Final report

Australian Lot Feeding Industry Shade and Shelter intentions survey 2025

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Abstract

This project evaluated the current state and future intentions regarding the provision of shade and shelter in Australian feedlots. The 2025 Australian Lot Feeding industry shade and shelter survey, prioritised by the Australian Lot Feeders Association (ALFA) as part of this project, gathered quantitative and qualitative data from a diverse range of feedlot operators across various geographic locations, business structures and sizes. The primary project objectives were to assess the current level of access to shade and shelter in Australian feedlots, contrast that with the ALFA estimate of 70.4% (FY24), understand the benefits and obstacles associated with their implementation, and forecast future investment and installation intentions.

The survey was carried out among all lot feeders, incorporating specific questions for feedlots where cattle have access to shade or shelter in all home pens, in some home pens and in none of the home pens. The survey questions focused on assessing existing shade and shelter installations, plans for future installations, factors affecting decisions about adopting shade or shelter, and challenges in providing complete coverage. Out of 321 contacts supplied by AUS-MEAT as per a confidentiality agreement, 151 feedlot operators responded, corresponding to a constructed feedlot capacity of 1.09 million.

The survey results suggest a projected increase in shade provision from the current estimate of 80%, with approximately 83.5% of total constructed capacity anticipated to have access to shade by the end of 2026. It is unlikely that the target of 100% of cattle on feed having access to shade will be met. Most respondents expressed strong support for shade provision and the ALFA pledge, citing its advantages for animal welfare, productivity, and environmental efficiency—specifically noting reductions in heat stress, improved feed intake, greater weight gain, and enhanced animal comfort. Nevertheless, some operators reported indifference or disagreement regarding the necessity for shade, attributing their concerns to financial constraints, regional climatic variability, and maintenance challenges.

The findings underscore the importance of shade in enhancing cattle welfare and performance, particularly during extreme heat load conditions. The survey results also emphasised the need for tailored shade installation solutions based on regional climates and feedlot-specific conditions. The insights gained from the survey will inform future industry standards and support the ongoing commitment to improving animal welfare and sustainability in the Australian lot feeding industry.

Executive summary

The Australian feedlot industry has made significant strides in demonstrating animal care and wellbeing, primarily through the National Feedlot Accreditation Scheme (NFAS). The Australian Lot Feeders Association (ALFA) launched the Shade Initiative in 2020, with the goal to ensure all cattle on feed have access to shade by 2026. As of June 2024, it was estimated that 70.4% of NFAS accredited feedlot cattle on feed were provided with access shade. This project explored the benefits, barriers, and solutions related to shade provision within feedlots. It involved a comprehensive industry shade and shelter survey and thematic evaluation to assess current and future industry installation and use of shade.

The methodology for this project involved several key steps to ensure a thorough evaluation of shade and shelter provision in Australian feedlots. A broad survey was developed targeting various groups of lot feeders, including those where cattle have access to shade or shelter in all home pens, some home pens and none of the home pens[1]. Questions were constructed to determine the current level of installed shade or shelter, the trajectory for future installations, the factors influencing decisions regarding shade or shelter adoption, and the barriers to providing full adoption.

The final approval for the survey was received from ALFA and MLA on 28th of March 2025. It was released to all NFAS accredited feedlots on the 31st of March 2025. The survey was sent to 321 contacts obtained from AUS-MEAT under a confidentiality agreement. After several iterations of promotion and the development of a shorter quantitative survey that targeted smaller feedlots, 151 responses were received representing a constructed feedlot capacity of 1,086,657.

Queensland and New South Wales had (as expected) the highest number of responses with single family-owned feedlots being the most common feedlot type. Small feedlots were under-represented in the survey responses relative to the AUS-MEAT data, which potentially reveals the challenges of engaging businesses to complete surveys that have limited time and resources and the fact that these feedlots may be more likely to not have shade and so be less inclined to complete the survey.

A significant majority of respondents (approximately 83%) support the provision of shade, recognising its benefits for animal welfare, performance, and health. However, there are differences in shade acceptance, with some feedlots in southern regions, some that feed *Bos indicus* cattle and some that only feed at certain times of the year expressing indifference or disagreement with need to provide shade.

The survey responses reveal a range of perspectives on the necessity and feasibility of providing shade or shelter to all cattle on feed by 2026. Many respondents strongly agree that providing shade is essential for animal welfare and performance, particularly during hot weather conditions. Respondents highlighted several benefits of shade, including reduced heat stress, improved feed intake, better weight gain, and enhanced animal comfort. Shade was also found to be effective in managing excessive heat load events in most circumstances. Concerns about increasing abnormal weather events and their impact on cattle health reinforce the need for shade.

[1] In the survey, respondents were asked to choose which of the following three statements best matched their feedlot:

- All home pens provide cattle with shade or shelter.
- Partial: Some but not all home pens provide cattle with shade or shelter.
- None of the home pens provide cattle with shade or shelter.

There are some disadvantages associated with the installation of shade. Several respondents highlighted that wet and humid conditions under shade structures can lead to challenges in pen maintenance, particularly during wet winters. Pen floor damage and the need for more frequent pen rotations were noted as additional costs associated with shade provision. Improved pen bases and better drainage can help address these issues.

The primary barriers to shade installation include financial and time constraints, and perceived lack of need in some geographic location. Some feedlots believe that shade is only necessary in hotter environments or for specific cattle breeds. The financial implications of installing shade structures are a recurring theme, with some smaller feedlots stating that they may struggle to comply and may leave the industry (or cease to maintain NFAS accreditation) if shade was to be made mandatory. A key insight was that feedlots that are expanding or creating new pen infrastructure should consider installation of shade at that time, as retrofitting shade appears to significantly increase costs.

There was a reoccurring theme that suggested that shade and shelter need to be considered differently. The benefits of shelter are different to those of shade and yet the terms are used interchangeably within industry. There are also quite different costs of installation and maintenance requirements (perceived disadvantages).

The analysis of the survey yielded several key findings regarding the current state and future intentions of shade and shelter provision in Australian feedlots. Results from this survey indicate approximately 80.5 % of the constructed feedlot capacity provided cattle with access to shade. This indicates that the previous figure of 70.4% may be an underestimate, with the actual pledge percentage higher. Further analysis provides a potential reason for this difference. Projections from the survey indicate a gradual increase in shade installation, with shade access expected to rise to approximately 83.5% of total constructed capacity by the end of 2026 and 84.5% by the end of 2029. Achieving the ALFA pledge of 100% compliance by 2026 remains unlikely due to existing significant resistance from some feedlots. Constructed capacity, where used in this report, is the lesser of approved capacity and constructed capacity.

The findings of the survey underscore the importance of shade provision in Australian feedlots for animal welfare and industry sustainability. While there is strong support for shade, achieving full compliance with the ALFA pledge is highly unlikely. Further shade installation may come through addressing the identified barriers and promoting the benefits of shade more effectively.

Recommendations

This report makes a series of recommendations for MLA's and ALFA's consideration in future planning and investment decisions. The recommendations are listed below, in the order in which they appear in the report. There is no rating or priority given to the recommendations. However, if implemented the recommendations are expected to deliver a viable alternative for the current ALFA shade pledge and some limited incremental improvement in adoption of shade.

Recommendation 1. That ALFA and MLA consider further investigation into why some feedlots consider that shade does not provide a welfare benefit. 46

Recommendation 2. That ALFA and MLA consider further investigation to identify what are the critical elements, factors or observations that feedlots are using to define or characterise animal comfort. 47

Recommendation 3. That ALFA consider developing a target extension program that addresses the disadvantages of shade installation (pen maintenance and water management) to optimise the benefits of shade provision. 54

Recommendation 4. That the resources of the ALFA shade hub are promoted directly (in a targeted extension program) to feedlots that don't have shade to ensure that core barriers to installation are addressed. *56*

Recommendation 5. Feedlots that are expanding or creating new pen infrastructure should be encouraged to consider shade installation or at least provide for shade installation. *56*

Recommendation 6. That the belief that feed additives alleviates the need for shade and reduces heat load should be quantified and published. *57*

Recommendation 7: Whilst shade and shelter appear to be often used interchangeably by industry, there are clear differences in welfare outcomes. The performance and welfare benefits of shelter and resulting value proposition and implications should be clearly separated in extension materials. *58*

Recommendation 8. That ALFA reconsider the likelihood of achieving 100% compliance with the pledge. It is highly unlikely that this will be achieved. Adopting the pledge as an aspirational target of 100% by 2029 may be an appropriate outcome. *59*

Recommendation 9: That ALFA consider the short-term effect on the industry if shade or shelter were mandated in the NFAS Rules and Standards. *63*

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Acronyms and Definitions

Acronym	Full Description
ALFA	Australian Lot Feeders Association
DOF	Days on Feed
EHL	Excessive Heat Load
Survey	Industry shade and shelter survey
MLA	Meat and Livestock Australia
NFAS	National Feedlot Accreditation Scheme
Constructed capacity	In this report, feedlot size is reported as 'constructed capacity' being the smaller of constructed capacity and approved capacity. Both constructed capacity and approved capacity for each feedlot being either 'head' or 'SCUs' as reported. Where both units are supplied, the higher value was selected.
Full shade or shelter	All home pens provide cattle with access to shade or shelter
Some shade or shelter	Some but not all home pens provide cattle with access to shade or shelter
No shade or shelter	None of the home pens provide cattle with access to shade or shelter
PIC	Property Identification Code
RD&E	Research Development and Extension

1 Background

The Australian feedlot industry's ability to effectively demonstrate animal care and wellbeing is a crucial factor in encouraging customer and community trust. The creation, application, and ongoing enhancement of national standards (the National Feedlot Accreditation Scheme (NFAS)), which support integrity and compliance throughout the sector, has a very good and impactful history in this industry. The Australian Lot Feeders Association (ALFA) launched the Shade Initiative in 2020 with the primary objective of ensuring all cattle on feed have access to shade by 2026 as part of its ongoing commitment to productivity and welfare enhancement.

In June 2024, it was estimated that 70.4% of Australian NFAS accredited constructed feedlot capacity provided cattle (1,136,982) access to shade[2]. That level of adoption was attained through substantial research, development and extension (RD&E) operations aimed at highlighting productivity and welfare benefits. ALFA's shade hub provides significant resources on the benefits and implementation of shade[3]. On the basis of the 2024 estimate, approximately 30% of feedlot capacity has not yet invested in shade, which could be due to a combination of factors such as time, resource availability and allocation, or a lack of determined value proposition based on breed type, location and scale. Furthermore, feedlots that have invested in shade provision may have valuable data and insights that might help to facilitate adoption within those feedlots that have not provided shade.

Whilst the terms shade and shelter are commonly used in an interchangeable manner within industry, it is important to note the difference between these elements. Shade is a thermal radiation shield that reduces heat load on the animal. Shade does not readily affect air temperature but can reduce

[2] Reference obtained from ALFA October 2024
[3] https://www.feedlots.com.au/resources/shade-hub

exposure to solar radiation and also enhance minimal air movement for cooling. By contrast, shelter shields animals from extreme weather conditions, including heat, wind, and rain. In this project the primary objective was to explore the installation of shade, however in a number of circumstances that installation will provide shelter benefits[4].

This project used a proven process to develop a customised thematic evaluation based comprehensive industry shade and shelter survey of the benefits, barriers and solutions that arise when either investing in or considering investment in shade provision within feedlots. The primary outcome of the project was to provide a quantitative and qualitative assessment of current and future industry installation and use of shade, including an understanding of likely investment intentions between 2025-26 and 2029. The survey analysis also includes a qualitative interpretation of key value benefits and barriers and a series of proposed activities that could lead to improved industry acceptance of the benefits from investment in shade.

The project was underpinned by a widely distributed and heavily promoted on-line quantitative and qualitative survey followed by detailed thematic and quantitative analysis to achieve outcomes against all four of the stated objectives. In addition, a stage gate model was developed to assist with potential industry adoption and implementation targets and for securing a high degree of industry awareness and adoption of shade benefits within the 30% of capacity that have not adopted shade.

The project results, key insights and recommendations will enable ALFA and the Australian feedlot industry to quantify, promote, and defend its credentials for animal productivity and welfare via shade provision to clients, consumers, and communities around the world.

2 Objectives

The objectives of this project included:

1. Develop a survey for each of the following groups of Lot Feeders'.
    a. Those that currently have installed shade and / or shelter across 100% of their feedlot pen capacity.
    b. Those that have installed shade and / or shelter across part of their pen capacity within the feedlot.
    c. Those that own more than one feedlot with different proportions of shade or shelter across those respective sites.
    d. Those that have not installed shade or shelter at their site(s).
2. Undertake a survey of each of the groups of lot feeders identified in Objective 1, to represent 80% of cattle capacity in each of the categories (1.a. – 1.d.). A diversity of geographic locations and feedlot business sizes within each category must be surveyed. Minimum 25 feedlots in each category required.
3. Determine the reasons for adoption / non-adoption of shade or shelter by the Australian lot feeding industry in each of the categories (1.a. – 1.d.).
4. Determine the percentage of residual non-shaded Australian feedlot pen capacity that is scheduled for shade or shelter installation and included in formal capital expenditure plans each year for the next five years.

[4] ALFA February 2025.

3 Methodology

3.1 Agreement on the key evaluation questions to be answered by the survey.

In addition to the stated objectives, the following key evaluation questions were presented at the inception meeting. These questions informed the primary survey questions and formed the basis of a component of the final report outcomes.

1. What is the current level of installed shade or shelter provided in Australian cattle feedlots (as a proportion of total approved capacity)?
2. Determine the trajectory for installed shade or shelter as a percentage of approved capacity using current levels combined with capacity that is planned and budgeted for installation over the next five years?
3. From those feedlots that have installed shade or shelter, what were the key factors influencing that decision, including expected benefits?
4. For those feedlots that do not have shade or shelter sufficient for their approved capacity, what are the reasons and or barriers to providing full coverage?
5. What are the crucial components of an extension program aimed at driving adoption of shade or shelter across the remaining Australian cattle feedlots?

3.2 Survey development

The project developed a comprehensive survey targeting various groups of lot feeders, including those where cattle have access to shade or shelter in all home pens, in some home pens and in none of the home pens. Specifically, it sought to understand the reasons for the adoption or non-adoption of shade or shelter and to assess future plans and intentions for installing these structures in feedlots.

The methodology involved designing a survey that included both quantitative and qualitative questions. Initial questions were based on tender document key questions (Oct-2024), which were a combination of quantitative & qualitative questions. Three sections[5] were created within the questionnaire for feedlots based on whether cattle have access to shade or shelter in:

- All home pens
- Some home pens (referred to as partial in the survey)
- None of the home pens

Key evaluation questions were used as the basis of additional questions to ascertain the current level of shade or shelter, the trajectory for future installations, and the factors influencing decisions regarding shade or shelter adoption. This comprehensive approach ensures a thorough understanding of the current landscape, the potential adoption of shade or shelter and insights in how to promote further adoption.

[5] In the survey, respondents were asked to choose which of the following three statements best matched their feedlot:

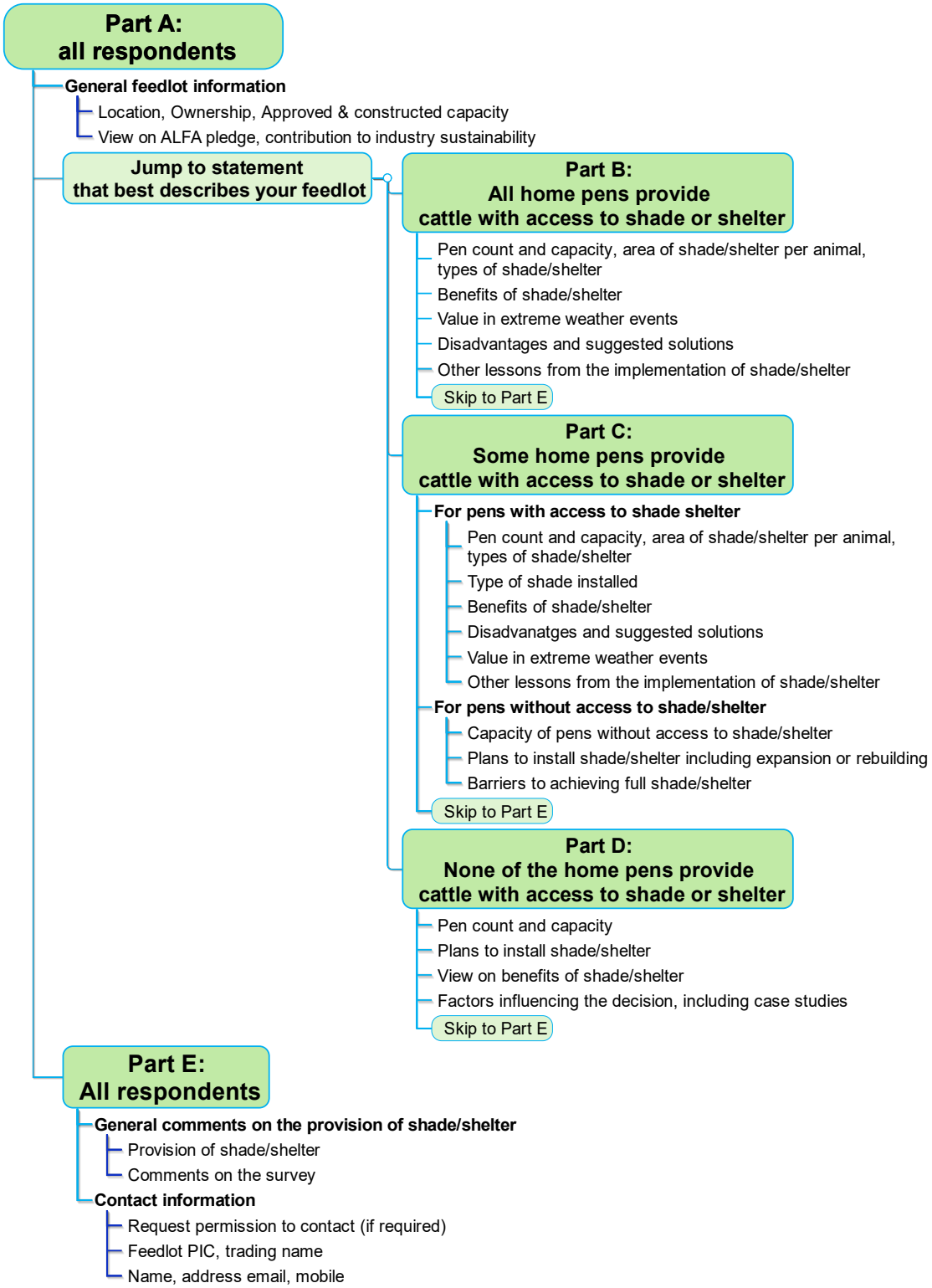
- All home pens provide cattle with shade or shelter.
- Partial: Some but not all home pens provide cattle with shade or shelter.
- None of the home pens provide cattle with shade or shelter.

The development process included feedback from stakeholders and multiple iterations to refine the survey.

As requested by ALFA and MLA, a pilot version of the survey was sent to 12 feedlot owners or managers on the 12th of March 2025. A three-week window was slated for completion of this pilot survey. On the 26th of March 2025 eight completed surveys had been received. Those responses showed that there were no issues with the logic of the survey. Of note, all eight responses were from feedlots with shade or shelter provided in all or some home pens. There were no responses from feedlots without shade or shelter.

