

AC Ag Consulting

Nutrien
Ag Solutions™



Final report

PDS: Maximising Dorper Reproductive Performance

Project code: L.PDS.2017

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1 Abstract

Sheep producers on the far west coast of South Australia had identified decreasing reproduction rates in their self-replacing Dorper flocks. This project was undertaken to demonstrate that the adoption of best management practices could result in an improvement in weaning percentage and turn off of kilograms of red meat per hectare.

Individual ewe performance was monitored for three years in two demonstration flocks, one joining biannually and one joining annually. In addition, four training workshops were conducted.

Monitoring of the biannually joined flock clearly demonstrated the relationship between condition score and conception rate and weaning rate. It became apparent that this was not a sustainable joining strategy for this producer's production environment and labour model.

The adoption of improved management practices in the annually joined flock including: monitoring of ewe condition score; pregnancy scanning; differential management of single and twin bearing ewes; culling scanned empty ewes; ram soundness checking prior to joining; and timely weaning resulted in an increase in conception rate in the monitored group of ewes from 125% to 159%. Over this period, the whole of flock marking percentage increased from 99% in year 1 to 137% in year 3. Contributing to the final year result was improved seasonal conditions and treatment of some ewes with Ovastim®.

2 Executive summary

Background

A number of commercial Dorper flocks on the far west coast of Eyre Peninsula, South Australia had reported declining reproductive performance over recent years, with lambing percentages falling to 100% or less in some cases, having previously been 150% or better. The number of lambs weaned in a self-replacing shedding flock is the key profit driver and poor results can lead to the enterprise being unprofitable and non-sustainable.

This Producer Demonstration Site (PDS) was established to demonstrate that the adoption of some key best practice management strategies can improve reproductive efficiency in these flocks.

The results of this work should be relevant to all producers with self-replacing shedding sheep flocks, but will have particular relevance to those operating in a challenging production environment such as this low rainfall cereal zone presents.

The findings from this project demonstrate that shedding sheep may be easy-care breeds, but there are a number of management practices that can and should be employed in order to maximise reproductive efficiency and thereby run a profitable and sustainable flock.

Objectives

- Establish baseline productivity measures in all participating flocks. This objective was achieved.
- Demonstrate that the adoption of best practice management can improve the conception rate, lambing percentage, weaning rate and production efficiency of Dorper flocks by 10% in mixed farming systems. This objective was achieved.
- Undertake a range of training and extension programs with commercial shedding sheep producers on condition scoring, pre-joining management of rams and feed budgeting so that 80% of core producers and 40% of observer producers will have adopted best practice

management for Dorper reproduction and 100% of core producers and 60% of observer producers will have improved their knowledge and skills in relation to the reproductive performance of Dorpers. This objective was fully met.

- Undertake a cost benefit analysis of the use of eID to monitor individual reproductive performance and inform culling decisions. This objective was not met.
- Changes in marking and weaning percentages following the adoption of a Campylobacter vaccination program will be documented. This objective was not met.

Methodology

Condition score, pregnancy scan result and lactation status of individual ewes in two flocks with different joining strategies were tracked for three years.

Four educational workshops for producers were held covering topics including condition scoring, the use of eID, feed budgeting, pre-joining ram inspection and management and other relevant topics, including discussions on the results that were being seen from the individual animal monitoring.

Results/key findings

The results from the monitoring of the biannually joined flock show that, even though the Dorper is considered a hardy breed that can remain productive on a poorer diet, conception rates and marking rates are still heavily influenced by the condition score (CS) of the ewes. Lower condition score animals, less than CS 3, will have reduced conception rates and weaning rates.

With the annually joined flock, the value of managing ewes differentially based on their foetus number was demonstrated. In addition, the adoption of an earlier weaning strategy enabled the ewes to be in better CS for mating. Other practices adopted in this flock which, combined with the aforementioned, contributed to an observed 38% increase in marking percentages included; lambing twin bearing ewes in smaller mobs, supplementary feeding of twin bearing ewes, removing passenger ewes and assessing ewe and ram fitness to join.

The increase in marking percentage demonstrated in this flock was equivalent to an increase in gross margin for the enterprise of \$16/DSE.

Cost benefit analysis of individual strategies or management practice change was not possible, as multiple changes to management were being made at one time and it was impossible to attribute the proportion of change to any one practice.

25 producers and stock agents attended at least one face-to-face project activity with seven attending every activity. In addition, update newsletters were shared with interested producers from outside the project group and it is intended that the findings will be shared through the rural press, breed societies and service provider groups.

100% of the remaining two core producers have adopted or intend to adopt the measured best management practices including pregnancy scanning, condition scoring, wet/dry at weaning, separate management of twin & single bearing ewes, use of campylobacter vaccination, ram checks prior to joining and eID.

100% of surveyed observer producers had already adopted the majority of best management practices or indicated that they intended to. The most frequently adopted practice was ram checks prior to joining, and the least adopted was eID.

100% of core producers increased their knowledge and skills in relation to the reproductive performance of Dorpers, by an average of 145%. They also had an average increase in confidence of 34%.

100% of observer producers indicated an improvement in their knowledge and skills in relation to the reproductive performance of Dorpers. The average knowledge and skills score prior to the project was 21% and post the project was 55%. 100% of observers also reported an increase in confidence in three measured skills.

Benefits to industry

This project was able to demonstrate that it is possible to achieve good reproduction rates in this challenging production environment if attention is paid to the management of the flock. Adoption of the recommended 'best practice' management strategies could result in an increase in lambing percentages of as much as 30%. This result could be applied across all shedding sheep flocks nationally.

Future research and recommendations

The shedding sheep industry could benefit from further research that continues to clarify the relationship between condition score, weight and reproduction efficiency for these breeds. This could include gaining further understanding of the limitations of over fat ewes; whether they are over fat because they don't conceive or whether they don't conceive because they are over fat.

Further analysis of lamb survival rates from birth to marking in shedding breeds, and the factors impacting this, would also be beneficial.

There is an opportunity to incorporate messaging specifically targeted at shedding sheep producers in any industry extension/adoption programs, with the aim to increase shedding sheep producers' understanding of the importance of monitoring ewe weight and condition score, and the value proposition from being able to differentially manage twin bearing ewes. Messaging should also include the importance of assessing fitness to join of both rams and ewes and the value of feed budgeting, including understanding the nutritional value of different feedstuffs and the nutritional requirements of different classes of stock.

3 PDS key data summary table

Project Aim: <i>Demonstrate that the adoption of best practice management can improve the conception rate, lambing percentage, weaning rate and production efficiency of Dorper (& White Dorper) flocks in mixed farming systems.</i>			
	Comments		Unit
Production efficiency benefit (impact) Animal production efficiency - kg red meat/DSE Reproductive efficiency – marking %, weaning %		35 4.25	marking % kg red meat/DSE
Profitability Gross margin/DSE		\$16.00	DSE
Increase in income		\$6.40	/ha
Additional costs (to achieve benefits)		\$0.00	/ha
Net \$ benefit (impact)		\$6.40	/ha
Number of core participants engaged in project		3	
Number of observer participants engaged in project		19	
Core group no. ha		22550	ha
Observer group no. ha	Approximate	42000	ha
Core group no. sheep		4500	hd sheep
Observer group no. sheep		6300	hd sheep
% Change in knowledge & skill - core		145%	
% Change in knowledge & skill - observers		162%	
% Change in confidence - core		34%	
% Change in confidence - observers		51%	
% Practice change adoption – intended & actual	Across 7 practices	195%	
% of total ha managed that the benefit applies to	Total ha managed including cropping rotation	100%	
Key impact data			
Net \$ benefit /ha (total ha managed)	\$6.40/ha		
Gross Margin / Ha	\$24.80/ha		
Gross Margin / dse	\$62.00/DSE		

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1. Background

The Far West Eyre Peninsula Dorper Breeders group formed specifically for this project, but members had previously had informal interactions and undertaken training and development together. Members are principally mixed farmers, along with a couple of livestock only producers, based on far western Eyre Peninsula, South Australia. They run self-replacing Dorper flocks, turning off prime lambs from the paddock or feedlots. This work is potentially relevant to all sheep producers in the region as well as elsewhere.

A number of commercial Dorper flocks in this region had reported declining reproductive performance over the previous 3-5 years, with lambing percentages falling to 100% or less in some cases, having previously been 150% or better. The number of lambs weaned in a self-replacing shedding flock is the key profit driver and poor results can lead to the enterprise being unprofitable and non-sustainable. Group members were wanting to understand what management practices they could implement to improve reproduction rates and demonstrate that adoption of improved management practices would lead to sustainable and profitable improvements in reproduction outcomes.

The Nutrien Ag Solutions South Australian Animal Production Specialist, Daniel Schuppan, had worked with some individual producers to try and address the problems, but it was felt that producers working together as a group and adopting best practice management would lead to greater adoption of these practices. Of note is that variable reproduction rates with Dorpers had been reported from other areas, including the mid-north of SA, the upper Southeast of SA and in areas of WA and NSW.

A number of different management practices were discussed and demonstrated including:

- Condition scoring of ewes
- Pregnancy scanning
- Feed budgeting and understanding feed analysis reports
- Differential management of single and twin bearing ewes
- Ram management prior to joining including assessment for reproductive diseases
- Udder assessment in ewes
- Smaller mob sizes at lambing, in particular for twin bearing ewes
- Timely weaning
- The use of eID to inform culling strategies and track condition score, pregnancy status, health status (including udder condition) and liveweight in control mated flocks
- Vaccination for Campylobacter.
- The use of Ovastim® to increase ovulation rates

2. Objectives

Objective 1: Establish baseline productivity measures in all participating flocks (9), but with a particular focus on the three demonstration sites (one flock with biannual mating, one with annual mating and one with continuous mating).

Objective 1 was achieved successfully. Baseline productivity measures were obtained from seven participating flocks, including the initial three demonstration site flocks. A copy of the survey used to collect this data is included in Appendix 1. The collated results are in Appendix 2.

