

Dairy Directions — Analysing Farm Systems for the Future

Providing robust analysis of the impact of on-farm changes and innovation on the profitability of dairy farm systems

Shade for dairy cows in northern Victoria – does it pay?

Why would I consider shade for my cows?

Climate change and climate variability in northern Victoria is expected to decrease water availability, and increase temperatures and the frequency of extreme weather events. For a location like Tatura in northern Victoria, it has been estimated that there will be an additional 10 heat stress days, where the thermal heat index (THI) is 75 or more, in the year 2025 compared to conditions between 1971 and 2000 (Nidumolu *et al.* 2010). High milk yielding cows and larger framed cows e.g. Holstein-Friesians, are more susceptible to heat stress than younger animals and low yielding breeds e.g. Brown Swiss or Jersey.

Is providing shade a worthwhile investment?

This study was conducted to examine if the benefit of investing in a range of heat stress mitigation options outweighs the cost for a 250 cow herd with either low or high susceptibility animals. Milk composition was assumed to be 3.3% protein and 4.2% fat with an average milk price of \$4.75/kg milk protein plus fat.

Seven shade options across three areas of the farm were assessed:

Paddocks and laneways

1. Shade cloth roof on wheels or skids.
2. Solid roof on wheels or skids.
3. Shade cloth on light frame with no wheel or skids.

Dairy yard

4. Fixed shade cloth shade structure (includes sprinklers, fans and trees).
5. Solid roof shade structure (includes sprinklers, fans and trees).

Existing feed pad

6. Basic single pitch roof structure with earthen/compacted gravel surface combined with a row of adjacent concrete troughs.



7. Gabled roof structure over a fully developed existing feed pad with concrete surfaces, centre feed alley, and effluent system (includes sprinklers and fans).

The key steps taken to analyse the economic benefits and costs of the different shade options were:

- Establish a baseline for the potential increase in number of heat stress days in 2025 without shade treatments, based on the CSIRO CCR: MIROCH climate model (Nidumolu *et al.* 2010).
- Estimate the range of milk losses and value of the milk lost for low and high susceptibility herds.
- Calculate the reduction in THI from using the seven shade options, and estimate the economic benefits and milk loss avoided.
- Undertake a discounted net cash flow analysis for each shade option using a 10% real discount rate.

How does the economics for each of the shade options compare?

Milk production losses in 2025 are estimated to be on average 240 L per cow for the low susceptibility herd with no shade treatment. For highly susceptible cows, milk production losses without intervention is estimated to be 493 L per cow. The provision of shade can reduce the milk production losses by 72% (Nidumolu *et al.* 2010). For low susceptibility cows, this would mean a decrease in annual milk production of 67 L, while the milk production of highly susceptible cows would decline by 138 L.

For the herd with low susceptibility to heat stress, it was generally not profitable to install shade structures when a real discount rate of 10% was assumed. The cost of installing shade structures outweighed the benefit from avoided milk loss (Table 1).

In contrast, for dairy herds that are highly susceptible to heat stress, it was generally profitable to invest in a type of shade structure. The net present value (NPV) for each shade option was positive at an assumed 10% real discount rate for all but the two transportable, in-paddock shade structures (scenarios 1 and 2).

Table 1 Capital cost and net present value of shade strategies for a 250 cow herd with low or high susceptibility to heat stress under expected climate conditions in year 2025

Type and location of shade	Capital cost	Net Present Value at 10% discount rate*	
		Low susceptibility herd	High susceptibility herd
<i>Paddocks and laneways</i>			
1. Portable shade cloth roof on wheels	\$160,000	-\$149,300	-\$83,000
2. Portable solid roof on wheels	\$240,000	-\$175,800	-\$109,500
3. Portable shade cloth (light frame) no wheels	\$80,000	-\$48,100	\$18,200
<i>Dairy yard</i>			
4. Fixed shade cloth structure	\$21,500	-\$10,300	\$22,800
5. Fixed solid roof structure	\$41,500	-\$17,100	\$16,100
<i>Existing feed pad</i>			
6. Basic roof shade structure over compacted gravel feed pad	\$70,000	-\$17,900	\$81,600
7. Gabled roof structure over concrete feed pad	\$130,000	-\$50,400	\$49,100

*Net present value is the sum of profits, in today's dollars, earned over the life of the investment, after allowing for a 10% return (excluding inflation) the capital could have earned if it had been invested in some alternative use.

In consultation with the Dairy Directions project steering committee, a decision tree for investment in shade structures based on the type of production system and herd type was developed (Figure 1).