There was a substantive amount of time spent on refinement and review of the survey and its implementation. Review was received from ALFA, MLA and EVIDN as well as feedback from the original pilot. The following mind map in **Figure 1** shows the final logic of the survey and the question flow for the three target feedlot types.

Figure 1. Survey logic



3.3 Survey release

The final approval for the survey was received from ALFA and MLA on the 28th of March 2025. A copy of the final survey is included in Appendix 7.1 The survey was released to all NFAS accredited feedlots on the 31st of March 2025 at 9am. Two formats were used:

- An email from one of the consultants (Alex Ball) that included a PDF of the ALFA introduction letter from Grant Garey (ALFA President) that had a direct link to the survey; and
- An email generated by Survey Monkey that opened directly into the survey.

The survey was sent to 321 contacts that were on the list obtained from AUS-MEAT on the 6th of November 2024 (obtained under a confidentiality agreement with AUS-MEAT). Of that list, 11 mail recipients were not recognised and a further 82 invitations bounced back from the Survey Monkey email (potentially due to the recipient's privacy settings).

ALFA then promoted the survey in its newsletter on the 7th of April 2025. Subsequent reminders were sent on the 14th and 21st of April 2025. The team also sent the direct link to additional feedlot contacts in the week starting the 21st of April 2025.

The survey was initially closed on the 7th of May 2025. At that date, 121 responses (37.7% of the contact list) had been received. Feedback from MLA encouraged the project team to continue to seek further responses from industry. Several mechanisms were used:

- The initial release indicated that a number of feedlots had alternative key contacts. Using project team databases, the survey was sent to approximately 70 alternative contacts. In addition, a team member contacted approximately 30 feedlots directly and encouraged their participation in the survey resulting in an additional 24 responses.
- On Monday 26th of May 2025 an updated list of contacts was received from AUS-MEAT. This updated list contained approximately 30 new contacts. Those new contacts were emailed directly with an invitation to complete the full survey. An additional nine responses were received.
- The project team identified that smaller feedlots were under-represented in the responses received. Preliminary analyses indicated that the volume of qualitative responses already received provided significant detailed information. Given time is a key constraint for feedlot operators, a shorter quantitative orientated version of the survey was created and emailed directly to feedlots with a constructed capacity of up to 5,000. That resulted in an additional 17 responses.

3.4 Survey and thematic analysis

The survey responses were downloaded from Survey Monkey® in Microsoft Excel format and analysed using a combination of MATLAB by Mathworks and Microsoft Excel. Standard statistics and frequency distributions were used to characterise the responses. Open ended (free text) questions were manually sorted into common themes using mind mapping software (Mind Mapper 24.9320p(22) Pro). Each survey participant's input was added as a final leaf to each of the related branches thus enabling topics to be ranked on a count of these leaves. Where appropriate aggregated themes and counts have been provided.

4 Results

4.1 Demographics and key features of surveyed feedlots

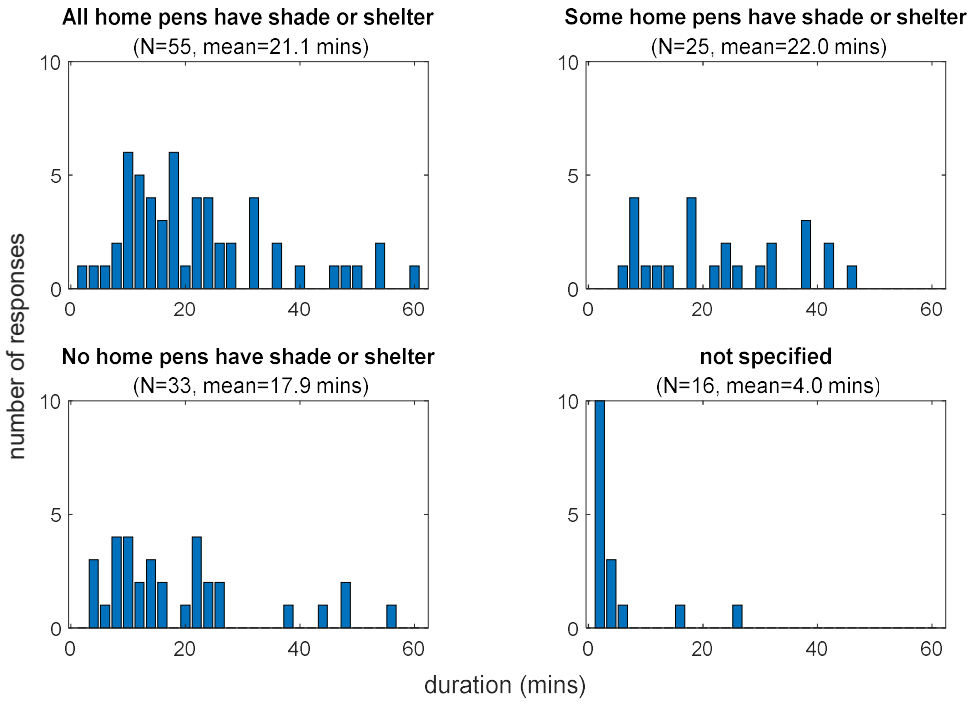
4.1.1 Response rate and survey completion timing

Survey Monkey®, the online survey tool used for this project, reports the start and end date and time for each response. The median duration for all 150 responses that answered at least one question was 18 minutes. Some responses had durations of hours, and four responses extended to days. It is assumed that these longer durations were a result of interruptions to the respondent or that the respondent simply quit the survey at a later time.

The average time to complete the survey was 18.3 minutes, excluding responses with a duration of more than an hour, a little over three times the median duration. The distribution of completion times by feed lot shade status is shown in Figure 2. This average time suggests that the time spent on the construction of the survey was validated as the initial goal was to achieve a survey response time of less than 30 minutes. Of note, there was no comment made on the length of the survey.

Feedlots that specified their shade status spent similar amounts of time on average. Those with no shade were a little quicker reflecting the fewer questions asked of them. Respondents that did not specify the shade status of their feedlot could not proceed to the following questions; thus, their duration was much shorter. This does confirm that the question on shade type did present a barrier to some respondents. If designing a similar survey in the future, consideration should be given to how this question may be changed to be less confronting.

Figure 2. Distribution of survey completion time (duration) by shade status. N=129.



The following table (Table 1), shows the response rate for the various methods used. Of note the direct email was more successful than the email sent from Survey Monkey. The additional work at the end of the initial survey period provided more responses and was extremely valuable in meeting targets. The short survey was useful, particularly for feedlots of less than 5,000 capacity.

Table 1. Number of responses for survey distribution method and survey type (full vs short)

Survey type	Number
Full via direct email	87
Full via Survey Monkey	32
Full (later additions)	35
Short	17

4.1.2 Demographic results

At the time the survey was closed, 151 (47.0% of the contact list) completed responses had been received. An additional 20 entities started to complete the survey but terminated responses before completing the survey, primarily at the question that asked for feedlot shade type. The number of responses recorded for each question varied depending on the demographic being targeted by the question and the preparedness of the respondent to answer the question. One hundred and fifty (150) feedlots completed the question on post code with those numbers shown in Figure 3 by state. As expected, QLD had the largest representation, with lowest response from Victoria and Tasmania.

Figure 3 compares the relative share of survey responses between states against the expected share calculated from the list of NFAS accredited active feedlots provided by AUS-MEAT. Of the two states with the largest number of feedlots, QLD has a little higher and NSW a little lower, representation in the survey responses. This profile indicates that the survey was able to get an appropriate distribution across regions and climatic scenarios.

Figure 3. Geographic distribution as determined by the feedlot postcode (N=150)

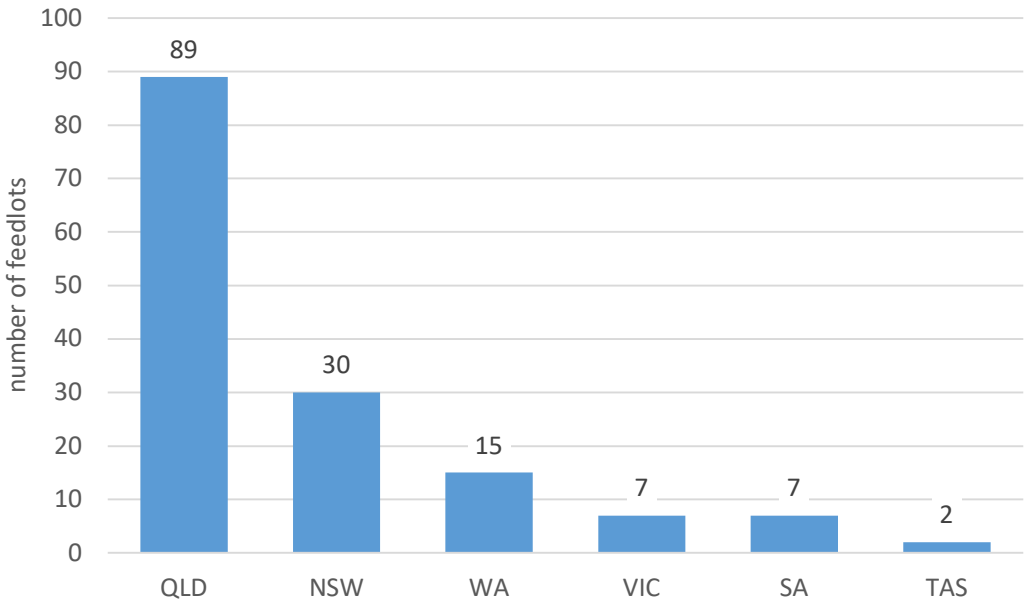
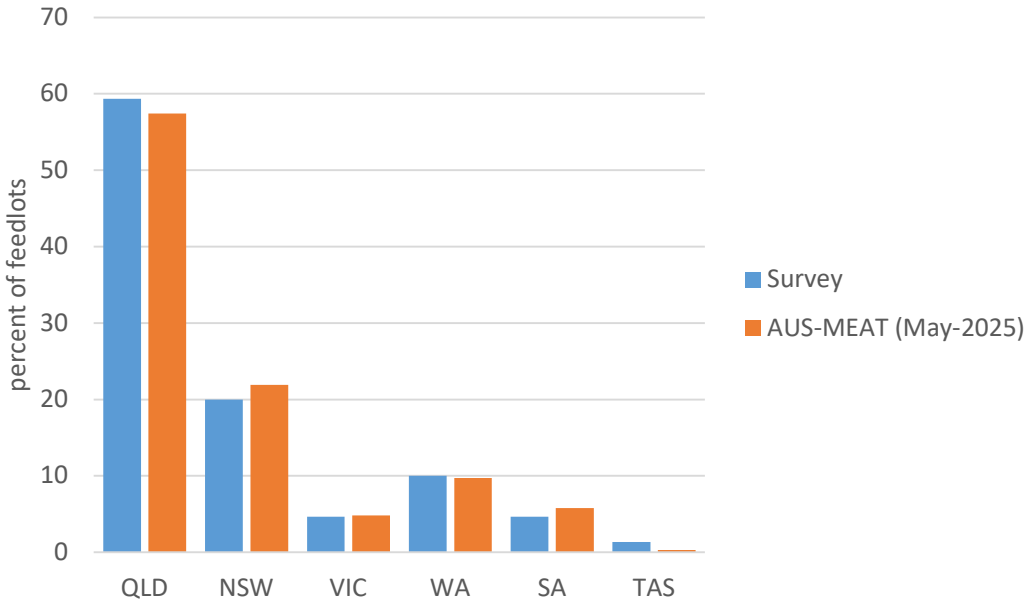
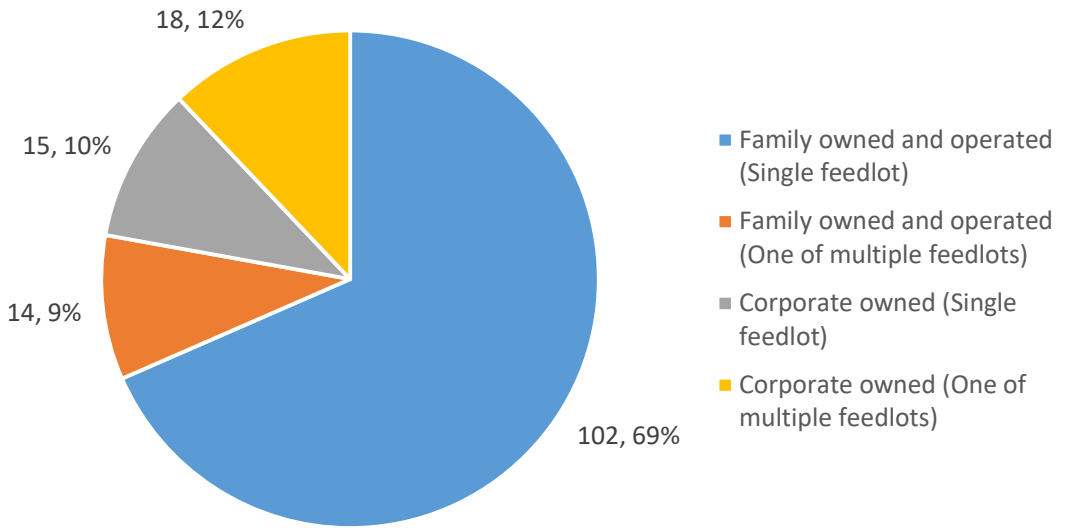


Figure 4. Comparison of the relative geographic distribution of feedlots between states that responded to the survey (N=150) and those reported by AUS-MEAT (active feedlots, May 2025, N=329).



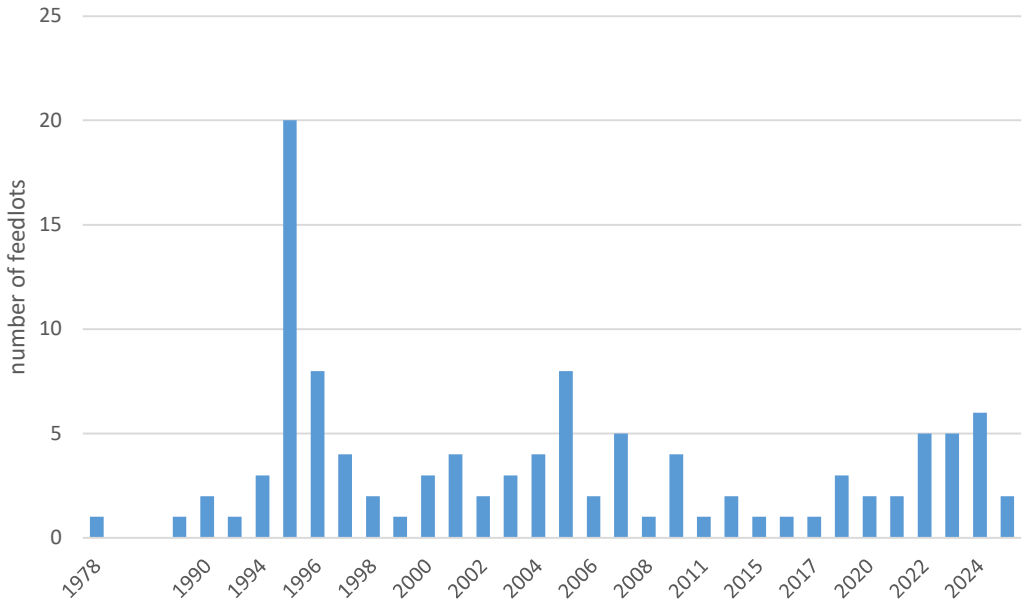
As expected, the family-owned single feedlot group dominated the responses. There was a target of at least 25 feedlots from entities owning multiple feedlots. As shown in Figure 5, the number achieved was 32 which exceeded that target. There was no data available from AUS-MEAT to compare feedlot ownership, although anecdotally the number of responses from multiple owned feedlots is high and reflects the direct targeting throughout the survey process.

Figure 5. Ownership structure of feedlots that responded to the survey, by number and percentage (N=149)



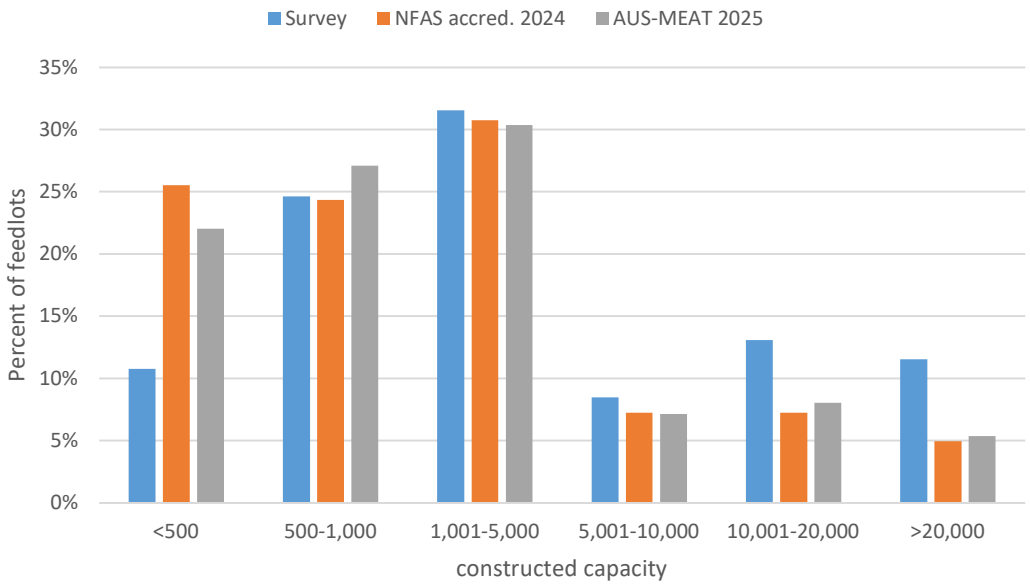
Year of NFAS accreditation is potentially a measure of feedlot maturity and of experience with management of heat load and shade. Most feedlots achieved NFAS accreditation in the late 90's and early to mid-2000's. However, there is a significant population that have only become accredited in the last 5 years (Figure 6). It should be noted that NFAS accreditation only commenced in 1994, so there is a potential that respondents may have confused the question between their commencement of feeding and accreditation.

Figure 6. Reported year for NFAS accreditation of feedlots (N=110)



The distribution of size[6] of feedlots is an important demographic, as it provides a level of interpretation and potentially bias within the survey. As expected, the proportion of small feedlots (less than 500 constructed capacity) that completed the survey was small relative to the expected distribution from AUS-MEAT and ALFA sources. Response rates from moderate to medium size feedlots (500 to 5,000 constructed capacity) was similar to the expected level based on the distributions, and response rates were higher with the large to very large feedlots (more than 5,000 constructed capacity). There are several reasons that may contribute to the lower response rate from small feedlots (Figure 7). Notably they may not have had time and resources available to open emails or complete the survey.

Figure 7. Distribution of feedlot size from the survey (N=130) relative to distributions obtained from ALFA (NFAS at March 2024, N=345) and AUS-MEAT (active feedlots, May 2025, N=336).



Despite the lower response rate from feedlots under 500 head constructed capacity, the survey responses for the main part align with expectations based on the AUS-MEAT distribution shown in Figure 7. It is notable that increasing response rates for small feedlots would only have a minor impact on cattle numbers. We also note that 21 feedlots did not provide a capacity answer.

[6] In this report, feedlot size is reported as 'constructed capacity' being the smaller of constructed capacity and approved capacity. Both constructed capacity and approved capacity for each feedlot being either 'head' or 'SCUs' as reported. Where both units are supplied, the higher value was selected.