Objective 2: Demonstrate that the adoption of best management practice (including lambing twin bearing ewes in small mobs) can improve the conception rate, lambing percentage, weaning rate and production efficiency (kg of lamb turned off annually per ewe and per hectare) of Dorper (& White Dorper) flocks by 10% in mixed farming systems.

This objective was partially met. The demonstrated best management practices of condition scoring ewes, pregnancy scanning for multiples, managing single and twin bearing ewes separately, pre-joining inspection of rams, culling ewes with unsound udders, timely weaning and feed budgeting and nutrition management resulted in an increase in conception rate in the group of ewes that were individually monitored in Flock 1 of 34% over the three years of the project. This was equivalent to an increase of 4.25 kg of red meat turned off per DSE.

Over the same time period across the entire flock, there was a corresponding increase in conception rate of 18% and in lamb marking percentage of 38%, aided by a 17% increase in foetus survival.

It was not possible to effectively demonstrate an increase in weaning percentage as a result of lambing twin bearing ewes in smaller mobs.

Objective 3: Undertake a cost benefit analysis of the use of eID to monitor individual reproductive performance and inform culling decisions.

A cost benefit analysis was not undertaken but a discussion is provided on the adoption of this technology.

Objective 4: Undertake a range of training and extension programs with commercial shedding sheep producers on condition scoring, pre-joining management of rams and feed budgeting etc. so that:

- a. 80% of core producers and 40% of observer producers will have adopted best practice management for Dorper reproduction
- b. 100% of core producers and 60% of observer producers will have improved their knowledge and skills in relation to the reproductive performance of Dorpers

Objective 4 was fully met. Four separate face-to-face training activities were conducted with producers covering a range of topics including condition scoring, eID, feed testing, assessing feed on offer and feed budgeting, pre-joining management of rams, udder assessment, and discussing the project trial results. Details of the advertising for the four workshops are included in Appendices 7, 8, 9 and 10.

In addition, three update newsletters discussing project results and reinforcing workshop learnings were shared with all interested producers, including some outside of the group. These are included in Appendices 11, 12 and 13.

100% of the remaining two core producers have adopted or intend to adopt the measured best management practices including pregnancy scanning, condition scoring, wet/dry at weaning, separate management of twin & single bearing ewes, use of campylobacter vaccination, ram checks prior to joining and eID.

100% of surveyed observer producers had already adopted the majority of best management practices or indicated that they intended to. The most frequently adopted practice was ram checks prior to joining, and the least adopted was eID.

100% of core producers increased their knowledge and skills in relation to the reproductive performance of Dorpers, by an average of 145%. They also had an average increase in confidence of 34%.

100% of observer producers indicated an improvement in their knowledge and skills in relation to the reproductive performance of Dorpers. The average knowledge and skills score prior to the project was 21% and post the project was 55%. 100% of observers also reported an increase in confidence in three measured skills.

Objective 5: Changes in marking and weaning percentages following the adoption of a *Campylobacter* vaccination program will be documented and shared with 25 producers.

This objective was not met. It would have been difficult to attribute any change in marking percentage seen through the course of the project solely to vaccination for *Campylobacter*, and the majority of producers had a somewhat hit and miss approach to vaccinating. One producer who had conducted a correct vaccinating program claimed he had seen a 20% increase in lambs, but this is impossible to verify.

3. Demonstration Site Design

3.1 Methodology

1. EID tags were put into at least 200 ewes in three separate demonstration flocks (one flock that joined annually, one flock that joined twice per year, and one flock that continuously mated). An open day was held at the annually joined flock (Flock 1) at the time of tag application, which was at the end of joining for this flock. This was to launch the PDS project, provide an introduction to and demonstration of electronic ear tags and discuss the value of monitoring individual ewe performance. Participants were also given some initial training in condition scoring ewes and introduced to the potential value of this practice in their own flocks.
2. A baseline production survey was posted to all group members. The purpose was to establish baseline productivity measures for all participating flocks, but with a particular focus on the three demonstration sites. Data was collected on scanning rates, lambing percentages, weaning percentages, number of ewes 'lost lamb' or dry at marking, single versus twin lamb survival, ewe death rates and breeding history (i.e. historic use of other breeds). All group members were surveyed to gauge existing adoption levels of targeted management practices, including pregnancy scanning for twins and singles, differential management of twin bearing ewes, condition scoring ewes, pre-joining ram management, use of eID, screening for reproductive diseases, wet and dry at marking/weaning, lambing twin bearing ewes in smaller groups. Any details of feeding history including any supplements fed or fodder crops grazed were also recorded. An in-depth analysis of current production parameters was conducted and used to inform the future direction of the project.
3. Flock 1 (Annually joined flock): Condition score was recorded at every opportunity over a three-year period for each individually identified animal in this flock. This included at joining and pre-lambing. Liveweight was recorded on two occasions at joining. Pregnancy scan result (foetal number) was recorded along with wet/dry status at lamb marking. Flock marking and weaning percentages were also recorded.
4. Flock 2 (Six-monthly joined flock): Condition score and wet/dry status was recorded twice per year for two years for this flock. This was done at the end of joining which was also

mid-lactation from the previous joining. Pregnancy scan result (foetal number) was also recorded for individual animals.

5. Flock 3 (Continuously joined flock): 270 ewes were initially tagged in this flock and weight, lactation status and condition score were recorded on one occasion. Further data collection was subsequently abandoned for this flock with the producer, having a large cropping program, struggling to make the project a priority and following a wild dog attack which dispersed the flock over a large area, resulting in an unknown level of mismothering in addition to direct losses from dog attack. This meant it was doubtful that it would be possible to collect any useful data from this flock.
6. Collected data was analysed to establish any relationship between condition score and weight and reproductive status.
7. A series of photos of problem udders observed in a demonstration flock were collated and made into a slideshow presentation (Appendix 13).
8. A workshop was conducted on feed budgeting including assessing Food on Offer, interpreting feed analysis results and managing supplementary feeding and containment feeding. A selection of locally available feed stuffs was analysed for this exercise. An overview of project results to date was given, including data showing the relationship between pregnancy status and condition score. A condition scoring refresher training exercise was included, as was information on assessing udder soundness.
9. A workshop was held looking at pre-joining inspection and management of rams. This was conducted in conjunction with Coopers Animal Health and also included a discussion of other sheep health issues.
10. An analysis of the impact of *Campylobacter* vaccination on reproduction rates was to be conducted but it was found that there was insufficient information available and that most properties had not kept up a consistent vaccination program. Testing was conducted in one of the demonstration flocks to determine if *Campylobacter* was still present in the flock.
11. In year 3, the use of Ovastim[®] was demonstrated in Flock 1.
12. A field day was held at the conclusion of the project to share and discuss results of the work. Topics covered included: assessing Food On Offer; understanding feed analysis results; feed budgeting; managing supplementary feeding based on animal requirements; condition scoring ewes; pregnancy scanning for foetal number; *Campylobacter* vaccination; udder soundness (including the recently released 'Fit to Join' MLA resources found at www.mla.com.au/research-and-development/livestock-production/reproductive-efficiency/sheep-reproduction-strategic-partnership-srsp/fit-to-join-improving-ewe-and-lamb-survival-through-pre-joining-assessment/); ram management. Group members present were surveyed to assess any attitude, knowledge, skills and practice change.
13. A spreadsheet was developed and supplied to group members to encourage the keeping of records to enable improved understanding and analysis of reproduction rates and losses.
14. At the completion of the project, gross margin analysis was conducted to illustrate the increase in gross margin that had occurred as a result of the adoption of the improved management practices.
15. Reports will be provided to regional media, rural media, breed groups and other relevant industry groups including service providers.

3.2 Economic analysis

3.2.1 Gross margins

The cleanskin sheep gross margin template from the PIRSA 2022 Farm Gross Margin and Enterprise Planning Guide

(https://pir.sa.gov.au/primary_industry/industry_support/farm_gross_margins_and_enterprise_planning_guide) was used to develop a comparison of enterprise gross margin before and after the application of the project learnings.

Key assumptions were:

- Comparing 100% marking rate with a 135% marking rate
- Self-replacing dorper enterprise with annual joining and joining ewe lambs as replacements
- Ewe standard reference weight of 70kg
- An average annual ewe DSE rating of 1.9 was used for the 100% marking flock and 2.1 for the 135% marking, to take into account the extra lambs
- All variable costs were assumed to be the same, except the ewe hay feeding costs for the 100% lambing flock were \$15/hd and \$20/hd for the higher fertility flock
- \$20.50 of supplementary feed was allocated to all lambs to help reach sale weights and to join ewe lambs
- Due to more twins in the 135% marking flock, it was assumed that they would be lighter at slaughter and so their dressed weight was reduced by 1kg
- In the gross margin, no account is taken of the extra feed (hectares) that may be required to support an increase in lambing percentage.
- The hectares and ewe numbers used to calculate the stocking rate are based on the baseline survey results obtained at the start of the project. The results per ha are based on the whole farm area which includes crops/stubbles and winter grazing. It is not based on winter grazing only. Many producers use feedlots to finish lambs.

3.2.2 EID cost benefit analysis

No cost benefit analysis of the use of eID was conducted. See the discussion at 4.2.2 in the Results section.

3.3 Extension and communication

The PDS communication plan is attached in Appendix 3. Table 1 provides a summary of the plan.