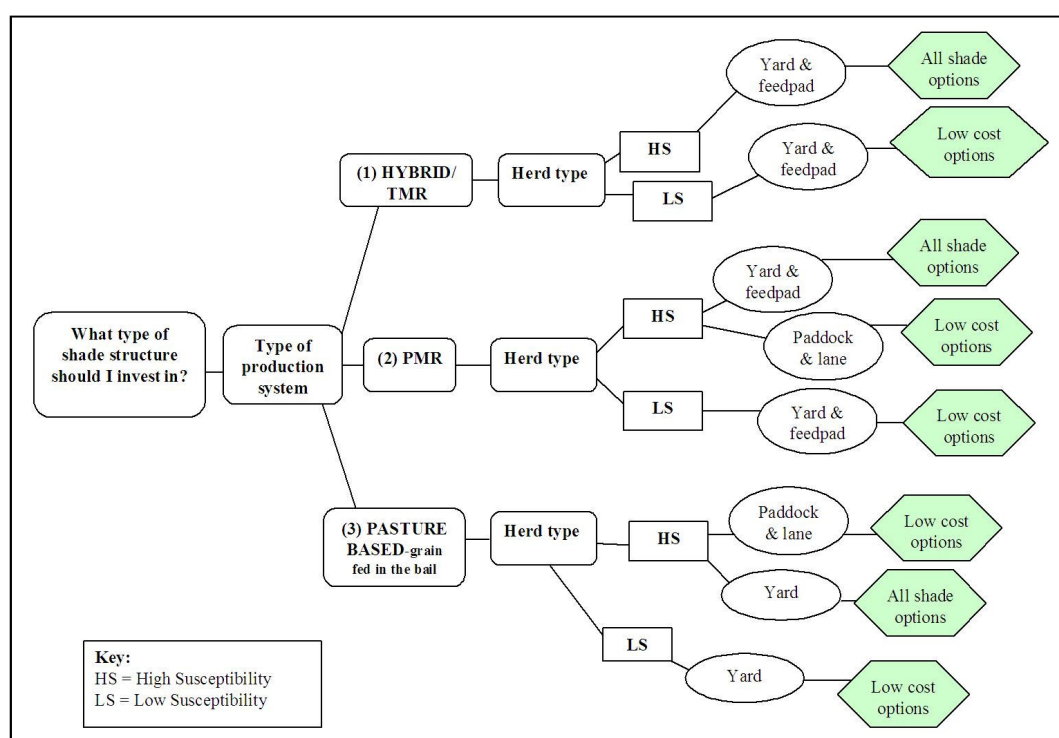


Figure 1: Decision tree for investing in shade

The decision tree shows that:

1. For hybrid and Total Mixed Ration (TMR) feeding systems, where dairy herds are mostly control fed with little or no grazing, the yard and feed pad shade treatments are more worthwhile investments than the in-paddock treatments.



2. For Partial Mixed Ration (PMR) systems, where dairy herds graze pasture and are fed supplements in a mixed ration, all shade options (yard, feed pad and low cost paddock) are potentially profitable investments.



3. For feeding systems based on grazed pasture, shade structures that are worth considering are yard shades, and those that can be used in paddocks and laneways since dairy herds will spend most of the year in the paddock.



Final thoughts

While investment in shade options was found to be unprofitable for herds with low susceptibility to heat stress, as cows become more productive, they may also become more susceptible if their frame size increases, and the importance of heat stress mitigation and the benefits from shade structures will increase for all herd types.

The type of feeding system that exists or is planned for a farm will also influence the choice of shade treatment. The profitability of providing shade for dairy cows is determined by the following key factors:

- Set up cost of the shade treatment.
- Benefits derived from the shade treatment.
- The dairy herd's productivity level and susceptibility to heat stress.
- Milk price.
- Climate variability and extremes in the future.

Further Information

Will Dalton

Future Farming Systems Research Division
Department of Primary Industries

Phone: (03) 9658 4821

E-mail: will.dalton@dpi.vic.gov.au



Funded by
Dairy Australia
and your
dairy service
levy



Australian Government
Department of Agriculture, Fisheries and Forestry



Published by the Department of Primary Industries, **February 2013**

© The State of Victoria, 2013

This publication is copyright. No part may be reproduced by any process except in accordance with the provisions of the *Copyright Act 1968*.

Authorised by the Victorian Government, 1 Spring Street, Melbourne 3000

ISSN: 2201-4764

ISBN 978-1-74326-361-7 (Online)

Disclaimer:

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

For more information about DPI go to www.dpi.vic.gov.au or call the Customer Call Centre on 136 186.