Table 2. Comparison of the percent of total constructed capacity by feedlot size in the AUS-MEAT list of active accredited feedlots (population estimate, N=336) and survey respondents (surveyed sample, N=130)

Feedlot constructed capacity	AUS-MEAT (May 2025) (%)	Survey (%)
< 500	1.3	0.4
500 – 1,000	4.7	1.7
1,001 – 5,000	18.1	10.4
5,001 – 10,000	11.1	5.8
10,001 – 20,000	25.7	22.1
> 20,000	39.1	59.7

4.1.2.1 Removal of survey sample bias

As shown in Table 2, there is a small bias between the feedlot size distribution of survey participants and the list of NFAS accredited feedlots provided by AUS-MEAT. Using the ratio of the percentages of feedlots in each feedlot size category, the survey data can be adjusted to reflect the distribution computed from the AUS-MEAT data. These percentages and ratios are presented inTable 3. For qualitative responses we are confident that the small bias would have no direct impact on our thematic analysis.

Table 3. Distribution of the number of feedlots by size in the AUS-MEAT (May-2025) dataset and from the survey (April 2025) together with ratios for adjusting survey data to better reflect industry.

Feedlot size category	Count of survey feedlots	Percent of survey feedlots	Number of AUS-MEAT accredited feedlots	Percent of AUS-MEAT accredited feedlots	Ratio of AUS-MEAT to survey percentages
< 500	14	10.8%	69	21.0%	1.947
500 – 1,000	32	24.6%	90	27.4%	1.111
1,001 – 5,000	41	31.5%	102	31.0%	0.983
5,001 – 10,000	11	8.5%	23	7.0%	0.826
10,001 – 20,000	17	13.1%	25	7.6%	0.581
> 20,000	15	11.5%	20	6.1%	0.527
Total	130		329		

When these ratios are applied to the constructed capacity of each feedlot according to its feedlot size category, the result is increased representation of the smaller feedlots and decreased representation of the larger feedlots. While this adjustment does decrease the total constructed capacity of the survey sample, its distribution better approximates the industry's distribution.

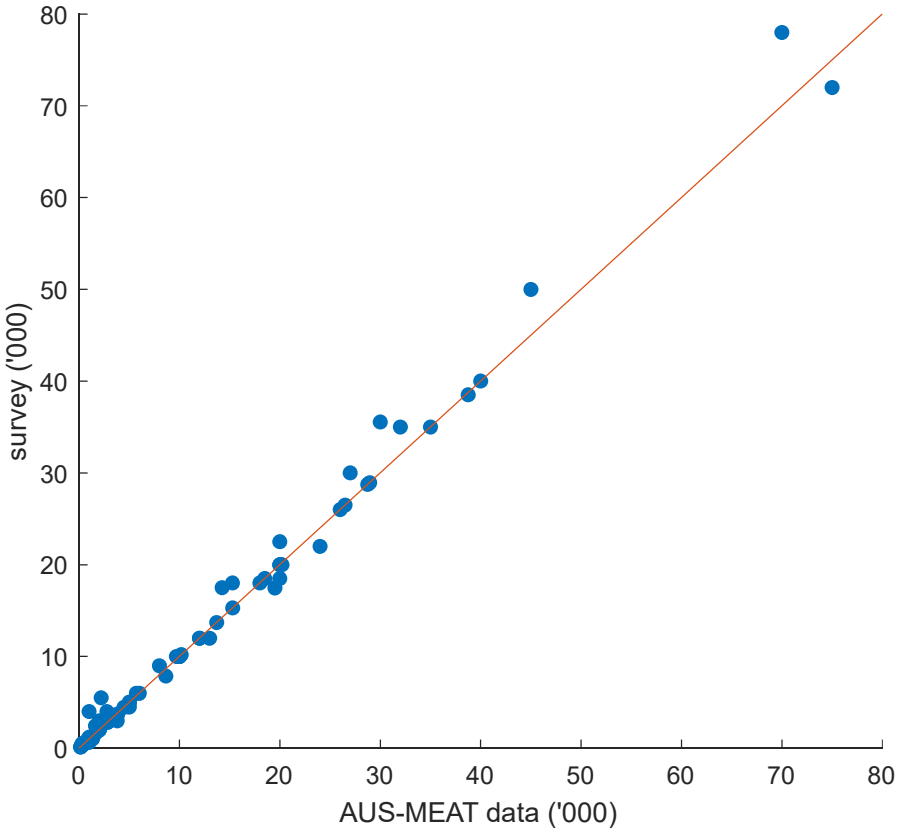
Table 4. Combining the total constructed capacity and the total constructed capacity with access to shade or shelter indicates an estimate of 83% of capacity with access to shade. This estimate drops to 79% when the original data is adjusted for the sample bias.

Feedlot size category	Constructed capacity of survey feedlots	Constructed capacity with access to shade or shelter	Adjusted constructed capacity of survey feedlots	Adj. constructed capacity with access to shade or shelter	Percent of constructed capacity with access to shade or shelter [7]
< 500	4,365	2,579	8,501	5,022	59%
500 – 1,000	16,332	12,513	29,263	13,906	48%
1,001 – 5,000	119,617	61,131	117,586	60,585	52%
5,001 – 10,000	87,960	58,265	72,672	48,138	66%
10,001 – 20,000	279,653	260,245	162,502	151,224	93%
> 20,000	568,730	511,414	299,635	269,438	90%
Total	1,086,657	906,647	690,159	548,313	
Percent of capacity		83%		79%	

An additional element that was explored to ensure that the survey data was representative of industry was to compare the stated feedlot capacity from the AUS-MEAT list to that which was provided as the constructed capacity in the survey. As expected, there was a very strong linear relationship as shown in Figure 8 with an r^2=0.991. This provides confidence that any aggregated data obtained within the survey is comparable to other industry estimations.

[7] The percent of constructed capacity within a feedlot size category does not change with this adjustment because the adjustment factor is the same for 'all feedlots' and 'feedlots with access to shade or shelter'. The weighted average percent access to shade or shelter does change.

Figure 8. Relationship between stated constructed capacity in the survey responses and capacity within the AUS-MEAT database (n=109): r^2= 0.991 regression coefficient =1.03



4.1.3 Response to ALFA pledge

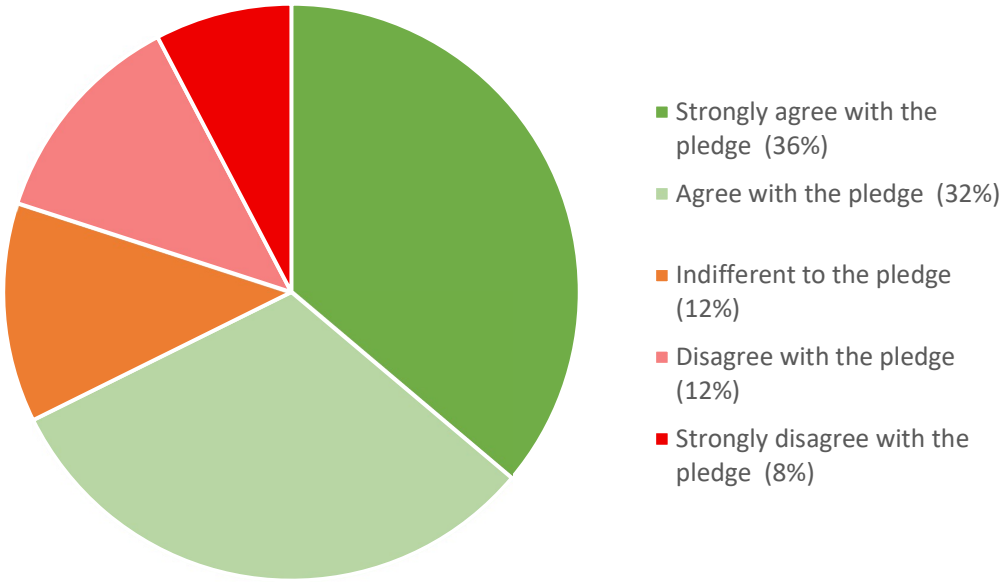
Understanding the current industry attitude toward the provision of shade and or shelter was assessed by asking respondents to what extent they agreed with the ALFA pledge to provide shade or shelter to all cattle on feed by 2026. A surprisingly high number of respondents, 30, did not provide an answer to this question. Over two thirds of the feedlots 'agreed' or 'strongly agreed' with the pledge (Figure 9). However, 20% of feedlots either disagreed or strongly disagreed with the pledge.

We asked, "To what extent do you agree with the Australian Lot Feeding industry pledge to provide shade or shelter to all cattle on feed by 2026? What are your reasons for that rating?" In summary …

The responses vary, highlighting differing perspectives on the necessity and feasibility of firstly the requirement and secondly compliance based on geographical and climatic conditions.

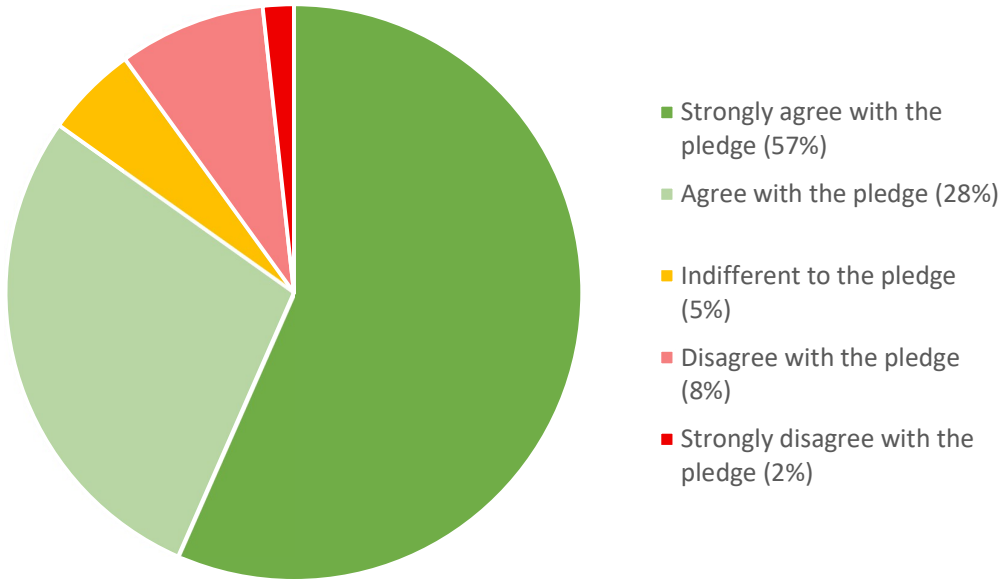
- **Support for shade access:** Many respondents strongly agree that providing shade is essential for animal welfare and performance, emphasising its importance during hot weather conditions.
- **Concerns about costs:** Some agree that while shade is beneficial, the timeline and expenses associated with implementing this requirement pose significant challenges.
- **Regional differences:** Several participants express indifference or disagreement, arguing that not all areas require shade due to varying climatic conditions, particularly in cooler regions.
- **Animal welfare benefits:** Strong support exists for the notion that shade enhances cattle welfare, particularly in feedlots where high grain intake can raise cattle temperatures.
- **Industry standards:** Some respondents suggest that all feedlot operators should uphold similar welfare standards regarding shade provision.
- **Impact of climate change:** Concerns about increasing abnormal weather events and their impact on cattle health reinforce the need for shade.
- **Flexibility in implementation:** A few respondents advocate for a risk-based approach, allowing flexibility based on individual feedlot conditions, rather than a one-size-fits-all mandate.
- **Financial viability:** The financial implications of installing shade structures are a recurring theme, with some stating that smaller feedlots may struggle to comply.
- **Perception of the industry:** The importance of maintaining a positive public perception of the cattle industry through improved animal welfare practices is highlighted.
- **Scepticism towards mandatory requirements:** Some participants express scepticism and/or opposition about the 'mandatory' nature of the pledge, citing regional differences and the potential for negative outcomes in certain climates.

Figure 9. Attitudes towards the ALFA pledge to have shade available to 100% of cattle by 2026 (N=130).



On an industry constructed capacity basis, support was even stronger for the ALFA shade pledge with feedlots operating 57% and 28% of constructed capacity indicating they 'strongly agree' and 'agree' respectively (total of 85%) with the pledge. Notably there is still effectively 10% of constructed capacity whose feedlot representatives either disagree or strongly disagree with the pledge. This number represents the key barrier to obtaining full compliance with the pledge and will be discussed later.

Figure 10. Distribution of constructed capacity by their agreement with the Australian Lot Feeding industry's pledge to provide shade or shelter to all cattle on feed by 2026 (N=130, constructed capacity=1.09 million).



A thematic of the key reasons that feedlot respondents identified when either agreeing with or disagreeing with the ALFA shade pledge is shown in Figure 11. Animal welfare, health and performance are the key drivers of positive responses, whereas community and consumer expectations whilst apparent, appeared to be secondary drivers. Financial position was the major driver of indifferent responses, which suggests that these feedlots may consider installation of shade when capital is available. Geographic location was the key driver of negative responses, although not all responses were from regions that are traditionally seen as hot. A lack of perceived benefits and costs are additional elements that lead to a disagreement with the pledge.

Figure 11. Summary of comments relating to the rating of agreement with the Australian Lot Feeding industry pledge to provide shade or shelter to all cattle on feed by 2026. N is the number of feedlots making a response matched to the topic. Individual feedlots may have contributed to more than one topic.

4.1.4 Industry sustainability

We asked, "Do you believe that provision of shade or shelter to Australian lot fed cattle will help maintain the long-term sustainability of the Australian lot feeding industry? Why?" In summary …

Respondents emphasised the importance of providing shade and shelter for cattle, particularly during the summer months, to support the long-term sustainability of the industry. They emphasised that shade is essential for animal welfare, as it helps reduce heat stress, improve productivity, enhance market access, and promote environmental efficiency.

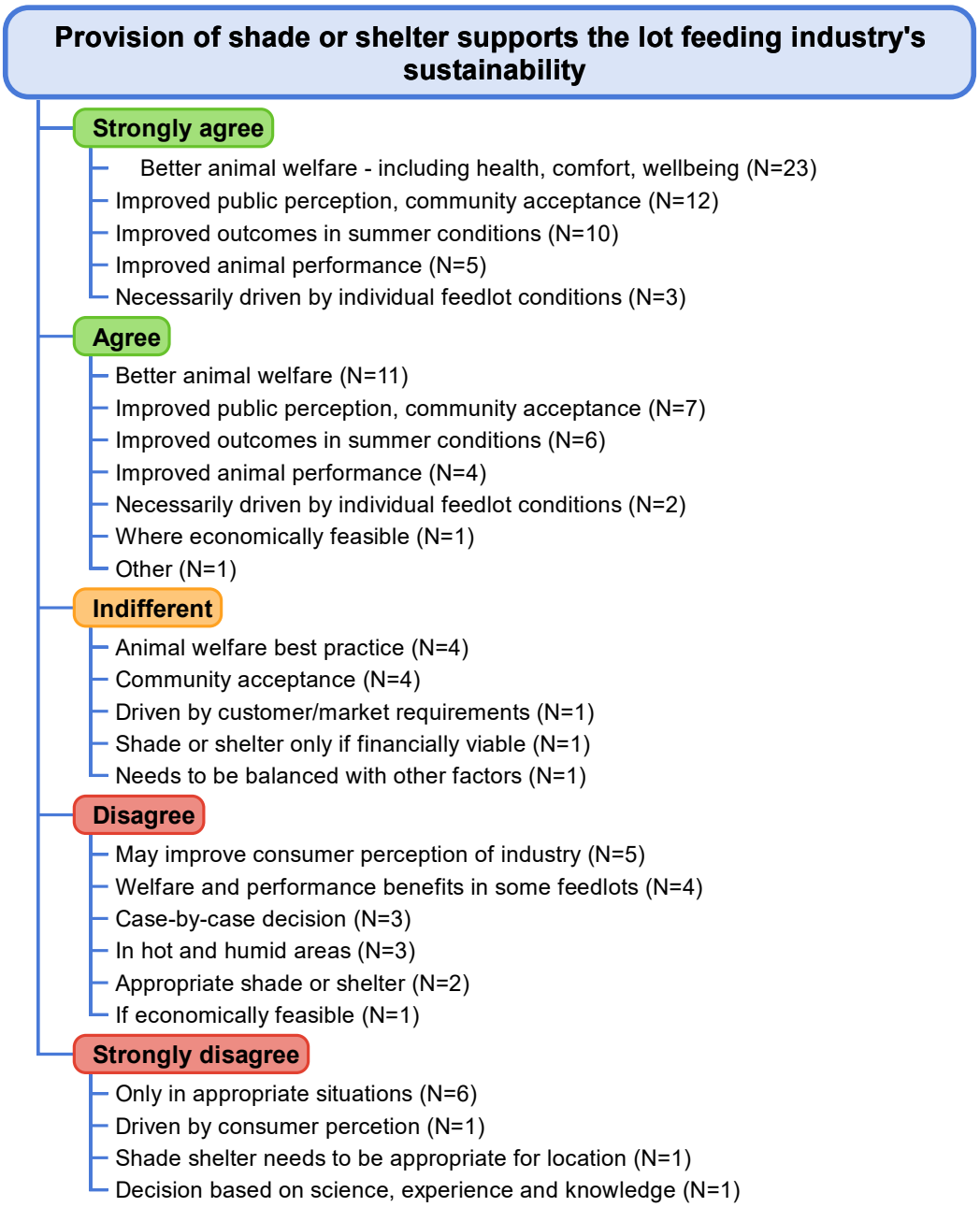
Respondents indicated several reasons why shade and shelter are beneficial:

- **Animal Welfare**: Providing shade helps reduce heat stress, which is critical for animal welfare. Cattle experiencing less heat stress tend to have better feed conversion rates, higher average daily gains, and lower mortality.
- **Productivity**: Shade helps improve cattle performance and health, leading to better productivity and reduced health-related costs.
- **Market Access**: Providing shade aligns with ethical standards and consumer expectations, ensuring continued market access and future-proofing the industry against environmental and regulatory challenges.
- **Environmental Efficiency**: Shade structures can improve environmental efficiency by reducing heat stress and promoting better cattle welfare.

Respondents also mentioned that providing shade and shelter is seen as important by the public and helps improve the industry's reputation.

Of the 124 responding feedlots, some 91% operating 98% of the industry's constructed capacity, indicated they "believe that provision of shade or shelter to Australian lot fed cattle will help maintain the long-term sustainability of the Australian lot feeding industry".

Figure 12. Summary of comments relating to the rating of the statement that provision of shade or shelter to Australian lot fed cattle will help maintain the long-term sustainability of the Australian lot feeding industry. N is the number of feedlots making a response matched to the topic. Individual feedlots may have contributed to more than one topic.



Animal welfare and increased community acceptance / support are the main drivers of shade being considered an important component of feedlot sustainability (Figure 12). Interestingly animal performance whilst seen as important, was a moderate driver of shade and feedlot sustainability. Feedlot conditions were also seen as a tempering element of positive responses. As before, geographic location was the key driver of negative responses to shade as a long-term sustainability component,

however even with those negative responses, welfare and consumer perception were still seen as favourable sustainability outcomes.