Table 1: L.PDS.2017 Communications Plan

Activity	Target audience	Key messages and must-have elements	Timing	Estimated reach
Field days	Core and observer producers	At time of eID implementation and first pregnancy scan an open day will be held at each location demonstrating the technology. Concluding field day to share insights from the demonstration project with all interested parties.	Mar 2020	15
			Sept 2022	30
Workshops	Core and observer producers	Condition scoring Feed budgeting Reproductive soundness assessment of rams	March 2020	15
			March 2021	15
			August 2021	15
Personal communications - email	Core and key observer producers	Project updates.	Throughout duration of project	15
DSSA newsletter article	National dorper producers – commercial and stud		2022	?5000
Facebook posts	National and international audience of dorper producers and service providers	Dorper Sheep Society Australia Australian Dorper & White Dorper Group	2020 2021 2022	DSSA 7000 AD & WD Group 3000
Presentation	Service providers	Presentation to SA Livestock Consultants	2023	20
In depth article	State-wide & national audience of producers & service providers	Stock Journal article Feedback Local newsletters	2023	3000
			2022/2023	10 000
			2023	1500
Producer guides	Dorper producers nationally	Summary of all findings from project and guidelines for producers.	2023	3000

3.4 Monitoring and evaluation

Both pre-project and post-project skills, knowledge and confidence surveys were completed by PDS participants. Copies of these surveys are included at Appendices 4 and 5. The metrics measured included:

Knowledge and skills in

- Timing of pregnancy scanning
- Energy requirements of twin bearing ewes compared to single bearing
- Condition scoring
- Mob size at lambing
- Campylobacter symptoms
- Pre-joining ram check
- Feed budgeting; and

Confidence in

- Condition scoring
- Ram assessment pre-joining
- Interpreting a feed test.

The adoption of the following practices was monitored:

- Pregnancy scanning
- Condition scoring
- Wet/dry at marking
- Differential management of twin and single bearing ewes
- Campylobacter vaccination
- Pre-joining ram health check
- Electronic identification

The first activity for the PDS had to be conducted very early on, in February 2020. This was a workshop on condition scoring of ewes and an introduction to individual animal management and the use of electronic ear tags, and was timed to coincide with when the cooperating producer (Flock 1) would have the ewes in hand to take the rams out at the end of joining. At this time, the format for the pre-project KASA survey had not been approved, and so it was not able to be completed face-to-face. The survey was subsequently sent as an email to all core and cooperating producers in April 2020, and they were asked to complete it considering the knowledge that had prior to the first workshop. This was a less than ideal scenario and, despite follow up phone calls, resulted in a 9 out of 13 (70%) return rate.

The post-project survey was completed at the final workshop. Unfortunately, there were only six producers who fully or partially completed both surveys.

4 Results

4.1 Baseline Survey

A full analysis of the results of the baseline survey is reported in Appendix 2. The survey identified a number of key opportunities where producers may be able to consider management changes that will improve reproductive outcomes.

1. More attention to **ram management**, including health/soundness checks and nutrition management where appropriate
2. Improved **ewe management** including management of maidens, monitoring of condition score, informed culling decisions including selling repeat dry ewes and for suspect udder function.
3. Improved **record keeping**.
4. Improved understanding of **nutrition** management and feed budgeting.

4.2 Demonstration site results

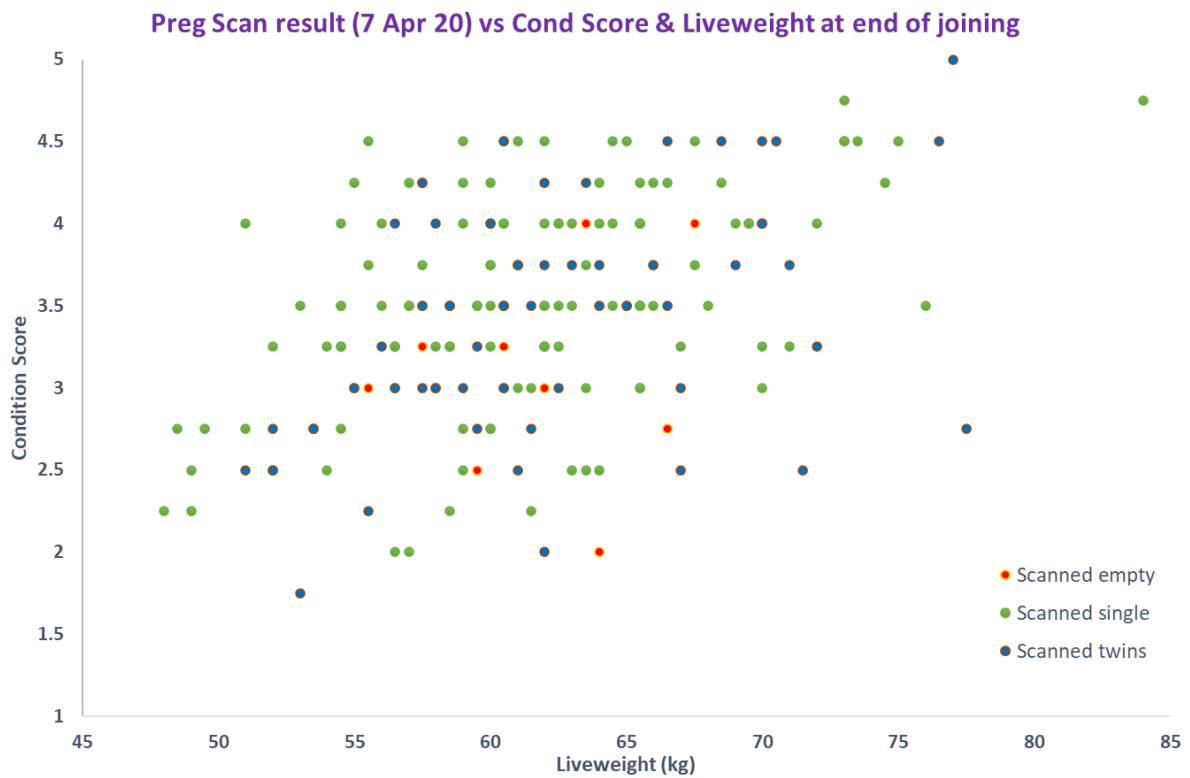
4.2.1 Flock 1

This flock was running around 1500 ewes at the commencement of the PDS but this increased during the course of the project due to additional land purchase. The reported recent marking percentages were 110% in mature ewes and 50-74% in maiden ewes. The flock is joined once a year with rams going in on 1st January for about eight weeks.

200 2018 drop ewes were tagged at the commencement of the PDS in February 2020. All of these ewes had been scanned in lamb in the prior year.

The first year of data from this flock showed the great range in liveweight and CS that there was in ewes that were essentially all the same age. Fig. 1 shows the 2020 preg scan result by liveweight and condition score at the end of joining. There is a great range in CS of ewes for any given weight, for example, 60-65kg ewes ranged in CS from 2 to 4.5

Figure 1: Flock 1 pregnancy scan result by joining condition score and liveweight 2020



This scan result in April 2020 was 125% (Table 2), with 64% of ewes scanned with a single. The twin bearing group was slightly heavier, but not because they had a higher CS.

Table 2: Pregnancy scan result by CS and liveweight at end of joining (April 2020, Flock1)

	No. Ewes	Percentage of group	Potential lambs	Avg CS	Avg LWT (kg)	
Twin	59	30.6%	118	3.4	62.8	
Single	124	64.2%	124	3.5	60.9	
Empty	10	5.2%	0	3.6	61.5	
	193		242	3.47	61.5	125% potential

In 2020, these ewes were run together as one mob for most of their gestation. Condition scores were taken again approximately two weeks pre-lambing. This showed that the ewes had lost CS in the 11 weeks since the end of joining, with approximately half the twin bearing ewes having fallen to CS 2.5 or less (Table 3).

Table 3: Change in condition score from end of joining to lambing (Flock 1 2020)

	CS 26 Feb 2020	CS 15 May 2020	Change in CS
Average	3.47	2.83	-0.64
Average Scanned with 2	3.39	2.62	-0.77
Average scanned with 1	3.49	2.86	-0.63
Average scanned with 0	3.60	3.35	-0.25

Figure 2: Flock 1 change in condition score from end of joining to lambing

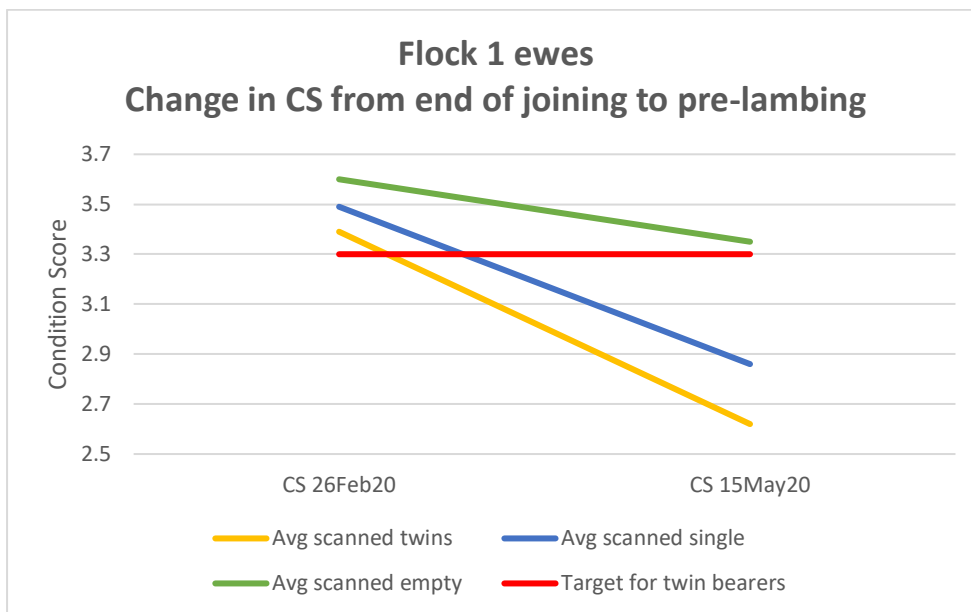


Fig. 2 shows the change in condition score for this group of ewes during pregnancy in 2020. All ewes were run under the same conditions with no supplementary feed. The average condition score for the whole flock at the end of joining (Feb 2020) was 3.47, but with an eight-week joining, by the end of joining there was already a slight difference in CS of the different groups of ewes, hinting at the impact of the multiple foetuses on the ewes' nutritional requirements. Without supplementary feed, the condition of the pregnant ewes, and in particular the twin bearers, had dropped away significantly by late pregnancy (May 2020). By this time there were 28 (47%) twin bearing ewes that were CS 2.5 or lower. Of the ewes scanned with twins, over 90% were below what would be considered a reasonable target CS to enable these ewes to successfully deliver and raise two lambs.

