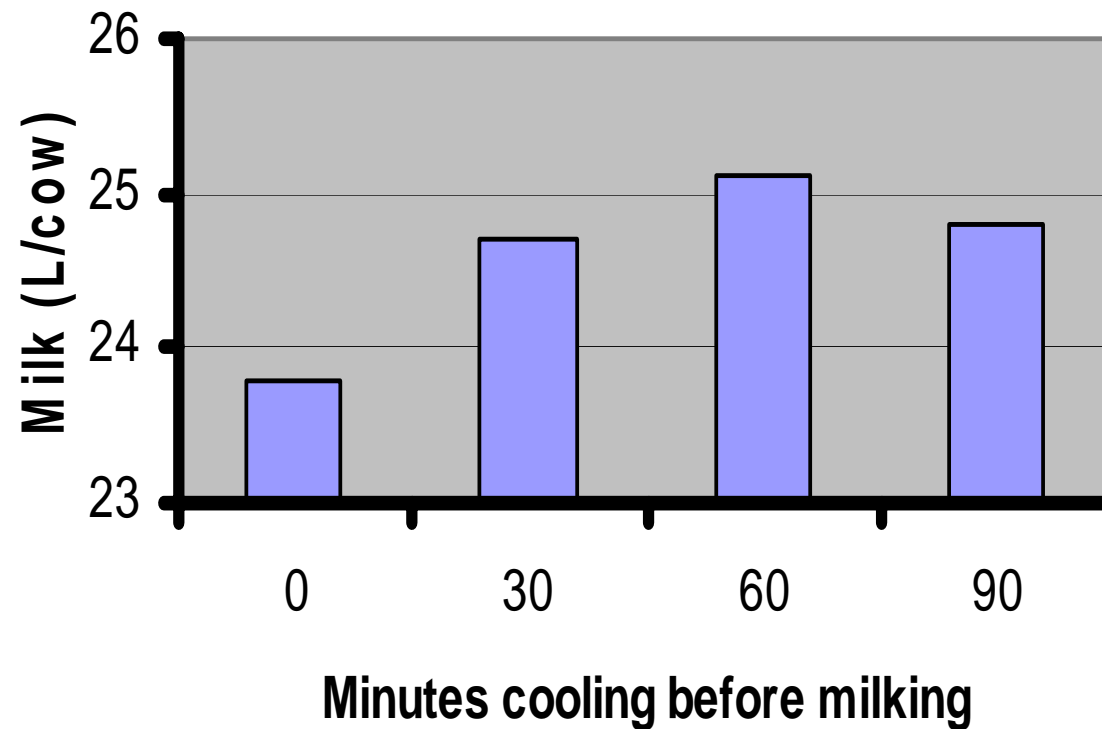
THI 3pm = 85; all cows fed 15.6 kgDM/day

Measure	High Q cooled	High Q Not cooled	Low Q cooled	Low Q Not cooled
Rectal temperature (°C)	38.1b	40.3a	38.0b	39.8a
Milk yield (L/cow/day)	21.8a	20.3a	20.2a	18.2b
Water intake (L/cow/day)	89.5b	111.8a	93.5b	105.9a
Cheese yield (kg/100kg milk)	9.52a	9.06ab	9.12ab	8.67b

Shade and sprinklers at the dairy holding yard for 150 cows



Cooling HF cows before pm milking each day



Recommendations on managing heat load on cows



Importance of drinking water

- Provide clean, cool water throughout the day
- Cows drink 50% of intake after milking
- Sufficient volume to provide up to 100 L/cow

Practical way to avoid heat stress

- Milk later in the afternoon
 - +1L/cow at 5pm cf 3pm
- Install shade and sprinklers over the holding yard at the dairy
 - +0.8 L/cow if cooled for 30 min before milking
- Feed concentrates/mixed rations under shade during the day
 - Feed forages/graze at night

Recommendations on shade structures (1)

- Roof
 - Lowest point >3.7m high
 - 4 m² roof /cow
 - Aluminium or galvanised material preferred
 - Roof slope 33°, 400mm vent along middle
- Floor
 - Concrete preferred
 - 2.5% slope

Cows facing east feeding area, sprinklers, slope of roof



Sprinkler close up

low pressure (0.7kg/sq cm), spacing = diameter of throw



Recommendations on shade structures (2)

- Orientation
 - North-south
- Feeding
 - Water on eastern and western edges, under shade
- Sprinklers
 - 2.3m high, over backs of cows
 - Medium to large droplet in Queensland

Feed in the middle

feeding area, roof structure
Note: no roof ventilation



Shade only lower cost



The job's done

roof ventilation, height, feeding area



Recommendations on sprinkling systems (Queensland)

- Continuous fans a help where no air movement
 - 0.5 hp 9m; 1.0hp 12m.
- Sprinklers
 - 200L water/cow/day
 - Under a roof
 - Close to feed and water
 - On for 3 min in 15 min cycle
 - Shut off below 26°C
 - Low pressure sprinklers (0.7 kg/sq cm)
 - Space between nozzles = diameter of throw

Morning feeding

North-south, sprinklers, roof height



Conclusions

- Use tools to assess likely level of heat stress
- Remove heat stress where practical using shade, sprinklers, fans
- Provide best feed while cows are cool, e.g. night
- Plenty of clean drinking water

More information www.dairyinfo.biz