4.1.5 Feedlot shade or shelter status

As shown in Figure 13, slightly less than half the participating feedlots (49%) indicated all home pens provide cattle with access to shade or shelter. Shade or shelter was provided in some, but not all the home pens in 24% of the feedlots surveyed. Just over a quarter (27%) of feedlots indicated that none of their home pens provide cattle with shade or shelter. On a capacity basis, feedlots operating 68% of constructed capacity indicated all home pens provide cattle with access to shade or shelter. Just 6% of constructed capacity is in feedlots that indicated none of their home pens offer access to shade or shelter (see Figure 14).

Figure 13. Distribution of feedlots (number) between those where all home pens provide cattle with access to shade or shelter, those where some pens provide access to shade or shelter and those with no access to shade or shelter (N=132).

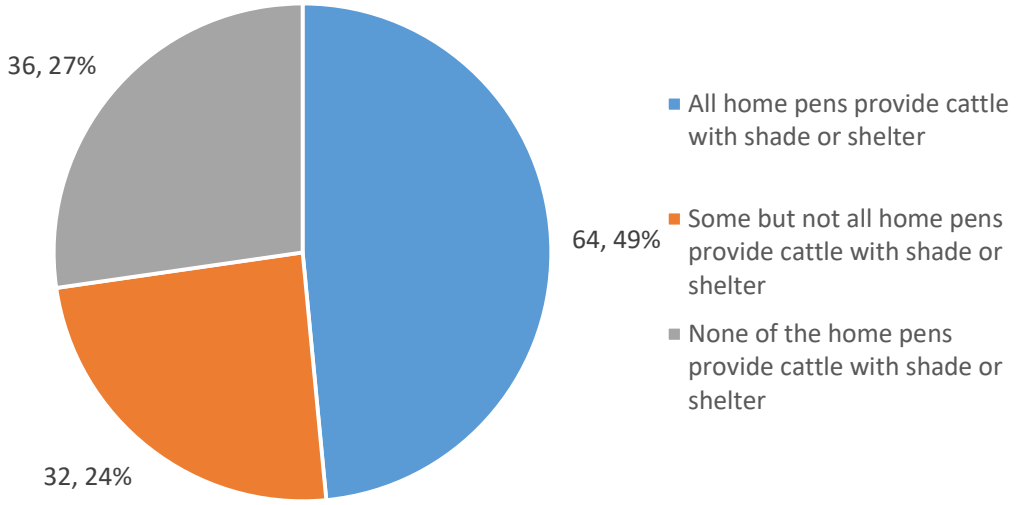
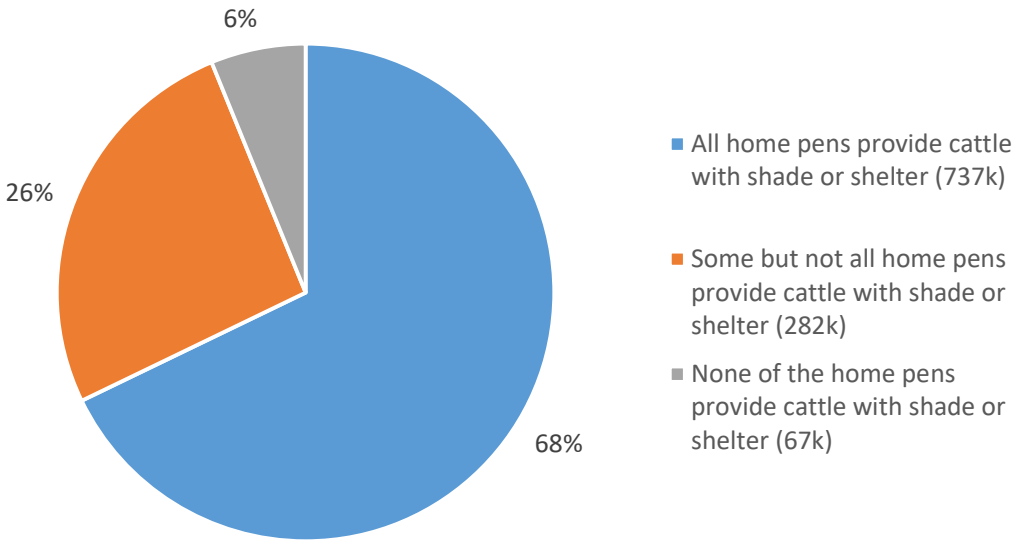


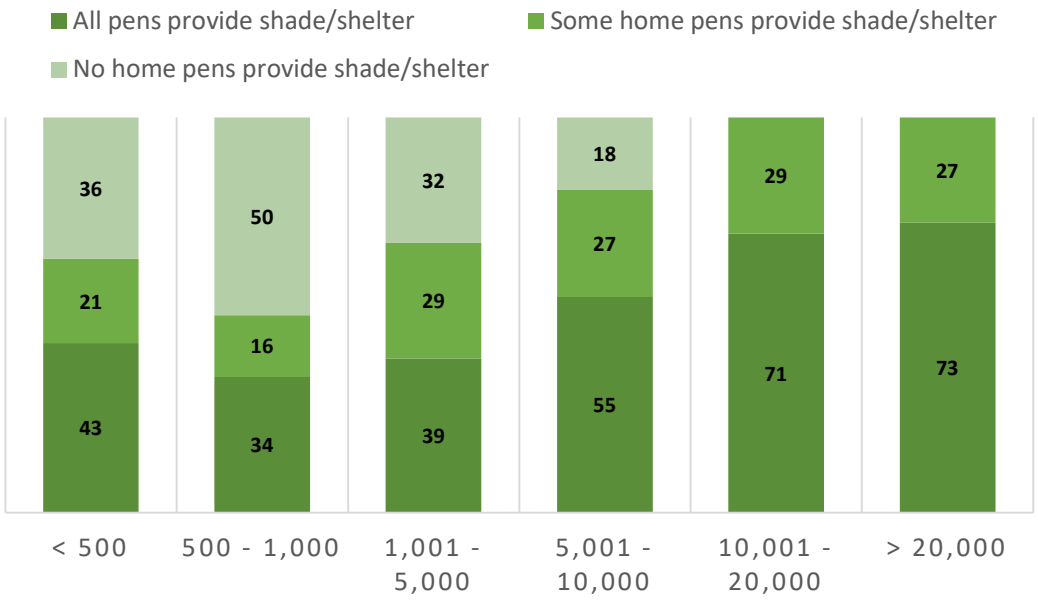
Figure 14: Distribution of constructed capacity between feedlots where all home pens provide cattle with access to shade or shelter, where some pens provide access to shade or shelter and feedlots with no access to shade or shelter (N=132, constructed capacity = 1.09 million).



4.1.6 Shade status by feedlot size category

Figure 15 shows the distribution of the feedlots surveyed in size categories and by their installed shade or shelter status. Generally, a higher proportion of larger feedlots provide access to shade or shelter in all home pens. All feedlots with a constructed capacity of greater than 10,000 having some home pens with shade (~30%) or all home pens with access to shade (~70%). As expected, higher proportions of feedlots with none of their home pens providing shade were reported in feedlots less than 5,000 with proportions ranging from 32% (1,000-5,000), to 50% (500-1,000), and 37% (less than 500).

Figure 15. The proportion of feedlots by access to shade or shelter within feedlot size categories.



Clearly and as expected, Queensland dominates with 61% of feedlots and 66% of the total constructed capacity recorded in this analysis. Figure 16 shows that there are feedlots in all states that have no shade or shelter offered to any home pens indicating that temperature / heat load may not be the only key driver of installation, with a high proportion of southern feedlots having installed shade or shelter (either to all or some home pens). However, when expressed on a constructed capacity basis (Figure 17), the numbers of cattle that don't have access to shade in Queensland is very low indicating that feedlot size is influencing the constructed capacity result. Western Australia has the highest proportion of cattle that don't have access to shade or shelter.

Figure 16. Distribution of feedlots by State and by access to shade or shelter.

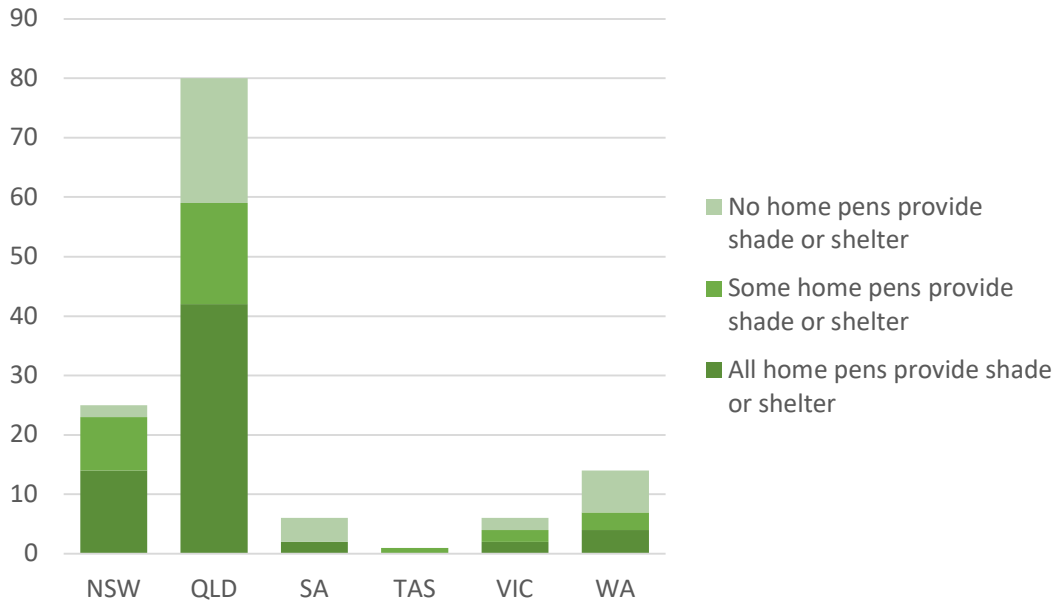


Figure 17. Relative distribution of constructed capacity by access to shade or shelter within each State.

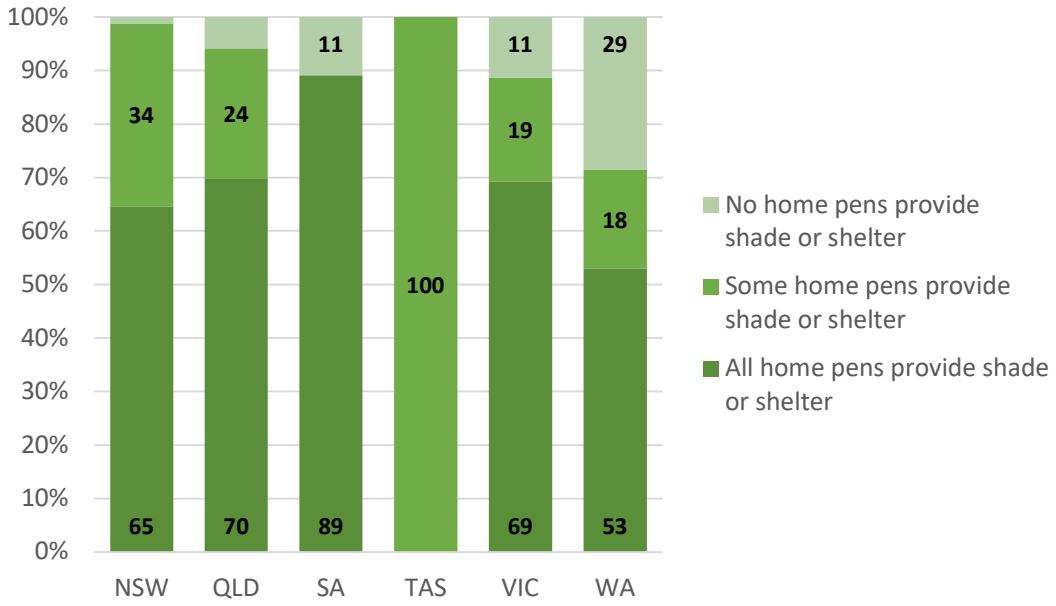
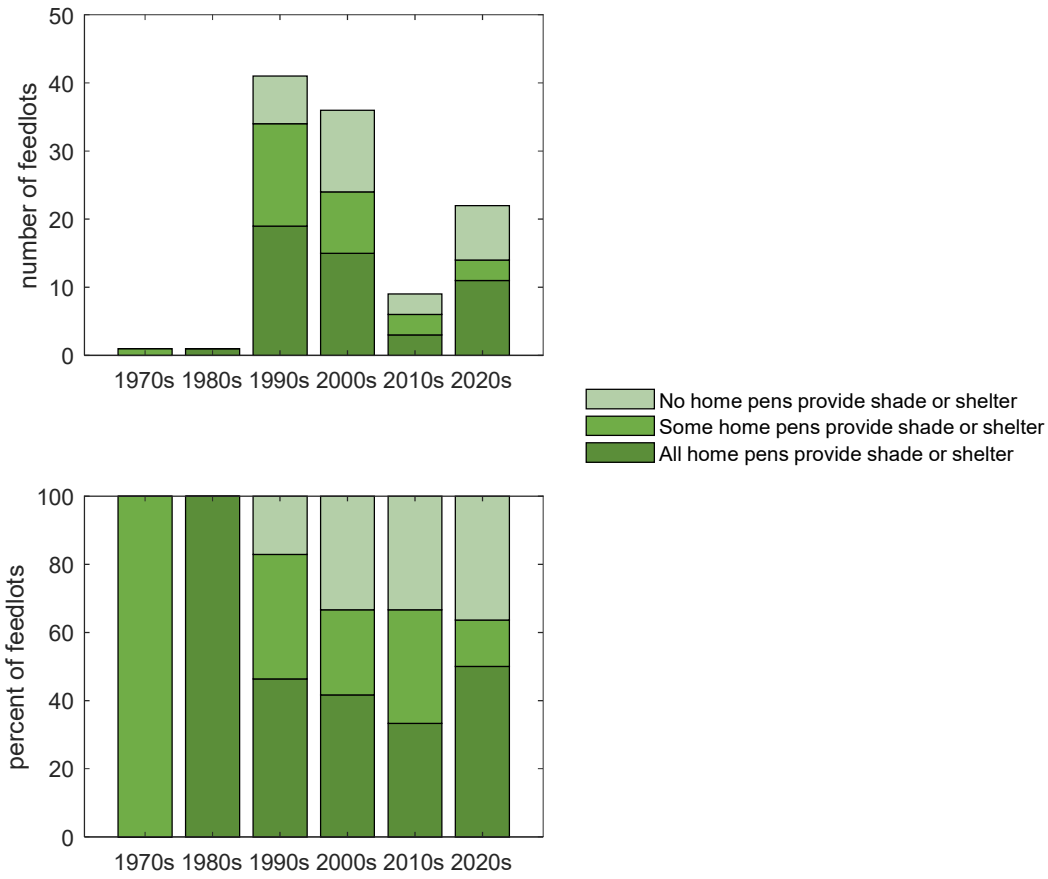


Figure 18 shows the distribution of feedlots with all, some or none of the home pens providing access to shade or shelter relative to timing of NFAS accreditation. There appears to be no relationship with feedlot accreditation time length and shade provision. Notably there are feedlots that have been accredited in recent years that don't have shade or shelter provision. These feedlots may be a target audience.

Figure 18. Number of feedlots and percent of feedlots responding to the survey that provide access to shade or shelter in all home pens, some home pens and none of their home pens by decade when NFAS accredited.



4.1.7 Custom feeding

Of the 138 feedlots that answered the question on whether they custom fed cattle, the 44% that indicated they did custom feed accounted for 39% of the constructed capacity.

Feedlots identified as one of multiple feedlots that are family owned undertook custom feeding at a higher rate (79% of feedlots, 95% of the capacity of family owned, multiple feedlots). Corporate owned, single feedlots had the lowest level of custom feeding at 16% of the total capacity of those feedlots.

Feedlots without shade or shelter had a higher participation in custom feeding than feedlots with some home pens providing access to shade or shelter. Feedlots with shade or shelter accessible in all home pens had the lowest participation in custom feeding.

Table 5. Distribution of custom feeding by feedlot lot ownership

Ownership	Total number of feedlots completing the survey	Percent of all feedlots that undertake some custom feeding	Total constructed capacity of survey feedlots	Percent of total capacity in feedlots that undertake some custom feeding
Family, Single	92	41%	277,300	49%
Family, Multiple	14	79%	130,200	95%
Corporate, Single	15	40%	220,000	16%
Corporate, Multiple	17	35%	374,200	25%
Total	138	44%	1,001,700	39%

Table 6. Distribution of custom feeding by shade or shelter status

Shade or shelter status of home pens	Total number of feedlots completing the survey	Percent of all feedlots that undertake some custom feeding	Total constructed capacity of survey feedlots	Percent of total capacity in feedlots that undertake some custom feeding
All home pens provide access to shade or shelter	57	35%	683,300	34%
Some home pens provide access to shade or shelter	31	42%	256,500	42%
No home pens provide access to shade or shelter	32	53%	61,900	78%
Total	120	42%	1,001,700	39%

4.2 Industry Responses to Shade and Shelter

The structure of the survey allowed for both common and unique questions to be asked for feedlots where cattle have access to shade or shelter in all home pens, in some home pens and in none of the home pens. As a result, the responses to those questions have been organised within those three sub-groups.

4.2.1 Key observations of feedlots that have provided shade or shelter

4.2.1.1 Area of shade or shelter per animal in feedlots where access to shade or shelter is provided in all home pens.

Of the feedlots that indicated that all home pens provided access to shade or shelter, three-quarters indicated an average of between 2m^2 and 4m^2 per animal, while 10% of feedlots provided less than

$2m^2$ per animal. On a constructed capacity basis, 95% have access to at least $2m^2$ per animal. However, it is important to note that 5% have less than $2m^2$ which is lower than the current shade recommendations that are promoted by ALFA and MLA[8].

Table 7. Distribution of feedlots and constructed capacity by area of shade provided per animal in feedlots where all home pens provide access to shade or shelter (N=63, total constructed capacity=737k)

Area of shade or shelter provided per animal	No. of feedlots	Percent of feedlots	Total constructed capacity	Percent of total constructed capacity
< 2 m^2	6	9.5%	34,600	4.7%
2 – 4 m^2	47	74.6%	591,100	80.2%
> 4 m^2	10	15.9%	111,400	15.1%

4.2.1.2 Who installed the shade or shelter in fully shaded / sheltered feedlots

In feedlots that reported shade, or shelter was available in all home pens, shade or shelter was installed by current feedlot management / owners in 95%, or 53 of the 56 feedlots that answered this question. Those feedlots accounted for 99% of the constructed capacity of the responding feedlots.

4.2.1.3 Type of shade or shelter installed on fully shaded / sheltered feedlots

Shade offered by continuous shade cloth (e.g. longitudinal rows - long thin shade structures that stretch over many pens) was reported to be installed in more feedlots than each of the other types (Figure 19). Figure 20 presents the total constructed capacity of the feedlots nominating each shade or shelter type. Note that 'Shade provided by discontinuous shade cloth panels' shows a relatively larger contribution when shown as total constructed capacity (Figure 20) likely indicating its use on larger feedlots.

[8] https://www.feedlots.com.au/_files/ugd/f25d7a_e1772a0f55a34310b93de726a11375e4.pdf

Figure 19. Number of times each shade type was chosen for feedlots with shade or shelter available to cattle in all home pens. The further 'dots' are from the centre of the chart, the greater the number of feedlots choosing that option.