This was a good illustration of the value in running twin bearing and single bearing ewes separately. In subsequent years, this producer separated his twin bearers from his singles, and provided them with additional supplementary feed.

Table 4: Pregnancy scan result by CS and liveweight at end of joining (April 2021, Flock1)

2021	No. Ewes	Percentage of group	Potential lambs	Avg CS	Avg LWT (kg)	
Twin	85	47.2%	171	3.6	70.2	
Single	89	49.4%	89	3.5	69.2	
Empty	6	3.3%	0	3	63.2	
	180		260	3.56	69.5	144% potential
Sil 2020 & Empty 2021	4	2.2%		2.5	59.0	
Empty 2020 & empty 2021	2	1.1%		4	70.8	

There was a small increase in the average condition score at the end of joining of the whole group from 3.47 in 2020 to 3.56 in 2021, and yet the potential lambing percentage as measured by pregnancy scanning result increased from 125% in 2020 to 144% in 2021, principally due to the percentage of twin bearers in the flock increasing from 31% to 47%. The percentage of empty ewes was also less in 2021, and was made up of two groups, heavy and fat ewes who hadn't been in lamb for two years, and a group of ewes whose CS had not recovered from a previously low CS at the last lambing (Table 4).

The impacts of bodyweight and condition score on conception for each year of the trial are summarised in Tables 5, 6 and 7. In year 1, the heavier ewes (over 60 kg) have the highest conception rate, so long as they are not greater than CS 4 (Table 5). At the time of joining these ewes were 18 months old. The average weight of the whole group was 61.5kg at the end of joining, whereas 12 months later the average liveweight was 69.5kg.

In 2021, as all the ewes are now heavier on average than in 2020, having reached their mature body weight, there appears little impact of bodyweight on scanning result. Rather the conception rates appear good for any ewes at a CS above 3 at the end of joining with an average in this group of 147%. The average conception rate for those ewes below CS 3 was 123%.

In 2022, half of the trial group ewes were treated with Ovastim® (discussed later in this section). Unfortunately, no liveweights were recorded for the 2022 joining and CS was recorded at the start of joining (recorded at the end of joining in 2020 and 2021) and at pregnancy scanning.

Table 5: Lambing potential by weight group and condition score for 2020 (Flock 1)

April 2020	Over 60kg liveweight					60kg & under liveweight					Potential all weights
	No. ewes	Avg LWT	Avg CS ^A	Potential lambs	Potential	No. ewes	Avg LWT	Avg CS	Potential lambs	Potential	
1-3 score	21	64.7	2.7	30	143%	39	54.8	2.6	48	123%	130%
>3-4 score	58	65.1	3.7	82	141%	40	57.1	3.5	42	105%	127%
>4 score	27	68.8	4.5	30	111%	8	57.6	4.3	10	125%	114%
Total	106	65.8	3.7	142	134%	87	56.5	3.2	100	115%	125%

^A CS at end of joining

Table 6: Lambing potential by weight group and condition score for 2021 (Flock 1)

April 2021	Over 65kg liveweight					65kg & under liveweight					Potential all weights
	No. ewes	Avg LWT	Avg CS ^B	Potential lambs	Potential	No. ewes	Avg LWT	Avg CS	Potential lambs	Potential	
1-3 score	5	69.5	2.7	6	120%	21	60.5	2.7	26	124%	123%
>3-4 score	112	72.2	3.7	165	147%	29	62.2	3.5	44	152%	148%
>4 score	13	77.1	4.3	19	146%	0	-	-	-	-	146%
Total	130	72.6	3.7	190	146%	50	61.5	3.2	70	140%	144%

^B CS at end of joining

Table 7: Lambing potential by condition score for 2022 (half of ewes treated with Ovastim®) (Flock 1)

April 2022	All liveweights			
	No. ewes	Avg CS ^C	Potential lambs	Potential all weights
1-3 score	123	2.6	196	159%
>3-4 score	21	3.4	32	152%
>4 score	2	3.6	3	150%
Total	147	2.7	233	159%

^C CS at start of joining

Figure 3: Flock 1 April 2020 pregnancy scan result by joining condition score (Feb 2020)

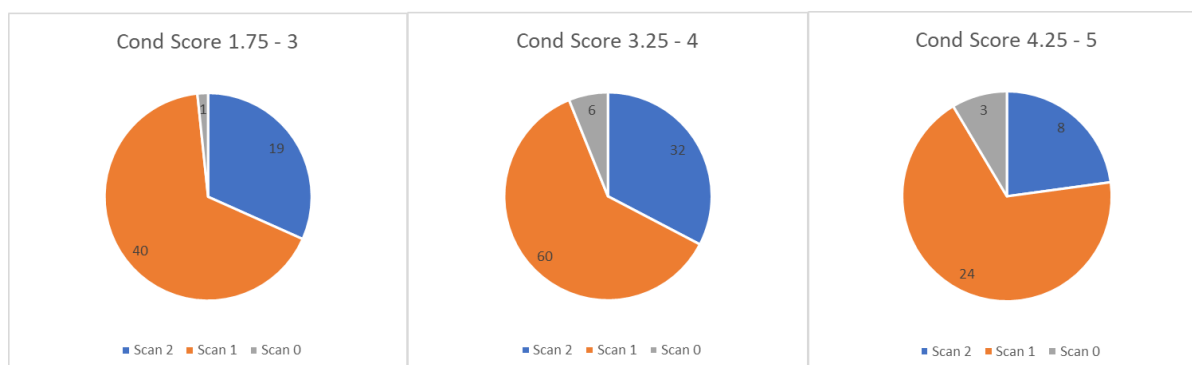
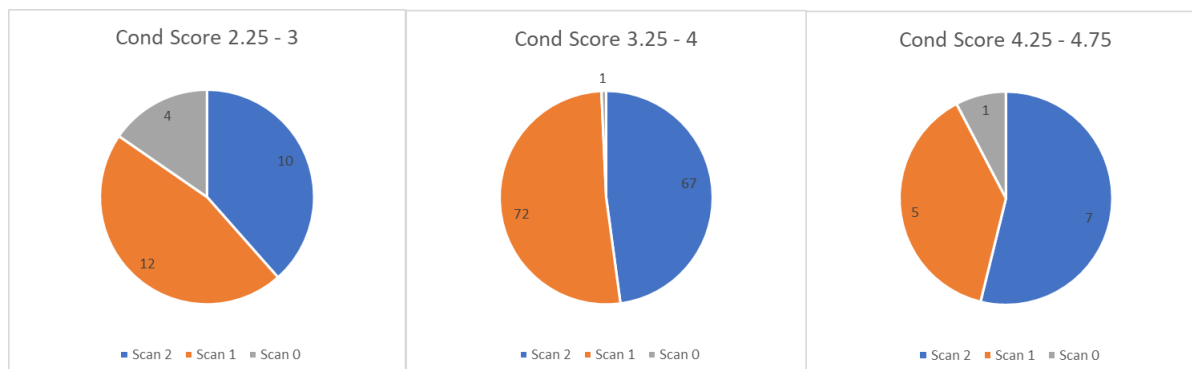


Figure 4: Flock 1 April 2021 pregnancy scan result by joining condition score (Feb 21)



Figures 3 and 4 further illustrate that, with this group of ewes, for the 2020 joining, when they were approximately 19 months old, body weight had a greater influence on conception rate than body condition score, but 12 months later condition score was much more influential, with ewes above score 3 having a more than 20% greater scanning percentage. However, in 2022 (Table 7) condition

score appeared to have little impact on conception rate. There was well above average rainfall in the summer of 2021-22 (Appendix 17) and this is likely to have had some influence on this result, with ewes likely to have been gaining condition throughout the joining period. The Ovastim® treatment discussed below would have had a small influence as well.

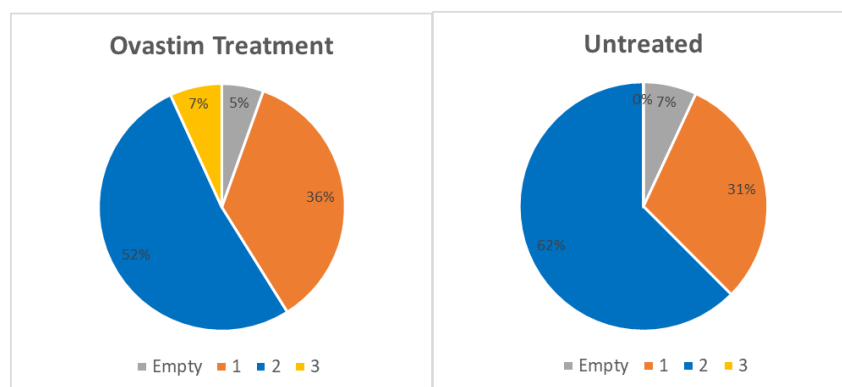
Prior to joining in late 2021 the trial group in Flock 1 (by now 145 2018 drop ewes) were treated with Ovastim®. Ovastim® increases the ovulation rate of treated ewes and is given as two doses three weeks apart in the lead up to joining. (Only one dose is required in subsequent years). Half the trial group were dosed 6½ weeks prior to joining and the second dose was given three weeks later. The cost is approximately \$2.70 per dose.

Treatment resulted in a very small increase in scanning percentage, which is unlikely to be statistically significant (Table 8). This increase was principally as a result of the presence of triplet fetuses in the treated group of ewes, whereas there were none observed in the untreated group (Fig. 5). However, there was actually a higher percentage of single bearing ewes in the treated group. This was quite an inconclusive result for the trial group of ewes.

Table 8: Flock 1 Pregnancy Scan results (all mobs) by Ovastim® treatment (Flock 1 2022)

	Empty	%	Single	%	Twins	% all mults	Trip-lets	Total ewes	Total foetuses	Percentage
Trial treated	4	5.5	26	35.6	38	58.9	5	73	117	160%
Trial untreated	5	6.9	22	30.6	45	62.5	0	72	112	156%
Orange tags treated	5	4.9	32	31.1	62	64.1	4	103	168	163%
Blue/black tags	7	3.6	90	45.9	99	50.5	0	196	288	147%
Purple tags	17	5.5	162	52.6	129	41.9	0	308	420	136%
Black/white tags	15	4.1	165	44.8	188	51.1	0	368	541	147%
Treated	9	5.1	58	33.0	100	61.9	9	176	285	162%
Untreated	44	4.7	439	46.5	461	48.8	0	944	1361	144%
Overall	53	4.7	497	44.4	561	50.9	9	1120	1646	147%

Figure 5: Flock 1 effect of Ovastim® treatment on number of foetuses

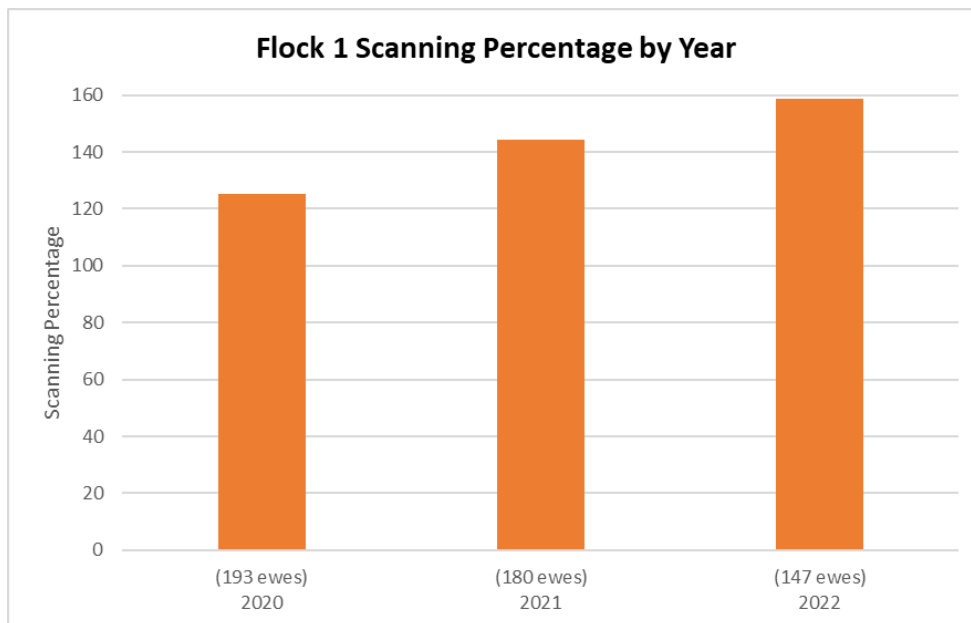


The producer also treated the balance of his orange tag 92018 drop) ewes (n = 103) with Ovastim®. Table 8 shows the preg scan result for his entire flock. When all ewes are considered, an 18% increase in scanning rate for treated compared with untreated was observed. This was due to an increase in the number of ewes with multiple foetuses (62% compared with 49%), including the

presence of triplet fetuses in the treated group while there were no triplets present in untreated ewes.

An increase in the number of triplets is not necessarily an ideal outcome for ewes raising lambs in this environment, as there is likely to be a lower survival rate of triplet lambs compared with singles or twins. Unfortunately, the producer didn't collect data on wet and dry ewes at marking for the trial group, so there is no information on whether the triplet bearing ewes were raising some or all of their lambs. However, based on the whole of flock lamb marking figures supplied by the producer for 2022, the foetus survival was 93% this year for the mature ewes. This appears an excellent result aided by the above average seasonal conditions (Appendix 17), but may be inflated by inaccurate scanning (further discussed below).

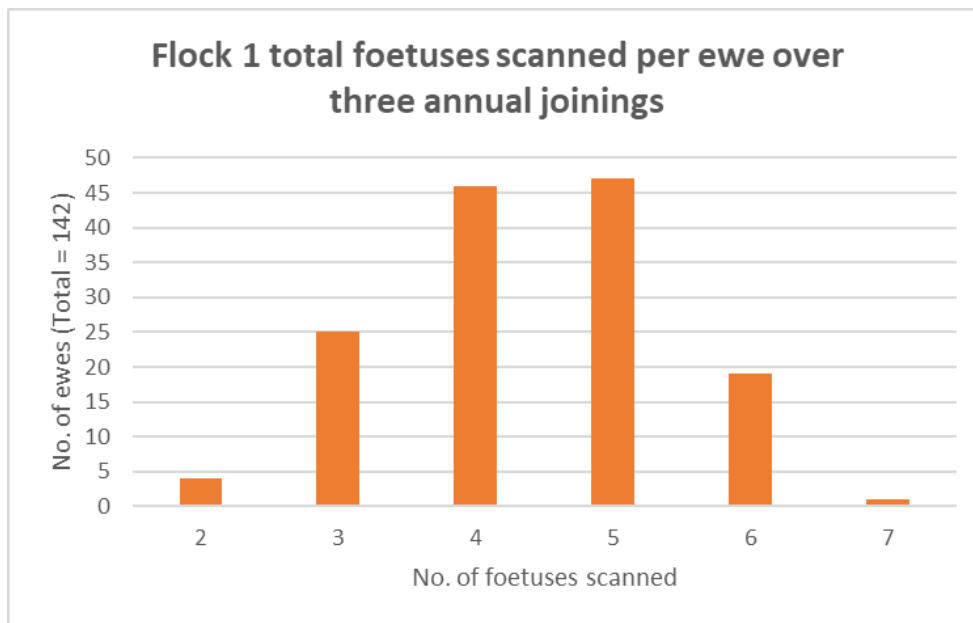
Figure 6: Flock 1 scanning percentage by year for trial group of ewes



The pregnancy scanning result for the trial group did increase annually for the three years of the project (Fig. 6). While we started with 200 ewes in this group in 2020, by 2022 there were only 147 of these ewes remaining. Aside from the general attrition that might be expected in a flock, it is known that there were also approximately 13 ewes lost in mid-2020 due to an accident with feeding and in 2021 the producer inadvertently sold 6 ewes that were scanned empty and 14 ewes that were dry at lamb marking (while this would be considered good management practice, it had initially been planned that all the trial ewes would remain in the flock for the duration of the project).

There was significant variation in the individual performance of the trial group ewes. Fig. 7 shows the number of ewes by the total number of fetuses scanned for the three years. While some ewes only scanned a total of two fetuses over three years, there were 20 ewes (14% of the total group) which were scanned with twins or better for each of the three years. The advantage of using individual identification (eID tags) is that these individuals are able to be identified and either retained or culled appropriately.

Figure 7: Flock 1 total fetuses scanned for individual ewes over three years



It was not practical to run the trial group as a separate group for lambing, particularly given that the producer was being encouraged to run his single and multiple bearers as separate mobs for lambing. There are therefore no marking and weaning percentages reportable specifically for this group. However, details of whole of flock pregnancy scanning and marking results were reported by the producer.

These whole of flock results are difficult to compare across years because of the different way that maidens were treated at pregnancy scanning each year and whether the ewes lambed in mixed age groups of ewes or not. In 2020, maidens were only scanned for in lamb or empty, in 2021 the maidens were scanned for litter size and lambed in mixed age groups, and in 2022 the maidens were not scanned at all and lambed in separate mobs. It would be the producer's normal management practice to sell any maidens that scanned empty, but in 2022 he had purchased additional land and so was planning to build ewe numbers by retaining all maiden ewes.

In 2020, the mature ewe scanned potential was 129%. 99.3% lambs were marked to joined ewes giving a foetus survival of 76%.

In 2021, the scanned potential of the mature ewes was 149% and of maidens was 122%. Maidens were lambed down in mixed mobs with aged ewes. 101% lambs were marked to ewes joined, which is an overall average foetus survival of 73%. Twin and single bearing ewes were lambed down in separate mobs. The best survival percentage for twins was 72% and for singles was 93%.

In 2022, maiden ewes were not scanned and lambed in separate paddocks. The scanned potential in the mature ewes was 147%. 137% lambs were marked to ewes joined, which is a 93% foetus survival. However, for this year, there was some uncertainty over the accuracy of the pregnancy scanning with a couple of scanned single mobs marking 112% and 124%. The best twin bearing mob marked 182%, which is 91% survival.

The maiden ewes only marked 37% in 2022, which is a disappointing result. They were not scanned, so it is not known what their potential was, but the producer reported that there were a number in the group that were probably too light to have joined successfully. There was also an issue with a bad worm infestation during joining for some of the maiden ewes, which likely would have impacted the end result.

It had been planned that a couple of additional management practices that could potentially increase reproduction rates would be demonstrated on this property as part of the project in 2022. Flushing ewes prior to joining is known to potentially increase conception rates. The producer was keen to trial this, but when it came time, it was decided that it was not a practical option in his production environment. The ideal feed to use is lupins which are difficult and expensive to source at this location. Peas were readily available and considered as an alternative but would require close attention to feeding methods and a more gradual introduction to the diet. The lead up to joining for this flock is usually at the height of harvest, and so any option that required any significant time commitment was considered not practical.

There were plans to place a very small group of multiple bearing ewes in a well sheltered paddock for lambing in an attempt to demonstrate the value of lambing multiple bearing ewes in small mobs in the best lambing paddocks. The producer ultimately decided that this wasn't a realistic representation of what local producers are likely to be able to do and decided against it. He did however ensure that all multiple bearers were in smaller mobs for lambing, with the best result from a larger mob of 245 twin bearers that were split into two separate mobs for lambing and recorded 182% lambs or 91% foetus survival.