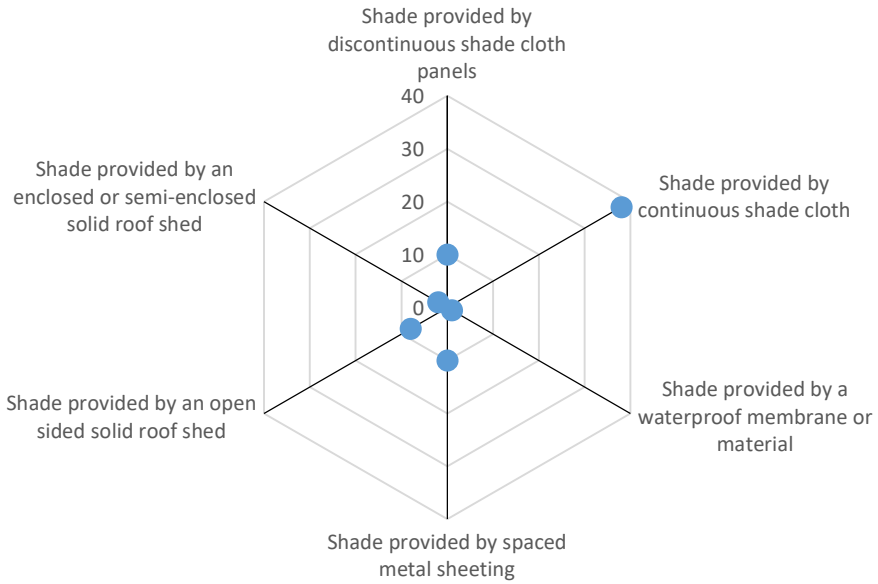
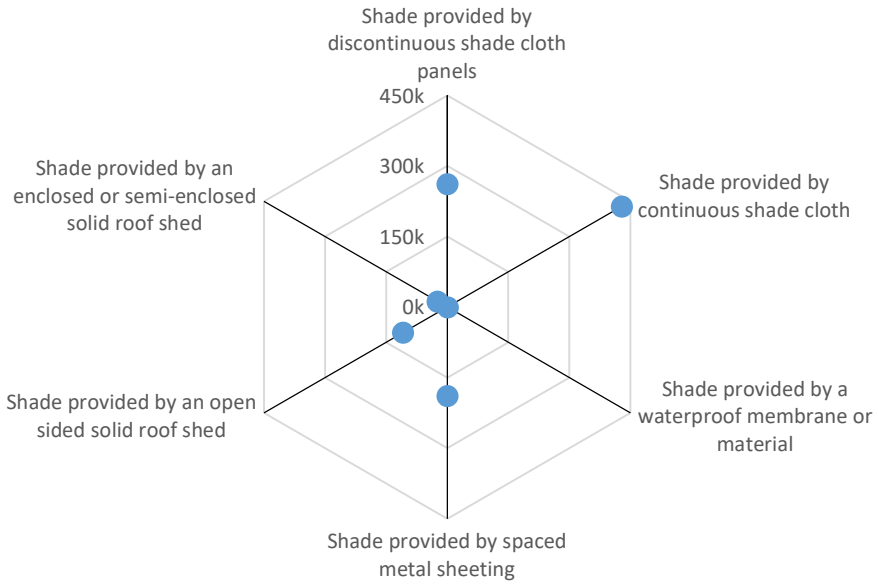


Figure 20. Total constructed capacity of full shade or shelter feedlots choosing each shade type. The further 'dots' are from the centre of the chart, the greater the constructed capacity of feedlots choosing that option.



The type of shade provided, gives an indication of the intent of that investment in terms of either shade, shelter or both. It can be inferred that the installation of shade cloth is primarily to provide shade and not specifically shelter. Installation of permanent solid structures or waterproof membranes infers that shade and / or shelter is being sought.

4.2.2 Feedlots that provide access to shade or shelter in some home pens

4.2.2.1 Area of shade or shelter per animal in feedlots with shade or shelter in some, but not all, home pens

Among feedlots that indicated that some home pens provide access to shade or shelter, 69% or 20 feedlots (out of 29 that answered the question) indicated that those home pens provided between $2m^2$ and $4m^2$ of shade or shelter per animal with a further 21% providing more than $4m^2$. Noting that 10% provide less than $2m^2$ of shade per animal.

Across all those same feedlots, home pens with shade or shelter could accommodate 60% of the total constructed capacity of these feedlots.

Table 8. Distribution of feedlots and constructed capacity by area of shade provided per animal in feedlots where only some home pens provide access to shade or shelter (N=29, total constructed capacity=278k

Area of shade or shelter provided per animal in pens with shade or shelter	No. of feedlots	Percent of feedlots	Total constructed capacity	Constructed capacity with access to shade or shelter
< 2 m^2	3	10%	2,300	1,700 (73%)
2 – 4 m^2	20	69%	214,100	155,500 (73%)
> 4 m^2	6	21%	61,500	9,700 (16%)
Total	29		278,000	167,000 (60%)

4.2.2.2 Who installed the shade or shelter in feedlots with shade or shelter in some, but not all, home pens

The shade or shelter installed in 25 of the 27 feedlots offering shade or shelter in only some home pens was installed by the current feedlot management / owners.

Those 25 feedlots provided shade or shelter for a combined constructed capacity of 156,600, or 91% of the shaded / sheltered constructed capacity (171,500) of those feedlots (Table 9).

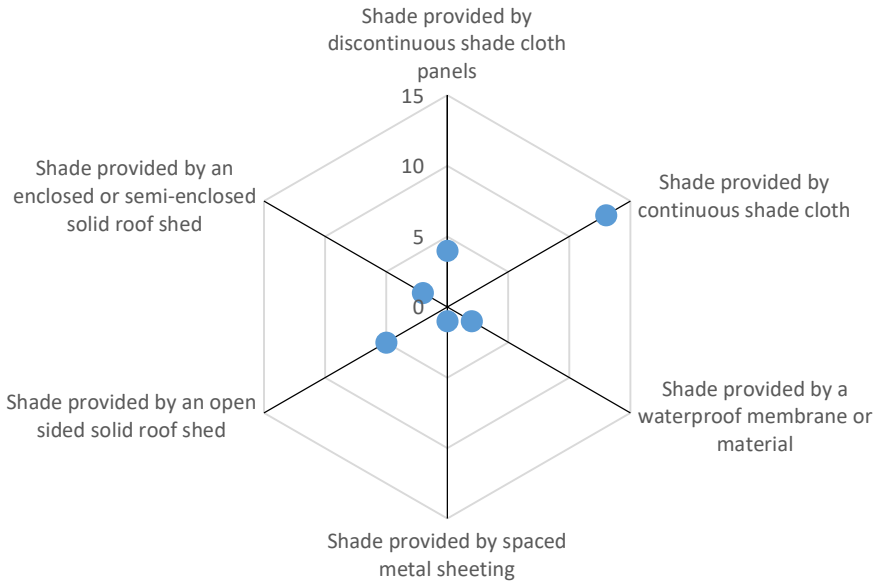
Table 9. Percent of feedlots that have shade or shelter over some, but not all, home pens and constructed capacity of the shaded / sheltered pens of those feedlots where the shade or shelter was installed by the current manager / owner

Current owner / manager installed the shade	Number of feedlots	Total constructed capacity of home pens with access to shade or shelter	Total constructed capacity of feedlots with access to shade or shelter provided to some home pens
Yes	25	156,600	254,300
No	2	14,900	17,500
Total	27	171,500	271,800
Percent 'Yes'	93%	91%	94%

4.2.2.3 Type of shade or shelter installed on feedlots with shade or shelter in some, but not all, home pens

For feedlots with shade or shelter available to cattle in only some home pens, 'shade provided by continuous shade cloth' was selected by 13 feedlots compared to a total of 14 feedlots choosing between all the other types of shade or shelter combined (Figure 21).

Figure 21. Number of times each shade type was chosen for feedlots with shade or shelter available to cattle in some home pens. The further 'dots' are from the centre of the chart, the greater the number of feedlots choosing that option.



4.2.3 Feedlots that have not installed shade or shelter

A total of 36 feedlots that have not installed shade or shelter over any of their home pens provided responses to the survey. These feedlots have a combined constructed capacity of 67,000.

When asked if they intend to install shade, 44% or 16 of the 36 feedlots answered 'Yes' and the same number answered 'No' with the remaining 4 feedlots 'preferring not to say' (Table 10). The total constructed capacity of the feedlots that indicated an intent to install shade or shelter was 26,600, or 40% of the 67,000 total constructed capacity of those feedlots without shade or shelter over any home pens. Notably 51% of this category has no intention to install shade or shelter, with 9% preferring not to say.

Table 10. Intention to install shade among feedlots that currently do not have shade or shelter over any home pens.

Do you intend to install shade and / or shelter over the constructed capacity of your feedlot?	Number of feedlots	Percent of feedlots	Total constructed capacity	Percent of total constructed capacity
Yes	16	44%	26,600	40%
No	16	44%	34,200	51%
Prefer not to say	4	11%	6,200	9%
Totals	36		67,000	

Of the 36 feedlots without shade or shelter over any home pens, only 18 indicated if the planned shade or shelter was funded, and only half of these indicated funding had been budgeted. Shade type intentions reflect an outcome mainly associated with shade provision being 75.1% of responses or 71% of constructed capacity. Only four feedlots signalled their intention to install solid or waterproof materials.

Table 11. Choice of shade or shelter type for feedlots that currently have no shade or shelter over their home pens. Survey respondents could, and in some cases did, choose more than one option.

Planned type of shade or shelter	Count of feedlots	Percent of feedlots[9]	Total constructed capacity[10]	Percent of constructed capacity
Shade provided by continuous shade cloth (e.g. longitudinal rows - long thin shade structures that stretch over many pens)	11	85%	13,700	69%
Shade provided by discontinuous shade cloth panels (e.g. centre squares)	1	8%	1,700	85%
Shade provided by spaced metal sheeting (e.g. separate panels - structures connected in a grid like pattern and providing alternate shade spots through the pen)	-	-	-	-
Shade provided by an open sided solid roof shed	1	8%	1,800	9%
Shade provided by an enclosed or semi-enclosed solid roof shed	1	8%	1,800	
Shade provided by a waterproof membrane or material	2	15%	900	4%

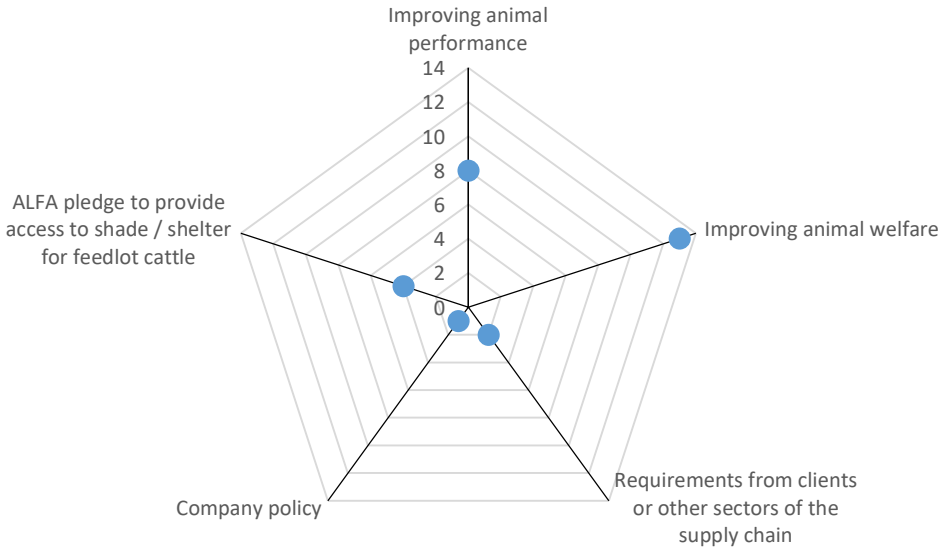
[9] 'Percent of feedlots' does not total to 100% because some feedlots indicated more than one type of shade or shelter was installed.

[10] Where a feedlot indicated more than one type of shade or shelter was installed, that feedlot's constructed capacity was split equally between each of the types of shade or shelter

Total number of eligible Respondents and total constructed capacity of their feedlots	13		19,700	

'Improving animal welfare' is the dominant motivation for intending to install shade or shelter over feedlots that currently offer no shade or shelter in any home pens (Figure 22). The fact that there is such as strong sentiment reflects the messaging that ALFA and industry have been promoting.

Figure 22. Primary motivation for intending to install shade or shelter among feedlots that currently do not provide access to shade in any home pens.



4.3 Functional elements of shade installation

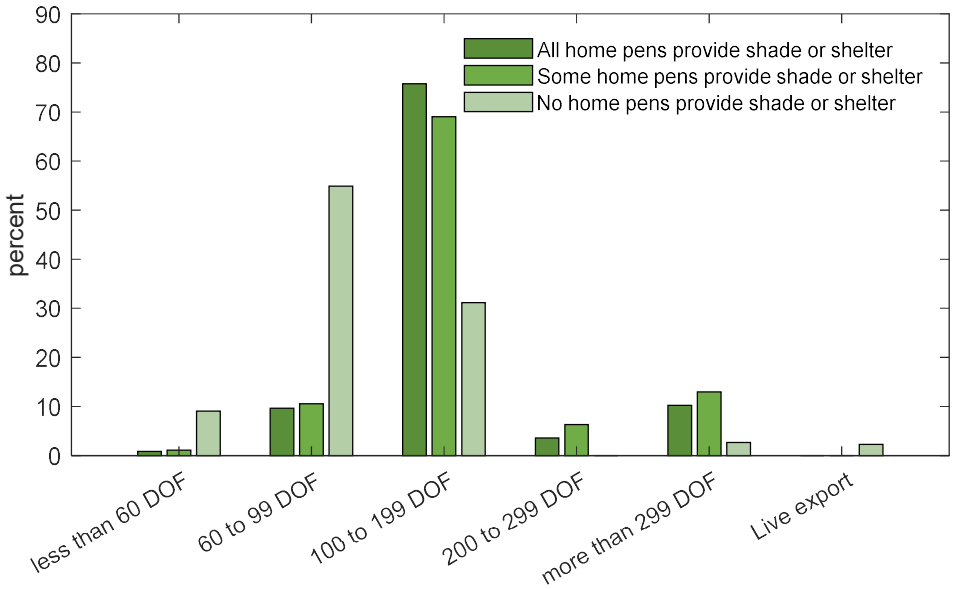
In the previous section, responses were split depending on the answer to the question of whether feedlots provide access to shade or shelter in all home pens, in some home pens or in none of the home pens. For the following sections, although the questions were asked separately depending on shade provision, they were identical and therefore we have decided for comparative purposes and discussion that responses will be displayed simultaneously.

4.3.1 Impact of Days on Feed (DOF) on shade installation

The survey asked for a split of annual turn-off among six categories, five based on days on feed (DOF) plus live export. Figure 23 shows the percentage of turn-off for each category split between feedlots where all, some, or none of the home pens provide access to shade or shelter.

Clearly, at 76% and 69%, feedlots with shade or shelter provided to all home pens and feedlots with shade or shelter provided to some home pens respectively, concentrate on feeding cattle for between 100 and 199 days. By contrast, feedlots not offering shade or shelter in any home pens favour 60 to 99 DOF for 55% of turn-off with only 31% fed for between 100 and 199 days.

Figure 23. Percent of turn-off by days on feed for feedlots with all home pens, some home pens or no home pens providing access to shade or shelter.

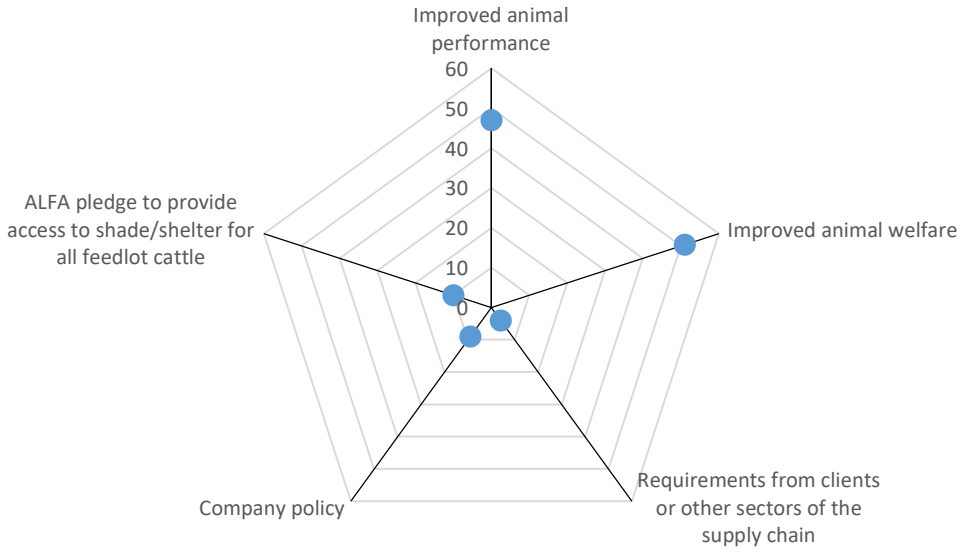


It is notable that as DOF increases, the provision of shade is significantly higher. We believe that this is to be expected as it is *Bos taurus* (predominately Black Angus and Wagyu) that will be fed for longer durations to achieve higher marble scores and performance is more likely to be susceptible to the impact of heat load, whereas *Bos indicus* types are more likely to be fed for shorter domestic focussed markets.

4.3.2 Primary motivation for installing shade or shelter

Survey participants both with all or some home pens providing shade or shelter were asked to identify their primary motivations for installing shade or shelter. Feedlots with shade or shelter available in all home pens chose 'improved animal welfare' and 'improved animal performance' significantly more than the other options (Figure 24). This should be seen as strong endorsement of ALFA and industry messaging. We hypothesised that client demands might be influencing the installation of shade; this appears to be only a minor driver. At this point in time, it is not a market-pull through driving shade, but welfare and performance.

Figure 24. Number of times each 'motivation' was chosen for feedlots with shade or shelter available to cattle in all home pens. The further 'dots' are from the centre of the chart, the greater the number of feedlots choosing that option.



Other motivations for installing shade or shelter put forward by feedlots with shade or shelter in all home pens included:

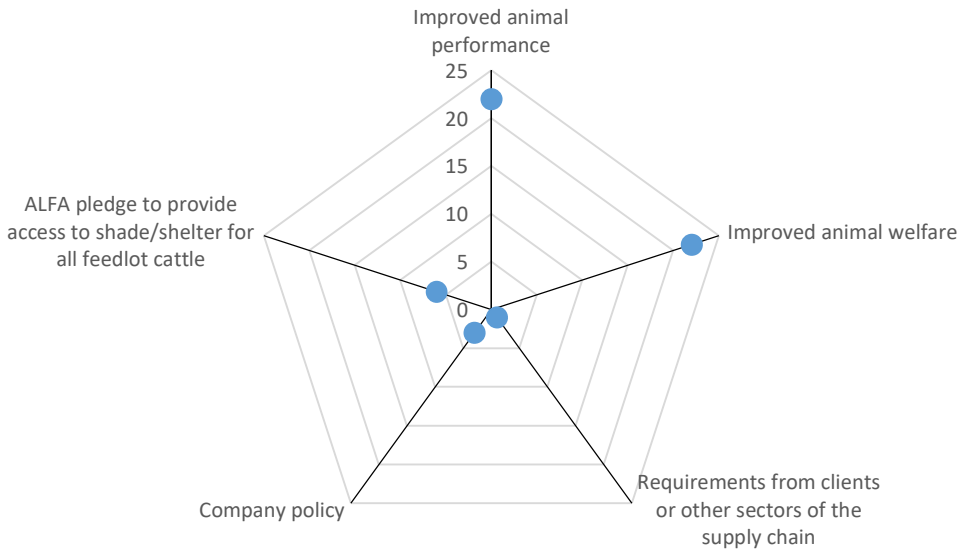
- 'Management of heat stress through extreme weather events.'
- 'Set up for robot feeding'.
- 'Customers perception re cattle welfare; less (sic) shading of water troughs in hot weather; changes in cattle pen distribution on hot days.'