4.2.2 Flock 2

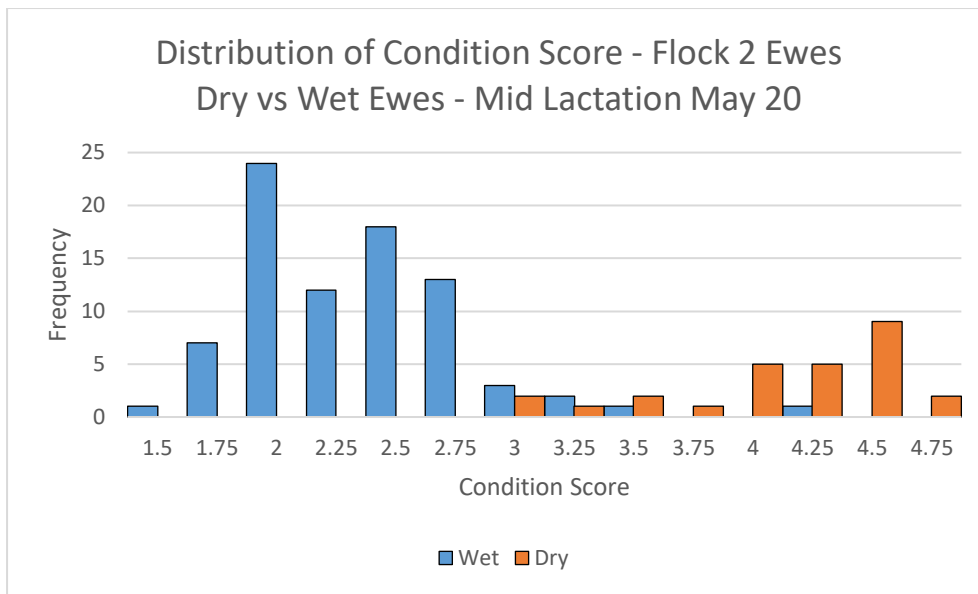
This flock runs about 1000 ewes and had been achieving marking percentages of around 110%. The flock had historically been joined once per year, but the producer was keen to trial six-monthly joining and this change in management coincided with the commencement of the PDS.

EID tags were placed in 115 mixed age ewes that had been scanned in lamb in February 2020. These ewes were joined in mid-October 2019 for five weeks. They lambed in March-April and the rams went back in again mid-April, for a September- October lambing.

Condition scores were collected for these ewes in May and November for the two years 2020 and 2021. This was mid-lactation for those ewes with lambs at foot and coincided with the rams being removed at the end of joining.

By May 2020, when the rams were taken out after the first six-monthly joining cycle, there was already a clear difference in the condition score of the lactating ewes (average 2.4) compared to the dry ewes (average 4.1) (Fig. 8). All ewes were being run as one mob and were not receiving any supplementary feed. Many of the dry ewes were becoming unnecessarily fat and a similar number of wet ewes had dropped to very low condition scores.

Figure 8: Flock 2 distribution of condition scores for dry and lactating ewes mid-lactation May 2020



These lower condition score ewes were at an increased risk of mortality of both the ewes and their lambs, their lambs at foot had the potential for lower growth rates, and the ewes were at risk of poorer conception rates at the next joining.

Lamb survival for these March-April drop lambs was 73%, from a lamb potential from scanning of 131%. There were a number of maiden ewes in the mob and only 65% of them were still wet, so much of the foetal loss had occurred in this group. 82% of aged ewes were still wet.

These ewes were pregnancy scanned in July 2020 and Table 9 shows the difference in conception rates between the ewes that were dry at joining, and with a higher CS (170% conception rate) compared to those that were lactating (103% conception). The majority (78%) of previously dry ewes (failed to rear previous lamb(s)) were now pregnant with twins. Nearly all ewes (90%) that were scanned in July as empty or with a single foetus had at least one lamb at foot at the time of joining. Two ewes were previously dry and now empty, the true definition of a “passenger”.

Table 9: Pregnancy scan status July 2020, dry at joining vs wet at joining (Flock 2)

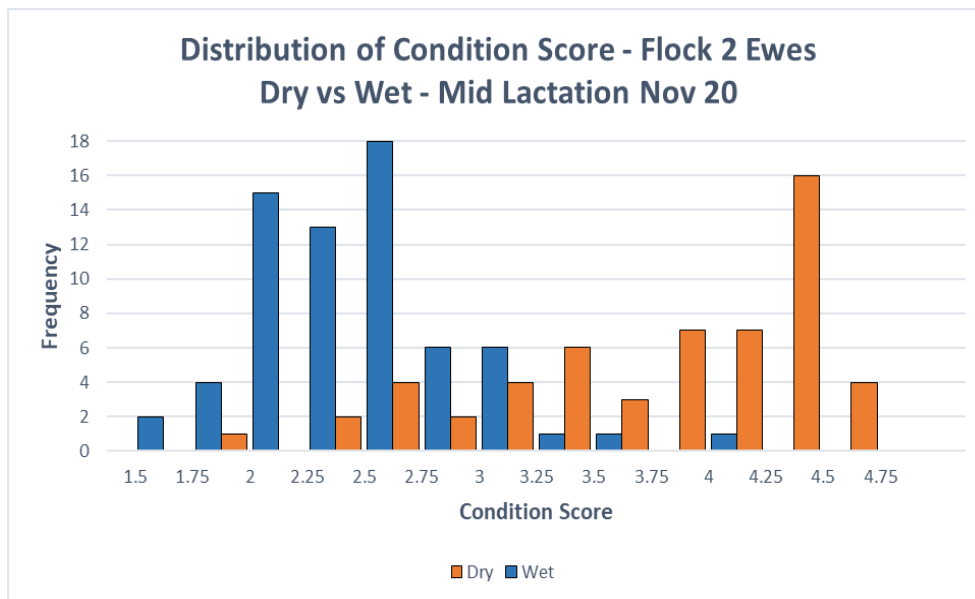
	No.	Avg CS at joining	No. previously dry (Avg CS in brackets)	No. previously wet (Avg CS in brackets)
Empty	27	2.49	2 (4.25)	23 (2.34)
Single	35	2.51	4 (4.25)	31 (2.28)
Twins	44	3.26	21 (4.08)	22 (2.47)
Four	1	2.50	0	1
Total ewes	107		27	77
Foetuses	127		46 (170%)	79 (103%)

Lamb survival for these September-October 2020 drop lambs was 59%, from a lamb potential from scanning of 119%. There were 70% lambs at foot. 46% of ewes were dry. Of these, 18% had also

been dry in May (from previous joining), although all had been scanned in lamb (sil) in February and 80% also sil in July. It appears there was around 8% of the flock who are repeatedly getting in lamb but not rearing a lamb. Of the lambs lost there were 16 singles, 9 sets of twins, 17 twins where one was lost and one quadruplet.

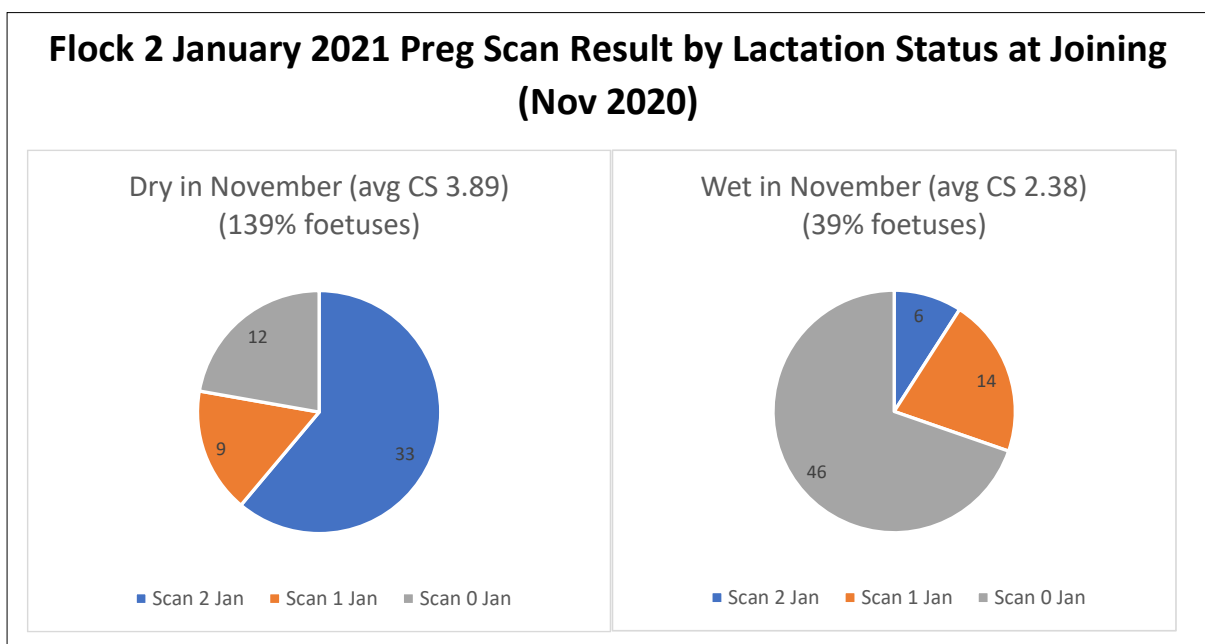
By mid-November, when condition scores were next taken, at mid-lactation for the next lambing cycle, the difference between wet (CS 2.4) and dry (CS 3.9) was still evident and there was a higher number of dry ewes in the flock (Fig. 9). In May the proportion of dry ewes was 24%, whereas by November it was 46%.

Figure 9: Flock 2 distribution of condition scores for dry and lactating ewes mid-lactation November 2020



The conception rate for the October-November joining was significantly impacted by the ewe's condition score at joining which in turn was heavily influenced by her lactation status (Fig. 10).

Figure 10: Flock 2 pregnancy scan result January 2021 by lactation status at joining (Oct-Nov 2020)



The relationship between condition score and pregnancy scan result for the April-May 2020 joining is shown in Fig. 11 and in Table 10. There is a clear trend for increased conception rate with increased condition score. By the October-November 2020 joining (Fig. 12) this trend was even more evident and the overall flock scanning percentage had fallen to 84% (Table 10).