Figure 25 shows that feedlots with shade or shelter accessible in some home pens indicated near identical motivations for installing shade or shelter to those of the full shade or shelter feedlots.

For feedlots with shade or shelter provided in some home pens, additional motivations include:

- 'To have clean cattle, dag free prior to exit for slaughter. (shedded for last approximately 45 days)'
- 'Requirement by local council on licence approval.'
- 'MLA and Murdoch University Shade trial. Contribute to industry / help understand benefits '
- 'We're hoping to prove improved performance and understand the genuine financial cost / benefit.'

Figure 25. Number of times each option was chosen for feedlots with shade or shelter available to cattle in some home pens. The further 'dots' are from the centre of the chart, the greater the number of feedlots choosing that option.



4.3.3 Production and welfare benefits

We asked "Do you believe providing shade or shelter has improved animal performance in your feedlot? Describe the benefits." In summary …

Providing shade and shelter for cattle significantly enhances their welfare and performance, particularly during extreme temperatures. The installation of shade has led to increased weight gain, improved feed conversion efficiency, and reduced heat stress, contributing to overall animal health.

- **Improved animal comfort:** Shade helps cattle cope better in hot conditions, leading to less stress and higher feed intake.
- **Enhanced performance metrics:** Cattle experience increased average daily gains (ADG) and better feed conversion rates when shade is available.
- **Welfare benefits during heat events:** Shade provides critical relief during heat waves, particularly for Bos taurus cattle, resulting in lower morbidity and mortality rates.
- **Sustained productivity:** The ability to maintain consistent feed intake and performance levels throughout summer months reflects the positive impact of shade on cattle welfare.

There was an overwhelming majority of responses that indicated that providing shade or shelter improved animal performance, with 84% of all respondents replying yes. Whilst the positive response for full (93%) shade was expected, there was no significant difference between feedlots with shade or shelter provided in some home pens (74%) and those not providing shade or shelter in any home pens

(77%). The observation that the majority of feedlots that don't supply shade still acknowledge the positive performance benefits is surprising and important as it suggests that extension messages that target performance outcomes have already been acknowledged and yet may not encourage shade installation (Table 12). There is a small proportion of feedlots that still believe that shade provides no performance benefits, including two feedlots that have shade installed.

Table 12. Number of feedlots by current provision of shade or shelter and view on whether animal performance is improved by the provision of shade or shelter

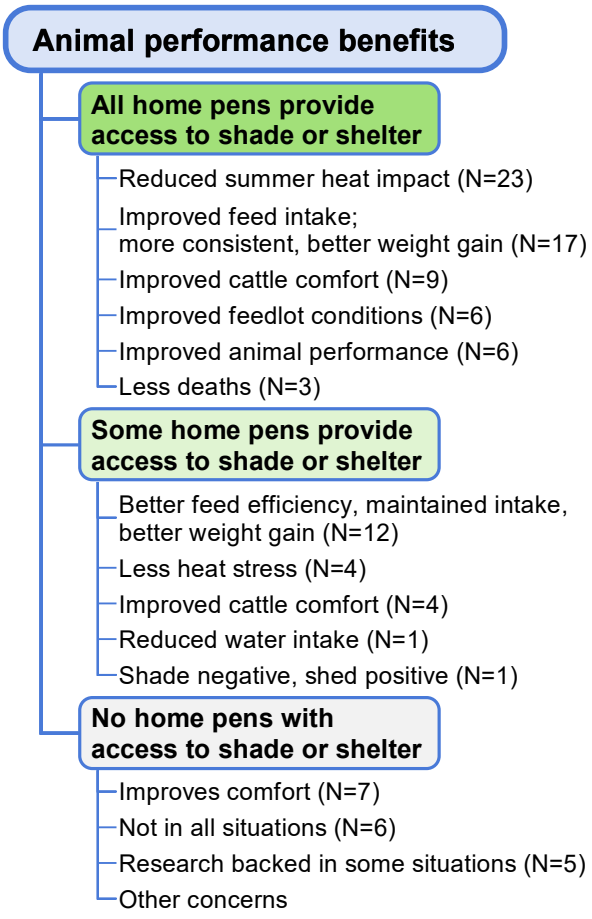
Do you believe providing shade or shelter has improved (or can improve) animal performance in your feedlot?	Feedlots where all home pens offer access to shade or shelter	Feedlots where some home pens offer access to shade or shelter	Feedlots where no home pens offer access to shade or shelter	All feedlots
Yes	52	20	23	95
No	1	1	7	9
Not sure	3	6		9
TOTAL	56	27	30	113
Percent 'Yes'	93%	74%	77%	84%

When evaluating the responses to animal performance due to shade on a constructed head basis, it again is very clear that the majority of cattle that have shade provided are perceived to be achieving a performance benefit (93%), with only 3% not achieving a perceived performance benefit and 4% in feedlots that are not sure. As indicated above 67% of cattle in feedlots that don't have shade would get a perceived benefit from shade if installed, whereas 33% are in feedlots where there is no expectation of performance benefits from shade installation. This supports the notion that for some feedlots without shade, performance extension messages will not alter their decisions (Table 13).

Table 13. Total constructed capacity of feedlots by current provision of shade or shelter and view on whether animal performance is improved by the provision of shade or shelter

Do you believe providing shade or shelter has improved (or can improve) animal performance in your feedlot?	Feedlots where all home pens offer shade or shelter	Feedlots where some home pens offer shade or shelter	Feedlots where no home pens offer shade or shelter	All feedlots
Yes	671,500	209,000	40,700	921,200
No	500	12,000	19,800	32,300
Not sure	11,300	30,800	n.a.	42,100
Total	683,300	251,800	60,500	995,600
Percent 'Yes'	98%	83%	67%	93%

Figure 26. Explanation for impact of provision of shade or shelter on animal performance. N is the number of feedlots making a response matched to the topic. Individual feedlots may have contributed to more than one topic. (N represents the number of comments related to the heading.)



The thematic of open responses to elements of feedlot performance due to shade provision is shown in Figure 26. Responses from feedlots providing shade or shelter to all home pens was dominated by reducing heat impact, improved feed intake, maintaining feed intake and better weight gain. In contrast, feedlots that provide shade or shelter to only some home pens, also noted the impact of better feed efficiency, maintaining feed intake and better weight gain, but were impacted less by reducing heat load. Improved cattle comfort[11] is an interesting observation in that there is a perception associated with performance and that goes across the three types.

[11] See recommendations

We asked "Have you observed or measured any animal welfare benefits from providing shade or shelter in your feedlot? Describe the benefits." In summary …

Providing shade significantly enhances animal welfare, by reducing heat stress and improving comfort. This leads to better health outcomes, including increased weight gain and lower mortality rates during extreme heat events.

- **Improved comfort and performance:** Cattle under shade exhibit reduced heat stress, leading to improved comfort, consistent feed intake, and better overall performance during hot weather.
- **Health benefits:** The provision of shade correlates with lower incidence of heat stress-related deaths and improved recovery rates during heat events. This contributes to a general increase in animal health and well-being.
- **Behavioural preferences:** Cattle actively seek shade during hot and rainy conditions, indicating a preference for shaded areas that provide relief from extreme temperatures.
- **Overall welfare improvements:** The presence of shade contributes to cleaner conditions for cattle, reducing stress and morbidity, leading to healthier animals with higher average daily gains.

The majority of feedlots that have installed shade reported positive animal welfare benefits (76% for feedlots where all pens provide access to shade or shelter and 81% for feedlots providing shade or shelter to only some pens). The observation that seven of the feedlots that have installed shade but don't believe that an animal welfare benefit has been achieved is interesting in that those feedlots did identify a performance benefit. There may be an opportunity to explore this further, given that ten feedlots with shade were not sure (Table 14).

Recommendation 1. That ALFA and MLA consider further investigation into why some feedlots consider that shade does not provide a welfare benefit.

Furthermore, noting that 28 out of 30 or 93% of feedlots that currently don't have shade believe that an animal welfare benefit can be achieved, would suggest that although these feedlots can see welfare benefits, there are other more important factors that influence the installation of shade decision. The constructed capacity (see Table 15), indicates that in feedlots that have installed shade, 85% of the cattle are perceived to have obtained a welfare benefit, although there is still 14% where no benefit has been observed. A key observation is that in those feedlots that have installed shade, approximately 84% of cattle have received a welfare benefit based on the experiences and perceptions of feedlot operators.

Table 14. Number of feedlots by current provision of shade or shelter and view on whether animal welfare is improved by the provision of shade or shelter

Do you believe that shade or shelter can benefit animal welfare?	Feedlots where all home pens offer shade or shelter	Feedlots where some home pens offer shade or shelter	Feedlots where no home pens offer shade or shelter	All feedlots
Yes	37	21	28	86
No	7	0	2	9
Not sure	5	5	n.a.	10
Total	49	26	30	105
Percent 'Yes'	76%	81%	93%	81%

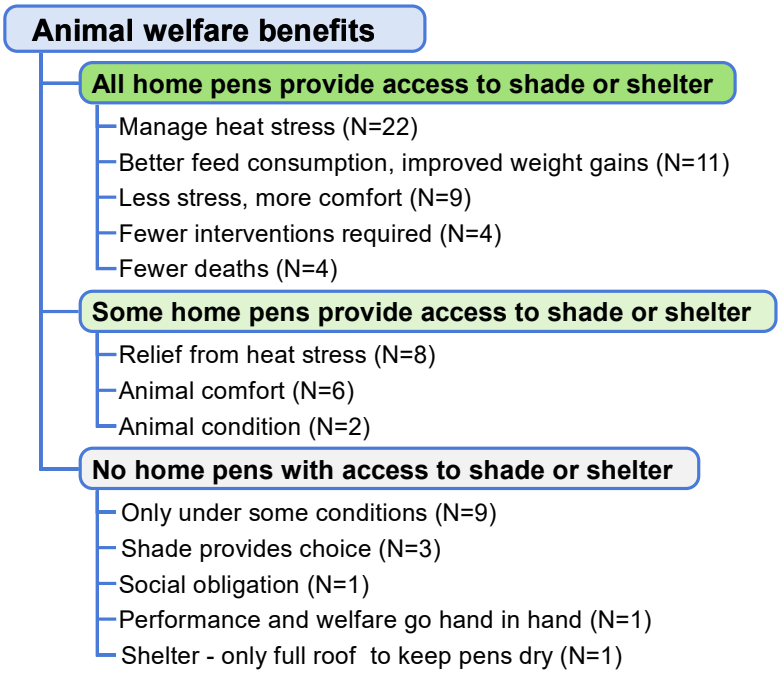
Table 15. Total constructed capacity of feedlots by current provision of shade or shelter and view on whether animal welfare is improved by the provision of shade or shelter

Do you believe that shade or shelter can benefit animal welfare?	Feedlots where all home pens offer shade or shelter	Feedlots where some home pens offer shade or shelter	Feedlots where no home pens offer shade or shelter	All feedlots
Yes	482,800	232,000	47,900	762,700
No	83,100	0	3,500	86,600
Not sure	26,400	18,800	n.a.	45,200
Total	592,300	250,800	51,400	894,500
Percent 'Yes'	82%	93%	93%	85%

Given the focus on animal welfare and benefits of shade, it is not unexpected that the most common benefit was managing heat load or heat stress (see Figure 27). The responses also highlight the strong interconnectivity between performance and welfare with several feedlots indicating better feed consumption and improved weight gain as a welfare benefit. The ubiquitous term of animal comfort was cited by feedlots providing access to shade or shelter to all or only some home pens. Given this term appears as frequently as it does, it may warrant further exploration as to what feedlot representatives are describing or measuring when they define animal comfort. The observation that feedlots with no shade make that animal welfare benefits are only observed under certain conditions strengthens the hypothesis that welfare benefits may not be a primary motivator for shade installation for this target group.

Recommendation 2. That ALFA and MLA consider further investigation to identify what are the critical elements, factors or observations that feedlots are using to define or characterise animal comfort.

Figure 27. Explanation for impact of provision of shade or shelter on animal welfare. N is the number of feedlots making a response matched to the topic. Individual feedlots may have contributed to more than one topic. (N represents the number of comments related to the heading.)



4.3.4 Additional benefits from shade installation

To confirm, the question on what additional benefits arise from the installation of shade or shelter was only asked for those feedlots that had installed shade or shelter to all or some home pens. It was not asked of feedlots that had not installed shade and that is why there is a N/A noted (see Table 16 and Table 17). Although previous questions had been asked on animal performance and welfare, a large proportion of the responses received were still linked to those outcomes. Unique responses included facilities management and efficiency, reduction in water use, social license and community perceptions, although these were much smaller in number of mentions in responses compared to welfare and performance. It is notable that several feedlots clearly distinguished animal health as being separate to performance and welfare (see Figure 28).

Table 16. Number of feedlots by current provision of shade or shelter and view on whether there are additional benefits from the provision of shade or shelter

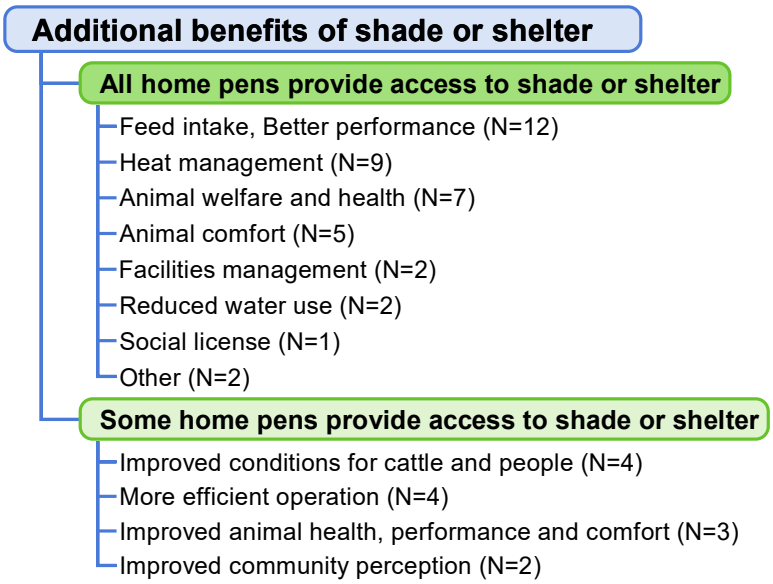
Have there been any additional benefits from providing shade or shelter to your feedlot?	Feedlots where all home pens offer shade or shelter	Feedlots where some home pens offer shade or shelter	Feedlots where no home pens offer shade or shelter	All feedlots
Yes	29	15	n.a.	44
No	16	7	n.a.	23
Total	45	22		67
Percent 'Yes'	64%	68%		66%

It is an interesting observation that a significant number of feedlots could not identify any additional benefits from provision of shade and shelter. Understanding why that is the case may be a useful investigation.

Table 17. Total constructed capacity of feedlots by current provision of shade or shelter and view on whether there are additional benefits from the provision of shade or shelter

Have there been any additional benefits from providing shade or shelter to your feedlot?	Feedlots where all home pens offer shade or shelter	Feedlots where some home pens offer shade or shelter	Feedlots where no home pens offer shade or shelter	All feedlots
Yes	333,200	194,300	N/A	527,500
No	236,500	42,600	N/A	663,100
Total	569,700	236,900		1,190,600
Percent 'Yes'	58%	82%		44%

Figure 28. Additional benefits from the provision of shade or shelter noted by feedlots providing shade or shelter to all or to some home pens. Individual feedlots may have contributed to more than one topic. (N represents the number of comments related to the heading.)



4.4 The value of shade in extreme weather events: Excessive heat load action plan implementation

One of the key questions that both ALFA and MLA requested to be asked in the survey was the occurrence of activation of the excessive heat load action plan[12] and whether shade installation (availability) influenced the implementation of that plan. Fifty-six percent (56%) of feedlots providing shade or shelter to all home pens (Table 18) and 62% of feedlots providing shade or shelter to some home pens(Table 19) indicated they had experienced an excessive heat load (EHL) event in the past ten years and 'shade was effective in helping manage the cattle through that event'. Positive outcomes were attributed to factors such as management of *Bos taurus* cattle, management of cattle density and management of feed intake both during and after the EHL event. Notably one feedlot indicated that more EHL events would have occurred without the presence of shade.

Only one full shade feedlot indicated that they did not see a benefit of shade during an EHL event and upon further investigation that event was highly challenging. Two feedlots with shade installed only on some home pens indicated that shade did not appear to help during an EHL event, although the comments would suggest that it is implementation of the plan that is questioned and not whether shade was available.

Several of the feedlots that had not needed to implement their EHL action plan indicated they are located in areas (geographic location) where these events are unlikely – Tasmania, Victoria and southern Western Australia.

[12] https://www.nfas.org.au/File/4kz7qrtbt4cfmrtstwmj1406cb#gsc.tab=0

Table 18. Responses from feedlots where all home pens provide access to shade or shelter when asked if weather conditions resulted in the need to implement their Excessive Heat Load Action Plan during the past ten years

Response	Feedlots where all home pens provide shade or shelter
Yes - the excessive heat load action plan was implemented, and shade was effective in helping manage the cattle through that event **"Shade provided an opportunity for cattle to seek shelter from the sun, particularly Bos taurus type cattle"** **"We were able to reduce the high-risk pen number to have over 5m^2 per animal which meant we didn't have to do anymore"** **"Reduced morbidity & mortalities in times of extreme heat load. Increased intakes & recovery in times of heat load."**	56% of feedlots (N=27) 64% of constructed capacity (N=380,700)
Yes - the excessive heat load action plan was implemented, but shade did not appear to help manage the cattle through that event	2.1% of feedlots (N=1) 0.7% of constructed capacity (N=4,000)
No - there has been no need to implement the excessive heat load action plan **"We are located in southern Western Australia"**	42% of feedlots (N=16) 35% on constructed capacity (N=207,700)

Table 19. Responses from feedlots where only some home pens provide access to shade or shelter when asked if weather conditions resulted in the need to implement their Excessive Heat Load Action Plan during the past ten years

Response	Feedlots where only some home pens provide access to shade or shelter
Yes - the excessive heat load action plan was implemented, and shade was effective in helping manage the cattle through that event **"Shade was integral and without it we would [have] had many more excessive heat load events"** **"Noticeable improvement in cattle comfort"**	62% of feedlots (N=16) 70% of constructed capacity (N=176,200)
Yes - the excessive heat load action plan was implemented, but shade did not appear to help manage the cattle through that event **"… would require further investigation but very few Excessive Heat events have triggered the implementation of the plan."**	8% of feedlots (N=2) 6% of constructed capacity (N=14,000)
No - there has been no need to implement the excessive heat load action plan **"No shade onsite, would require further investigation but very few Excessive Heat events have triggered the implementation of the plan"** **"Tasmania has never had the kind of continuous heat which does not dissipate overnight that leads to excessive heat load in cattle."**	31% of feedlots (N=8) 24% of constructed capacity (N=60,600)

4.5 Disadvantages of installed shade

We asked, "Has the provision of shade or shelter resulted in any disadvantages? Please describe. What solutions can you propose to mitigate these disadvantages?" In summary, feedlots with shade available in all home pens responded …

Concerns:

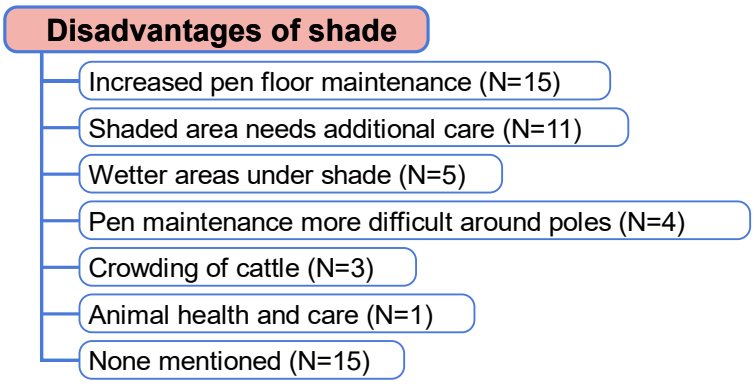
1. ***Wet and humid conditions:*** Areas where cattle stand can become wet and humid, leading to challenges in pen maintenance. This is particularly problematic during wet winters when pens can become excessively wet.
2. ***Pen floor damage:*** Wet and humid conditions can cause damage to pen floors, making them slippery and difficult to maintain.