Figure 11: Flock 2 pregnancy scan result July 2020 by condition score at joining

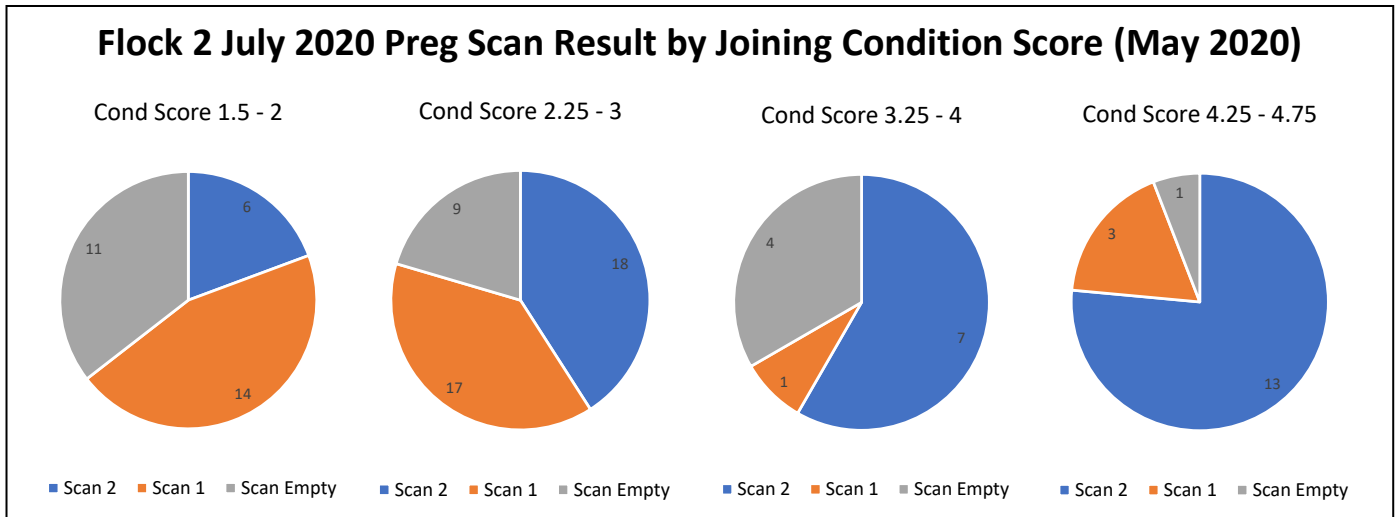


Figure 12: Flock 2 pregnancy scan result January 2021 by condition score at joining

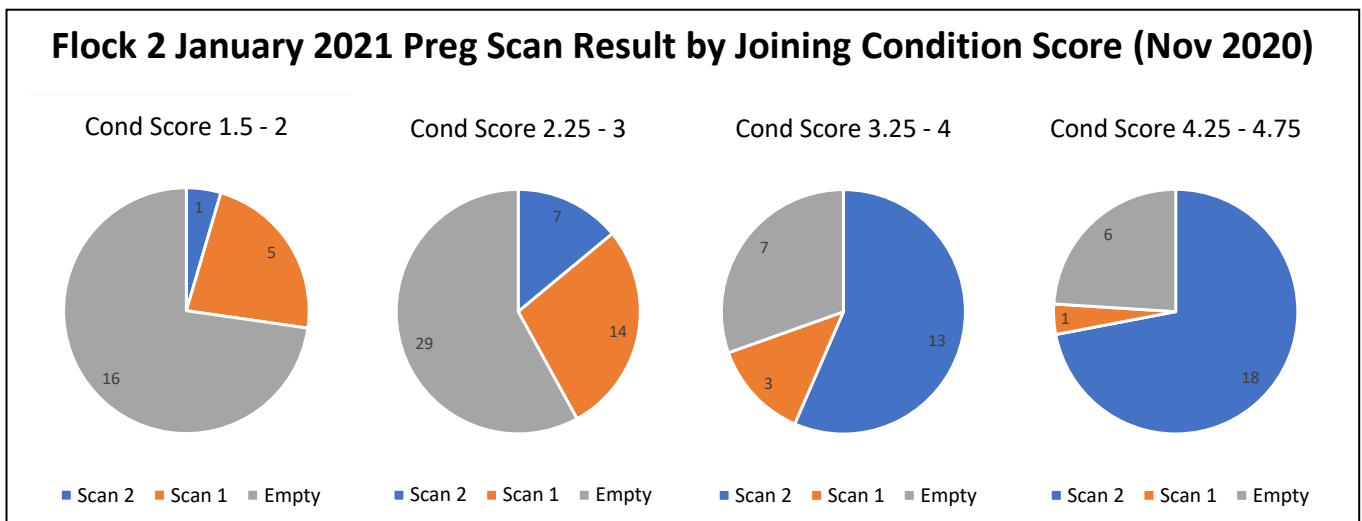


Table 10: Scanning percentage by condition score Flock 1, April-May 2020 and October-November 2020 joinings

CS at joining	July 2020 Scanning		January 2021 Scanning	
	No. of ewes	Foetus Percentage	No. of ewes	Foetus Percentage
1.5 – 2	31	84%	22	32%
2.25 – 3	44	120%	50	56%
3.25 - 4	12	125%	23	126%
4 – 4.75	17	171%	25	148%
Overall	104	118%	120	84%

At the October-November 2020 joining there were still a number of lactating ewes at an average CS of 2.5 that were able to conceive twins (n=6) (Table 11) but a third of these had lost both these lambs by lamb marking (others may have lost one twin). The result from the single bearers was even worse with only one third still with a lamb at foot at lamb marking. There was little paddock feed available for these ewes by May 21. The producer had been supplementing with some home-grown cereal rye hay. A feed test was organised and the hay was found to be quite poor quality and not sufficient to sustain lactating ewes (Appendix 15).

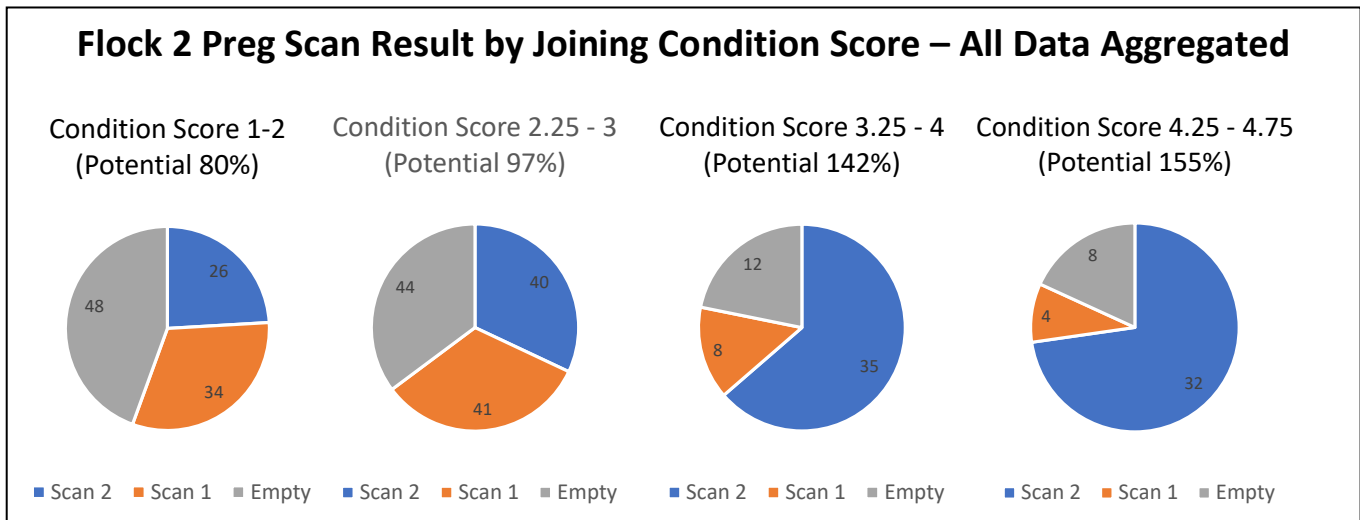
Table 11: Effect of CS at joining (closely related to lactation status at joining) on lamb survival (Flock 2)

Nov 20 Lactation Status (joining)	Jan 21 Preg Scan	Nov 20 CS (joining)	May 21 CS (marking)	% Wet May 21 (marking)
Wet	2	2.5	1.9	67%
	1	2.3	2.3	36%
	0	2.4	2.4	
Dry	2	4.1	2.1	88%
	1	3.3	2.4	67%
	0	3.8	3.4	

Six-monthly joining continued in this flock throughout 2021. The scanning percentage in July 2021 was 119%, even though the average CS for the flock was only 2.3. However, the marking percentage was only 68% giving a foetus survival percentage of only 60 percent.

When the pregnancy scan results are aggregated from July 2020, January 2021 and July 2021 and compared with the condition score at the time of joining, there is a very clear trend for increased conception rates with increased condition score (Fig. 13). The highest conception rates were at CS above 4. This is in concordance with results found by Bates *et.al.* (2022) who also found a greater pregnancy rate and number of foetuses across all breeds at a mating CS of 4.

Figure 13: Flock 2 pregnancy scan result by condition score at joining for three six-monthly joinings 2020 -2021



The final collection of data under the biannual joining was made in November 2021. At this time the average condition score of the whole group of ewes was 2.3. 64% of ewes were assessed as lactating. However, 14% of these wet ewes had actually been scanned empty and appeared to be still feeding their lambs from the previous joining. These lambs would have now been approximately 8 months old and had never been weaned. The average CS of all wet ewes was 1.87 and all dry ewes was 2.95.

With these production statistics, it is easy to see why the producer ultimately abandoned this joining strategy and reverted to 12 monthly joining. Concerted hand feeding for maybe 8 months of the year using quality supplementary feed stuffs would be necessary for this joining strategy to be successful in this production environment. This requires commitment of time, labour and finance.

It should be noted that there was at least one observer group member who was successfully managing a six-monthly joining strategy, and we are aware of other flocks doing the same. It is our observation that these are generally much smaller size flocks with the labour and facilities available to provide extra nutrition to the ewe when required.

In 2022, Flock 2 was joined in February-March for an August lambing. Unfortunately, there was a data recording error by the producer when collecting the pregnancy scanning records for the individually identified ewes. He was able to report a scanning percentage of 136%, with a lamb marking percentage of 110% giving a foetus survival of 81%.