Solutions:

1. ***More pen rotations:*** Rotating pens more frequently can help manage wet and humid conditions by allowing areas to dry out and reducing the buildup of moisture.
2. ***Improved pen bases:*** Enhancing the pen bases under shaded areas can help address wet and humid conditions by providing better drainage and reducing moisture accumulation.
3. ***Waiting for summer or a drought:*** In some cases, waiting for summer or a drought can naturally alleviate wet conditions, although this is not a practical or reliable solution.

Installation of shade does not come without disadvantages. Pen floor maintenance, additional pen care and pen maintenance around poles (which are likely to be strongly linked) were key disadvantages, with a few feedlots indicating that there are a significant resource requirement and cost in pen maintenance that should not be ignored. Wet areas (particularly in southern winters) under shade or shelter are notable barriers, although water placement and ventilation appear to be key factors that can minimise this concern. Notably, a number of feedlots stated that there are no disadvantages with shade installation which is a favourable outcome.

Figure 29. Reported disadvantages of installing shade. (N represents the number of comments related to the heading.)



We asked operators of feedlots with some shaded home pens, "Have there been any disadvantages in installing shade? What solutions might mitigate some of those disadvantages?" In summary …

Feedlot operators highlighted various challenges such as regular maintenance, construction costs, and the impact on cattle behaviour and pen conditions.

- ***Maintenance Challenges:*** High winds can damage shade structures, leading to increased maintenance needs and potential risks for cattle and employees. Solutions include well-designed structures and more frequent pen cleaning.
- ***Environmental Impact***: The installation of shade can lead to wetter conditions under the structures, affecting cattle movement and pen cleanliness.
  - ***Wetter Conditions:*** Pens can remain damper for extended periods under shaded areas, which can affect cattle movement and pen cleanliness.
  - ***Pen Surface Degradation:*** The location of shade and direction of the shade footprint can impact the speed of degradation of the pen surface.
  - ***Observation Challenges:*** Single shade structures can make it harder to observe cattle when riding pens.
  - ***Water Troughs:*** Shade over water troughs can make cattle more prone to hugging the water troughs.

Suggested Solutions:

- ***Adjusted Orientation:*** Adjusting the orientation of the shade structure can help mitigate wetter conditions and pen surface degradation.
- ***Shade Placement:*** Avoid placing shade over water troughs and run multiple strips of shade in pens to improve cattle movement and observation.

These challenges highlight the importance of well-designed structures and regular maintenance to ensure the safety and well-being of both cattle and employees**.**

Recommendation 3. That ALFA consider developing a target extension program that addresses the disadvantages of shade installation (pen maintenance and water management) to optimise the benefits of shade provision.

4.5.1 Barriers to shade installation

We asked operators of feedlots that had no shade in home pens, "What are the reasons why you will not be pursuing the installation of shade or shelter at your feedlot? What potential solutions have you considered to address the barriers to installation of shade or shelter across your feedlot?" In summary …

Many operators feel shade is unnecessary due to climatic conditions, cost concerns, and the acclimatization of their cattle. Some suggest that while shade may not be needed, shelter could be beneficial in winter if designed correctly. Additionally, there are considerations regarding the practicality of installing durable structures due to environmental factors.

The key points from the responses:

1. ***Installation is unnecessary***: Many feedlot operators believe that installing shade or shelter is unnecessary due to climatic conditions, cost concerns, and the acclimatization of their cattle.
2. ***Winter Shelter***: Some operators suggest that while shade may not be essential, shelter could be beneficial in winter if designed appropriately.
3. ***Environmental Factors***: There are considerations regarding the practicality of installing durable structures due to environmental factors.
4. ***Cost Concerns***: The cost of installing shade or shelter is a significant barrier for many operators.
5. ***Acclimatization***: Cattle are often acclimatized to the local climate, reducing the perceived need for additional shade or shelter.
6. ***Practical Solutions***: Some operators have considered practical solutions such as installing durable steel or aluminium cladding instead of trees or shade cloth, which may not be viable due to birdlife.

The two most mentioned barriers to providing access to shade or shelter in all home pens are 'time' (N=12) and 'access to capital' (N=19). A number of feedlots indicated that current financial position and a lack of a clear commercial value proposition inhibited more shade installation and that current installation of shade to only some home pens was often a compromise between the willingness to install shade and capital costs. Access to physical resources (including installers, labour) were selected by only 6 feedlots and lack of a clear value proposition or benefit / cost by just 3 feedlots (see Figure 30).

Other comments included:

- 'Time cost and labour are certainly challenges. Additionally, we are examining the balance of these barriers against the benefit of having shade across the entire feedlot. I think we will land somewhere in between where the feedlot ends up majority shaded, with unshaded areas for heat tolerant cattle, who will always have the option of moving to natural shaded areas if stress symptoms present.'
- 'Unshaded pens are poorly designed and would require major modification prior to shade installation'

- '[It would] reduce the full potential of our outdoor pens from drying out as much as is possible through the wetter months.'

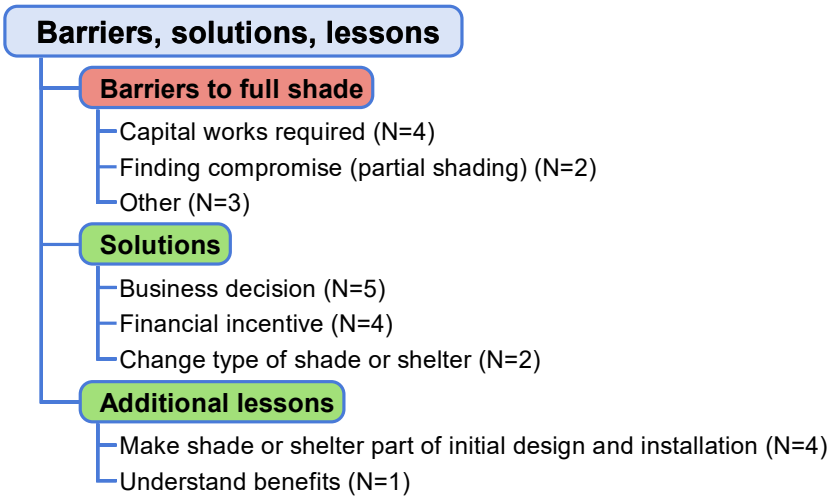
Potentially a focus on the shade provision as a business investment may help with adoption, although those feedlots that did highlight capital as a barrier, also suggested that incentives from other sources might help, particularly for small to medium businesses. Examples of such schemes are listed within the ALFA shade hub under financing and due diligence[13]. Letting market requirements drive further installation of shade was a clear sentiment.

There was associated commentary that often the decision is clouded by which type of shade to install and who can actually install that type. A couple of feedlots highlighted poor shade installation as a core barrier to further installation.

Recommendation 4. That the resources of the ALFA shade hub are promoted directly (in a targeted extension program) to feedlots that don't have shade to ensure that core barriers to installation are addressed.

A key insight was that any new feedlot or a feedlot considering expansion should include the cost of shade installation in those development costs. Retrofitting of shade into existing infrastructure was seen as a key barrier, particularly in terms of water and pen management.

Figure 30. Barriers to full shade reported by feedlots providing shade or shelter to only some home pens, their suggested solutions and additional lessons from installation of some shade.



Recommendation 5. Feedlots that are expanding or creating new pen infrastructure should be encouraged to consider shade installation or at least provide for shade installation.

[13] https://www.feedlots.com.au/resources/shade-hub

4.6 Key observations for feedlots that have not installed shade

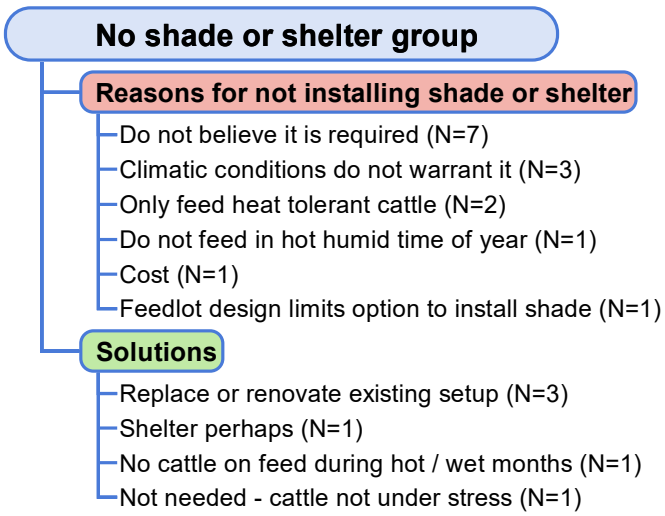
4.6.1 Factors that influence the decision not to install shade

There are very strong opinions and beliefs that shade is only required in hotter environments and predominately where cattle being fed in those environments are *Bos Taurus* and not adapted as shown in Figure 31. Additionally, a few feedlots that don't have shade indicated that they simply don't feed cattle in those months where extreme heat and humidity may require shade. A further observation was that shade is not needed when nutritional management is optimised, with a comment that feeding betaine reduces heat load and therefore the need for shade, appearing more than once. Surprisingly cost was only mentioned once.

Recommendation 6. That the belief that feed additives alleviates the need for shade and reduces heat load should be quantified and published.

There was little appetite for providing solutions to increase installation of shade by those feedlots that don't currently have shade. A couple of respondents indicated that they would consider the installation of shade in future expansion or capital works. Mostly there was a reinforcement that shade is not needed if feeding *Bos indicus* cattle or feeding cattle in southern environments.

Figure 31. Reasons for not installing shade or shelter reported by feedlots that currently have no access to shade or shelter in their home pens, plus possible solutions.



4.6.2 Will Case Studies be a useful extension tool to increase shade installation?

Operators of feedlots without shade were asked if they would be influenced to install shade if case studies were available from feedlots that have successfully installed shade. These are the key points raised:

1. **Opinions on Shade for Cattle Feedlots**:
    - Some believe that shade is not needed and consider [case studies] a big expense with no benefit.

- Others believe in the benefits of shade for animal welfare and performance, contingent on supportive data suggesting that whilst they accept that benefits exist, they are not motivated by those benefits.

2. **Site-Specific Assessments**:
   - Every feedlot needs to be assessed per site as no two sites are the same.
   - Case studies would have to match the specific conditions and practices of each site suggesting that generic information is not going to be a useful motivating factor.

3. **Cost Considerations**:
   - The cost of implementing shade is seen as prohibitive by some, who would prefer to invest in other infrastructure like sheds. This suggests that shelter might be a different value proposition to shade and may warrant separate case studies
   - Some are open to the idea if subsidies are available.

4. **Data and Evidence**:
   - There is a need for factual information and unbiased data to support the benefits of shade.
   - Seeing actual results on the cost of shade versus benefits would be ideal. Clearly information that is available through the shade hub needs to be provided to these feedlots.

These points highlight the varying opinions and considerations regarding the use of shade in cattle feedlots, emphasizing the importance of site-specific assessments and reliable data.

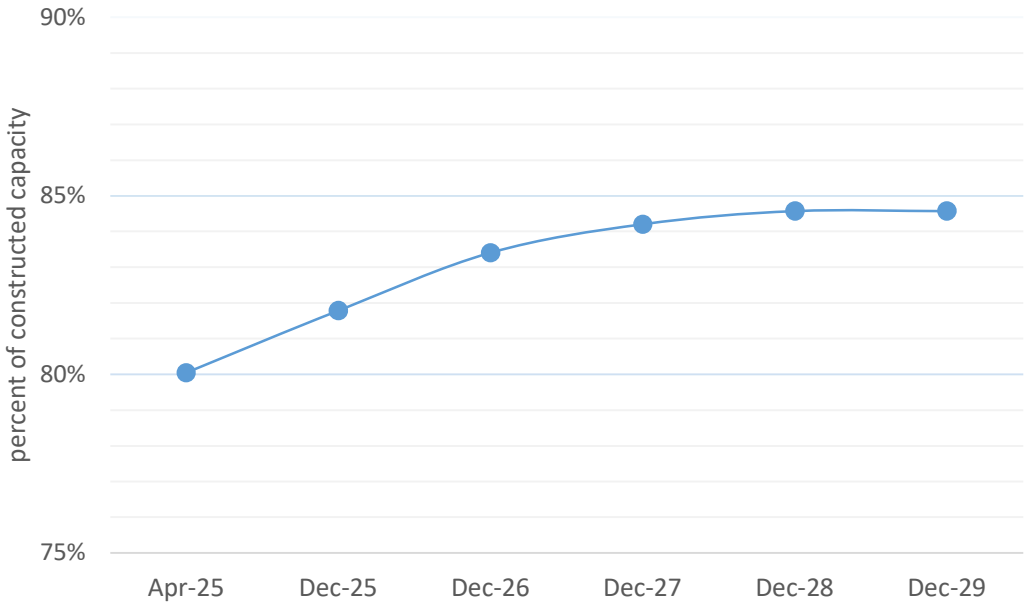
Recommendation 7: Whilst shade and shelter appear to be often used interchangeably by industry, there are clear differences in welfare outcomes. The performance and welfare benefits of shelter and resulting value proposition and implications should be clearly separated in extension materials.

4.7 Forecast of shade installation in feedlots that only have shade installed to some or none of their home pens

Another core question that MLA and ALFA required was an estimate of the future intent to install shade or shelter and what the implications of future installation may have relative to the ALFA pledge. To answer this question survey respondents whose feedlots only offered access to shade in some or none of the home pens were asked if they had plans to install shade and if so, by when and what percent of their capacity would ultimately have access to shade.

From the survey, data on access to shade or shelter was available for 121 feedlots, including 60 that had access to shade or shelter in all home pens. Of a further 29 feedlots that already had some pens with access to shade or shelter, 13 indicated they planned to install additional shade or shelter by December 2026. A further 13 feedlots out of 32 that currently have no access to shade expect to install some shade or shelter by December 2029. The following chart (Figure 32) plots the projected increase in shade or shelter as a percentage of total constructed capacity. This projection is based on survey data that has been adjusted to reflect the distribution of feedlot sizes in the AUS-MEAT dataset.

Figure 32. Projected increase in percentage on total constructed capacity with access to shade or shelter. No allowance was made for any increase in the number of feedlots nor for any increase in constructed capacity over the current installed base.



Based on the information supplied and project modelling, forecast shade intentions are predicted to lift shade (% of constructed capacity) from 80% to 83.5% by the end of 2026. After that, there is a slow increase to 84.5% by end 2029. This trend would indicate that it is highly unlikely that the ALFA pledge of 100% of feedlot cattle will have access to shade will be reached. It is also unlikely that trend will change as there is solid opposition to installation of shade by several feedlots.

Recommendation 8. That ALFA reconsider the likelihood of achieving 100% compliance with the pledge. It is highly unlikely that this will be achieved. Adopting the pledge as an aspirational target of 100% by 2029 may be an appropriate outcome.

4.8 Shade projection model – confidence limits on estimated shade percentages

At the presentation of the draft report for the Feedlot Shade project, the project team was asked about the confidence levels about the projected percentage of constructed capacity in feedlots with access to shade. This section presents our estimates and explains how they were calculated.

4.8.1 Methodology

From the data collected via the online survey instrument, a dataset of 121 observations that provided a timeline of capacity per feedlots was assembled containing current constructed capacity, and constructed capacity with access to shade in April 2025 and then estimates for each December from 2025 through December 2029.

All feedlots that indicated shade was accessible to cattle in all home pens were assumed to continue to provide shade in all home pens through to December 2029. For those feedlots that indicated that shade was provided to some home pens, we used the estimates presented in the report, which were

constructed by multiplying the pen number stated to have shade by the constructed capacities within those pens. Those estimates were updated based on the trajectory of shade installation that was provided by each of the feedlots.

The percent of constructed capacity with access to shade was calculated as the total of the constructed capacity with access to shade of all feedlots divided by the total of the constructed capacities of the 121 feedlots.

$$constructed\ capacity\ with\ access\ to\ shade\ (\%) = 100 \times \frac{\sum_{i=1}^{n} nominal\ capacity\ with\ access\ to\ shade_i}{\sum_{i=1}^{n} nominal\ capacity\ of\ feedlot_i}$$

A bootstrap procedure creates new datasets from the original dataset such that each new dataset has the same number of observations as the original dataset, and each observation is randomly chosen from the entire original dataset. This means that one or more observations in the original dataset may be chosen more than once, and consequently one or more observations may not be selected at all in a specific new dataset.

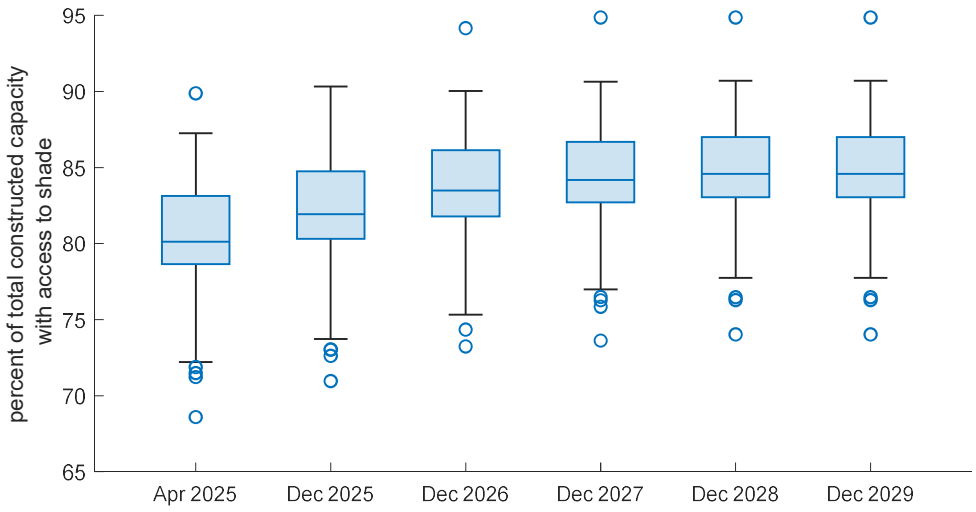
This process was applied 100 times to the 121 feedlot shade observations and the constructed capacity with access to shade calculated for each sample at each date. The resulting data is summarised in the table below and illustrated in Figure 33.

4.8.2 Results

Table 20. Basic confidence interval estimates for the trend in access to shade derived from the survey

Date	Mean	Standard deviation	Median	95% confidence interval for mean	
April 2025	80.2	4.0	80.1	79.5	81.0
December 2025	81.9	3.9	81.9	81.2	82.7
December 2026	83.5	3.8	83.5	82.8	84.3
December 2027	84.3	3.7	84.2	83.6	85.1
December 2028	84.7	3.5	84.6	84.0	85.4
December 2029	84.7	3.5	84.6	84.0	85.4

Figure 33. Box plots showing confidence intervals around the projected percent constructed capacity with access to shade. At each date, the box plot shows (from top to bottom): outliers (circles), maximum value other than outliers (top of the whisker), upper quartile and lower quartile separated by the median (dividing line in the box), minimum value other than outliers (bottom of whisker) and outliers (circles).



This analysis shows that the standard error of our estimates is ±4 currently and reducing to ±3.5 in December 2029. The 95% confidence limits are 84.3 and 85.4 respectively. With those estimates, it confirms the early statement that it is highly unlikely that the pledge target of 100% will be reached in 2026 or by 2029.

4.9 Source of Differences

An additional question that was asked of the team, was consideration of the potential difference between the project estimates and those that ALFA have calculated. One key difference may be that a calculation of the mean of percentage of shade in all feedlots is different to percent of constructed capacity as shown in the following equation.

$$\frac{\sum_{i=1}^{n} capacity\ with\ shade_i}{\sum_{i=1}^{n} capacity\ of\ feedlot_i} \neq \frac{\sum_{i=1}^{n} \frac{capacity\ with\ shade_i}{capacity\ of\ feedlot_i}}{n}$$

That difference is due the fact that a mean of the percentage of shade does not adjust for the difference in the size of each of the feedlots. Given the distribution of feedlot sizes are skewed by having large numbers of smaller feedlots and small numbers of very large feedlots, the latter mostly with shade, an unadjusted mean will always provide a lower estimate. This factor combined with having different samples may explain the differences that have been observed and the lower estimate that ALFA has.

The following table (Table 21) compares percent of total constructed capacity with access to shade (left hand side of above equation) against the average of the feedlot's percent of constructed capacity

with access to shade (right hand side of above equation). We believe that the current estimate that ALFA is producing may be an average of feedlots and therefore is potentially an underestimate of the actual percent of constructed capacity with access to shade.

Table 21. Comparison of methods to predict percent of constructed capacity relative to mean percentage of all feedlots.

Date	Percent on total constructed capacity with access to shade	Average of the 121 feedlot's percent of constructed capacity with access to shade
April 2025	80.2	63.5
December 2025	81.9	67.7
December 2026	83.5	71.3
December 2027	84.3	73.5
December 2028	84.7	74.1
December 2029	84.7	74.1

4.10 Other commentary on the provision of shade

All survey respondents were given the opportunity to provide other comments on the provision of shade in Australian feedlots. A collection of opinions regarding the necessity of shade or shelter for cattle in feedlots was presented. The comments reflect a range of perspectives on the implementation and importance of shade for animal welfare across different climates in Australia.

- **Mandatory shade provision:** Many respondents believe that shade should be compulsory in feedlots for animal welfare, emphasizing its essential role in protecting cattle from heat stress.
- **Cost considerations:** There are concerns about the financial implications of installing shade structures, including initial costs and ongoing maintenance, which may not be feasible for all feedlots, especially smaller ones.
- **Climate variability:** Comments highlight the need for tailored solutions based on regional climate differences, suggesting that not all feedlots may require the same type of shade or shelter.
- **Incentives for implementation:** Suggestions include providing financial support or incentives, such as grants or interest-free loans, to assist smaller feedlots in installing shade structures.

4.11 Additional commentary on the survey

Survey respondents were invited to provide general comments or suggestions relating to the survey. Key points include making shade mandatory for new feedlots, encouraging existing feedlots to install shade, and considering the financial implications and benefits of shade for feedlot operators. Additional suggestions include allowing operators to share photos of shade structures, offering discounts for shaded feedlots, and ensuring customer willingness to pay for the costs associated with shade installation.

4.11.1 Survey process and response rate

The Request for Quotation provided stipulated a comprehensive range of questions that were required to address the objectives. There was a mix of both qualitative and quantitative questions that resulted in the survey being relatively long. The decision to split the survey into three components (those with access to shade or shelter provided in all home pens, in some home pens or in no home pens) did reduce the apparent time spent on the initial full survey. The decision to create a 2nd shortened and more quantitative focussed survey did lead to a greater response rate, particularly in smaller feedlots.

There were multiple promotion channels for the survey. The direct email approach (from one of the consultant's own email addresses) using the AUS-MEAT supplied contact list and a letter from the ALFA president resulted in the highest number of responses. Using the same list but having a direct invitation from Survey Monkey was not as effective. Further direct email invitations as reminders or sent to known emails within the consultants' networks did result in more responses. Notably the promotion of the survey via ALFA newsletter only resulted in a minor increase in responses in the week following that release.

Queensland and New South Wales provided the highest representation in the survey responses which was expected and relative to the AUS-MEAT information response rates from medium to large feedlots was as expected. Response rates from small to moderate size feedlot was less than expected and potentially this is a target audience that requires direct engagement.

4.11.2 Should shade be mandatory within NFAS

Opinions vary on whether shade should be mandatory in NFAS. Several respondents emphasised the importance of making shade mandatory in feedlots to enhance animal welfare, whilst an additional small group advocated for compulsory shade installation to demonstrate industry commitment to welfare, highlighting improved animal comfort, reduced heat-related deaths, and enhanced public perception.

However, several respondents argued against mandatory shade provisions within NFAS citing the need for a case-by-case approach, considering regional climate, economic viability, and the distinction between shade and full shelter. Some caution that poorly designed shade can be detrimental, and that in cooler climates, shade might cause negative welfare outcomes like wet pens and feet problems. Others suggested extending the timeline for existing feedlots to install shade and incentives such as discounts on annual fees or grants to support implementation. Concerns were also raised about the cost and return on investment of shade structures, as well as the need for state-specific surveys and further evidence of customer willingness to pay for shade-related improvements before introducing mandates.

It is outside the remit of the current project, however making shade or shelter mandatory in feedlots could bring further benefits in terms of animal welfare and public perception. It also poses challenges related to cost, maintenance and potentially the disenfranchisement of a group of current NFAS accredited feedlots. A balanced approach that considers these factors is needed before any policy decision is made.

Recommendation 9: That ALFA consider the short-term effect on the industry if shade or shelter were mandated in the NFAS Rules and Standards.

4.12 Review of corporate and multi-feedlot businesses

A total of 32 feedlots identified their ownership as either "Family owned and operated (one of multiple feedlots)" (N=14) or "Corporate owned (one of multiple feedlots)" (N=18). Their status regarding access to shade or shelter in home pens is shown in Table 22.

Table 22. Number of feedlots operated as one of multiple feedlots with family or corporate ownership and split by shade status

Shade status	Family owned and operated	Corporate owned
All home pens provide access to shade or shelter	4	11
Some home pens provide access to shade or shelter	4	6
None of the home pens provide shade or shelter	2	1
Not specified	4	-
Total	14	18

The survey recorded more than two or more responses (feedlots) from five corporates and three families for a total of 17 feedlots. The other 15 feedlots were from families or corporates that only submitted survey responses for one feedlot.

Only one of the corporates, represented by two feedlots, did not have shade or shelter accessible in all home pens. Both these feedlots were located in the southern half of Australia. One noted that shelter would be considered if it were cost effective and the design did not lead to runoff management problems. The other noted concerns over maintenance of the shade cloth, particularly the impact of UV rays and the potential for wind damage at their location.

Of three feedlots under the control of one family, two had full shade cover and the third had access to shade for a little less than half of the constructed capacity. Progress is being made to install 'continuous shade mesh through the centre of pens' over the remaining pens.

The other family, represented by two feedlots, already provides shade to nearly 60% of the constructed capacity of those feedlots. Located in NSW, they plan to raise coverage to 90% by the beginning of 2027, finance permitting. They indicated their decision is motivated by improved animal performance and animal welfare observed under the existing shade, and despite some negatives – capital requirement, slower drying out under shade, and need to revise pen cleaning procedures / equipment.

5 Overview of responses relative to key evaluation questions

Key evaluation question	Overall summary	Insights or critical observations
What is the current level of installed shade or shelter	Approximately 83% of surveyed feedlot capacity had access to shade, with	It appears that the previous estimate by ALFA of 70.4% may be an underestimate of the actual

provided in Australian cattle feedlots (as a proportion of total approved capacity)?	significant variation based on feedlot size and geographic location.	percentage of cattle that have shade available.
Determine the trajectory for installed shade or shelter as a percentage of approved capacity using current levels combined with capacity that is planned and budgeted for installation over the next five years?	The survey projected a gradual increase in shade installation intentions, estimating that by the end of 2026, shade access could rise to approximately 83.5% of total constructed capacity. However, achieving the ALFA pledge of 100% compliance remains unlikely due to existing and ongoing resistance from some feedlots.	The ALFA shade pledge is a very worthy target. However, our forecasts show that that target is aspirational and unlikely to be reached by 2026 or by 2029. It is highly unlikely that those feedlots that are opposed to the pledge will change their attitudes within the next 5 years.
From those feedlots that have installed shade or shelter, what were the key factors influencing that decision, including actual or expected benefits?	Most feedlots that have installed to all or some home pens recognised the benefits of shade. Animal welfare, performance and health are the key drivers of positive responses, whilst community and consumer expectations, although apparent, were not the major drivers. Additional benefits identified included facilities management and efficiency, reduction in water use, social license, and community perceptions. Several feedlots clearly distinguished animal health as being separate from performance and welfare Fifty-six percent of feedlots providing shade to all home pens and 62% of feedlots providing shade to some home pens indicated they had experienced an excessive heat load event in the past ten years, and shade was effective in helping manage the cattle through that event.	Respondents highlighted several benefits of shade, including reduced heat stress, improved feed intake, better weight gain, and enhanced animal comfort. Shade was also found to be effective in managing excessive heat load events in most cases.
For those feedlots that do not have shade or shelter sufficient for their approved capacity, what are the reasons and or barriers to	Financial position was a driver suggesting that these feedlots that have shade provided to only some home pens may consider installation of more shade when capital is available.	It was unexpected that some feedlots that only provide shade to some home pens could not identify any compelling benefits. The primary barriers to further shade installation include financial

providing full coverage?	Feedlots that provide shade or shelter in only some home pens have not been able to identify significant welfare or performance benefits or if benefits have been identified they are not compelling.	constraints, time, and geographic location.
For those feedlots that have not installed any shade, what are the reasons and or barriers to installing shade?	Geographic location was a key driver of negative responses, citing environments, feeding regimes or cattle types that do require shade to protect against excessive heat load.	Certain feedlots have strongly held beliefs that shade is not required in southern colder environments. That same question should be asked of shelter rather than shade. There is strong industry belief that Bos indicus types are more resistant to heat load impacts. A meta-analysis of available Australian literature on heat impacts relative breed type would be useful project to consider. The belief that betaine can alleviate the need for shade and protect cattle against heat impacts needs to be quantified and if needed promoted or challenged. .
What are the crucial components of an extension program aimed at driving adoption of shade or shelter across the remaining Australian cattle feedlots?	Extension messages focussed on welfare and performance benefits of shade are unlikely to engage those feedlots that are resistant to shade installation. Extension message focused on heat load are also not likely to change attitudes of feedlots that are located in regions or have cattle types (*Bos indicus)* that they perceive don't require shade. The benefits of shelter as opposed to shade is a different question and may be a lever that could be used in certain scenarios.	Whilst a target extension program (at feedlots that don't have shade) promoting the shade hub resources will motivate feedlots that don't have shade. Information on welfare and performance benefits have been accepted by some and rejected by others. Regardless case studies that refer to this information are unlikely to have any major impact on attitudes to installation of shade. Some respondents suggested the ability to share photos of shade structures to inspire operators and highlighted the importance of considering location and topography in planning feedlots.

5.1 Adoption barriers and solutions

Table 23 has been developed as a summary of the key barriers and the associated commentary that are inhibitors to shade installation. The key observation is that for many of the identified barriers, additional data or extension efforts are unlikely to shift the current position of feedlots that currently do not provide shade to all home pens with regards to future shade installation. Several factors are attitudinal and based on in situ experiences of the feedlot and management observations, which also

are unlikely to be changed by generic information. However, the project team has provided potential motivators (extension themes) that could be considered by ALFA and MLA.

Table 23. Key barriers and potential opportunities / motivators to encourage increased shade provision.

Factor / Barrier	Description / Opinion	Potential motivators or catalysts for change
Shade required only in hotter environments	Strong belief that shade is needed only in hotter areas, mainly with *Bos taurus* cattle	Meta-analysis of shade R&D across breed type to reconfirm the differences in heat tolerance in feedlot environments
No feeding during extreme heat / humidity	Feedlots that avoid feeding cattle during months requiring shade	Opportunity cost of provision of shade relative to feedlot throughput
Optimised nutritional management	Belief that shade is unnecessary if nutrition is optimised; key example feeding betaine reduces heat load	Literature review of diet impacts on heat load
Cost	Feedlots that consider capital costs are a barrier. Cost is prohibitive for some; preference for other infrastructure like sheds (large investment); open to subsidies Identified performance and welfare benefits in feedlots that do not provide shade to all home pens are not compelling.	Tools for feedlots (that do not provide shade to all home pens) to complete value proposition analysis
Lack of market demand	Contrary to expectations, there was little evidence to suggest that customer / client or other actors in the supply chain were influencing the decision to install shade.	Potential for developing materials that highlight the welfare expectations by other partners in the supply chain but noting the key risk or disclosure of commercially sensitive information.
Site-specific assessments	Each feedlot needs individual assessment; generic information will not motivate	Development of specific information for feedlots less than 1,000.
Need for data / evidence	Desire for factual, unbiased data on shade benefits and cost-benefit results. Some belief that ALFA and MLA generated information is 'biased'	Ensure that information provided is independently validated and peer endorsed

Shade vs. shelter	Industry uses terms interchangeably, but clear differences / differentiation is required;	Extension materials should be developed that clearly define and separate benefits of shelter as opposed to shade

6 Key observations and recommendations

6.1 Support for ALFA Pledge

A majority of respondents either agreed or strongly agreed with the ALFA pledge to provide shade for all cattle by 2026; however, a notable minority disagreed, indicating that there are still significant barriers to full compliance. On an industry constructed capacity basis, support was even stronger for the ALFA shade pledge with feedlots operating 57% and 28% of constructed capacity indicating they 'strongly agree' and 'agree' respectively (total of 85%) with the pledge. Notably, there is effectively 10% of constructed capacity whose feedlot representatives either disagree or strongly disagree with the pledge.

6.2 Feedlot industry compliance with ALFA pledge

Given the industry position that is stated above and our projections, it is highly unlikely that Australian feedlot industry will achieve 100% of shade provision to cattle on feed by 2026. Our current estimation is that the industry is at 80% which will rise to 83.5% by the end of 2026 and then to 84.5% by end of 2029. Importantly, the trajectory based on this survey is such that 100% compliance will not be achieved.

Whilst there is some limited potential for changing that trajectory, deeply held beliefs and for some the lack of a compelling case (either welfare or economic), would inhibit total compliance with the ALFA pledge.

There was some commentary that shade should be made mandatory. Adopting that position is likely to further alienate some feedlot industry participants, to the point that some will consider leaving the industry if that policy was put forward. However, it is undeniable that there is overwhelming support for the pledge and that as a target it has stimulated industry engagement and action. As an aspirational target it will still maintain the focus on provision of shade for the Australian feedlot industry.

6.3 Limited impact of future extension

One of the key questions asked was what scope and what activities are required to stimulate further investment in shade installation. Our findings are that the extension messages around performance and welfare benefits of shade are widely known and accepted. Deeply held views that animals in feedlots that are southern based, not feeding during summer or feeding *Bos indicus* animals for relative short DOF do not require or obtain benefit from shade are unlikely to be influenced by any current extension materials or case studies. There are small incremental improvements in shade installation focussing on knowledge around costs and breed type, however, it is marginal that further industry expenditure will result in a positive benefit: cost return.

6.4 Future industry surveys

At the commencement of this project, the target set for survey response was 80% of the industry. Our team, with both MLA and ALFAs assistance, spent inordinate time using multiple channels of engagement to promote and encourage feedlot stakeholders to complete the survey. The response obtained (46%) of known industry contacts is as high as one might expect. There still remains a challenge in getting people to complete surveys or even to make time to talk to consultants to extract information. Modern satellite image analysis may be an alternative to extract structural information on shade and shelter, and this could be an option that requires further investigation by MLA and ALFA. The question still remains as to the accuracy of such analyses and ground truthing with real data will be required.

6.5 Benefits to industry

The following points summarise the benefit of this project to MLA, ALFA and the feedlot industry

- There is strong support for and recognition of the ALFA pledge. It has generated significant engagement and endorsement. However not all feedlot stakeholders support the pledge.
- There is strong support for and recognition of the benefits of shade for welfare, performance and sustainability
- There are logical reasons that are used to reject the need for shade that are built on long standing beliefs and observations in feedlots that are either southern based, do not feed during summer, feed Bos indicus cattle or combinations of the above.
- Extension programs promoting shade credentials are widely known and accepted. Those extension programs have contributed to significant installation of shade in Australian feedlots
- Further investment in extension programs is likely to have minor incremental impacts on shade provision

6.6 Recommendations

Several recommendations have been proposed based on the analysis of both the quantitative and qualitative responses to the survey. These recommendations are not in priority or rank order. They should be considered in future planning and investment decisions.

Recommendation 1. That ALFA and MLA consider further investigation into why some feedlots consider that shade does not provide a welfare benefit. 46

Recommendation 2. That ALFA and MLA consider further investigation to identify what are the critical elements, factors or observations that feedlots are using to define or characterise animal comfort. 47

Recommendation 3. That ALFA consider developing a target extension program that addresses the disadvantages of shade installation (pen maintenance and water management) to optimise the benefits of shade provision. 54

Recommendation 4. That the resources of the ALFA shade hub are promoted directly (in a targeted extension program) to feedlots that don't have shade to ensure that core barriers to installation are addressed. 56

Recommendation 5. Feedlots that are expanding or creating new pen infrastructure should be encouraged to consider shade installation or at least provide for shade installation. 56

Recommendation 6. That the belief that feed additives alleviates the need for shade and reduces heat load should be quantified and published. 57

Recommendation 7: Whilst shade and shelter appear to be often used interchangeably by industry, there are clear differences in welfare outcomes. The performance and welfare benefits of shelter and resulting value proposition and implications should be clearly separated in extension materials. 58

Recommendation 8. That ALFA reconsider the likelihood of achieving 100% compliance with the pledge. It is highly unlikely that this will be achieved. Adopting the pledge as an aspirational target of 100% by 2029 may be an appropriate outcome. 59

Recommendation 9: That ALFA consider the short-term effect on the industry if shade or shelter were mandated in the NFAS Rules and Standards. 63