4.2.3 Flock 3

Flock 3 is a ‘continuously’ joined flock running approximately 1500 ewes and based near Coorabie, approximately 150km west of Ceduna. The owner reported an annual turnoff of sale lambs of about 150%. The rams are generally removed from the ewes for a couple of months each year so as to avoid any lambing at the height of summer. The ewes are usually handled four times each year. Even though there were several members of the group who effectively ran continuously joined flocks, it took some time to locate a producer who was prepared to cooperate as a demonstration flock for the PDS. Generally speaking, anyone who is running a continuously joined flock is doing so because they want a very low input, easy care operation.

In July 2020, 270 eID tags were placed in a group of mixed age ewes. Liveweight, condition score and lactation status were recorded for each animal. A small number (6) of the tagged ewes were young 2020 drop ewes and these animals are not included in the presented results.

Table 12: Liveweight and condition score of a group of continuously joined Dorper ewes (Flock 3)

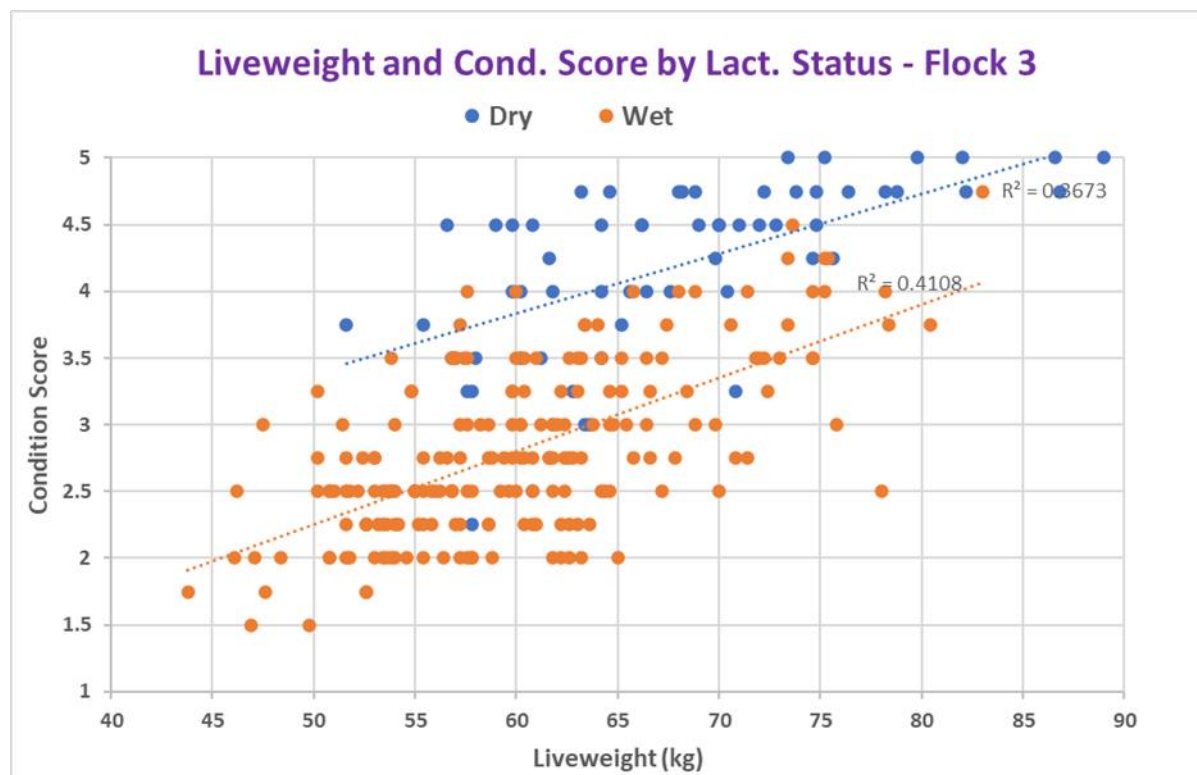
	Number	Condition Score		Liveweight (kg)	
		Average	Range	Average	Range
Whole mob	265	3.1	1.5 - 5	62	43.8 (CS 1.75, W) - 90.2 (CS 4.25, D)
Wet ewes	203 (77%)	2.8	1.5 – 4.75	60.1	43.8 - 83
Dry ewes	62 (23%)	4.2	2.25 - 5	68.2	51.6 – 90.2

As is clearly illustrated in Fig. 14, lactating ewes were on average a lower condition score than dry ewes (2.8 compared with 4.2). They were also, on average, 8kg lighter (Table 12).

It is clear that there is great variation in the flock in both weight and condition score. For any given weight, there is great range of CS and vice versa. For example, ewes that weighed between 60 – 65kg ranged in CS from 2 to 4.75.

There were some individual ewes that were assessed as wet but were CS 4 or greater. Without any history of individual animals, it is guesswork to understand why this would be the case, but it is possible that these ewes had small lambs on them and had had a significant break between pregnancies. Likewise, the individuals that were dry and lighter may have recently weaned twins, or the wet ewes that were very poor condition may be rearing twins soon after having weaned twins. You would have to suspect that any ewe that presented with a CS of 5 was likely not “pulling her weight” in terms of a high reproductive rate, and in fact one of these ewes was recorded at the time as likely barren.

Figure 14: Liveweight vs Condition Score for Lactating and Dry ewes (Flock 3) July 2020



The total number of ewes running in the mob was 476 with 461 lambs at foot. This equates to 97% lambs over all ewes.

Of the ewes that were eID tagged, 17 (6.4%) were noted with obvious udder issues. These were mostly one-sided udders (11) but also bottle teat, barren, lumpy and mastitis (busted).

The average weight of a score 3 ewe in the tagged group was 61.6kg. All but two of these score 3 ewes were lactating.

Unfortunately, no further data was collected from this flock. It became increasingly difficult to organise with the producer a suitable time for another visit as he struggled to make it a priority. With an eight-hour trip one way for the project facilitators, it was not something that could be planned at short notice. Producers who want a very low input, easy care flock will tend to continuously join, and in this case, sheep work is not a priority task. In the meantime, the mob in question was significantly impacted by wild dogs. This resulted in the flock being dispersed over a very large area, resulting in an unknown level of mismothering in addition to direct losses from dog attack. Any further data collected would have been very difficult to interpret as a result.

In addition, this producer had not been able to make it to any of the group activities for the project.

4.2.4 Feed test results

Feed analysis results collected through the course of the project are included at Appendix 15. In February 2021, samples of pasture hay, barley hay, oats, barley and field peas that the host producer had on hand were analysed in the lead up to a workshop discussing nutritional values of different feed stuffs, how to interpret feed analysis results, assessing Food on Offer, managing supplementary feeding and containment feeding and the use of feed budgeting.

In May 2021 samples of cereal rye and oaten hay were taken on the flock 2 property. The producer was using these feed stuffs to supplement the virtually non-existent paddock nutrition on offer to the demonstration flock of lactating ewes. The ewes were losing condition and it was suspected and subsequently confirmed through the testing that the oaten hay was only of average quality and the cereal rye hay had quite low nutritional value, with both being insufficient to maintain ewes with lambs at foot.

4.2.5 Recording reproduction results

Results gathered from the baseline survey conducted at the commencement of this project indicated that many producers in the group were barely keeping any records of their flock's ongoing reproductive performance, let alone detailed records by paddock, year, ewe age group or foetal number.

It was decided to develop a simple spreadsheet that could be used electronically or as a hard copy that might encourage project participants to start keeping more detailed records of their flock's performance. This spreadsheet is included in Appendix 14.

4.2.6 Monitoring udder soundness

During the course of the project, it was observed that there were a number of ewes present in the demonstration flocks that appeared to have udder soundness issues. On the one occasion that data was collected for flock 3 it was observed that 6.4% of ewes had obvious udder issues. This issue was particularly apparent in the six-monthly joined flock, where the udders get very little recovery time

between periods of lactation. Over the course of the first two years monitoring this flock, as many as 13% of ewes were noted with udder issues.

Udder health and structure is a key indicator of a ewe's ability to successfully rear healthy lambs. Recent MLA funded research showed that lambs from ewes that were "unfit to join" (poor udder health/structure, lameness and/or age-related teeth issues) had a 21% higher risk of dying and that culling these ewes could increase on-farm profit by \$4-\$8 per ewe (www.mla.com.au/research-and-development/livestock-production/reproductive-efficiency/sheep-reproduction-strategic-partnership-srsp/fit-to-join--improving-ewe-and-lamb-survival-through-pre-joining-assessment/).

4.2.7 Campylobacter

The baseline survey conducted at the commencement of the project indicated that around 40% of producers had recently vaccinated for Campylobacter, while another 30% were considering doing so. Some of the flocks had tested for Campylobacter and returned a positive result. Other flocks were not screening for reproductive diseases at all. For those who had vaccinated, the reported benefits varied. One producer reported lambing percentages picking up by 20%, while two others reported no change, although one did feel that his maidens may have benefitted.

Throughout the course of the project, there was a deal of variation between producers in how diligent they were with their vaccination programs, either not vaccinating every year or encountering issues with their vaccination methodology, such as equipment failure. The significance of Campylobacter as a reproductive wastage disease, along with effective control strategies, was discussed at the third project workshop in September 2021. At this time, blood samples were taken from a sample of ewes from Flock 1 that had been scanned in lamb but failed to rear a lamb. The results are shown in Appendix 16.

The results show high *Campylobacter fetus fetus* titre levels, which suggests recent exposure to the bacteria and may be responsible for some lamb loses. The advice was to continue/recommence vaccinating the maiden ewes each year. The producer did vaccinate his maidens at the next joining but not all ewes received the correct dose as the applicator malfunctioned.

As reported in section 4.1.1 above, in this flock the maiden ewes only marked 37% in 2022. They were not pregnancy scanned, so it is not known what their potential would have been.

In such a variable production environment, the reported benefits that producers said they had observed as a result of vaccination are impossible to confirm and it would be perilous to attribute any change from one year to the next solely to a vaccination program.

4.3 Economic analysis

4.3.1 Gross margin analysis

The results of the gross margin comparison showed a return of \$46/DSE with a 100% marking rate. This figure increased to \$62/DSE with a 135% marking percentage.

Assuming an average district stocking rate of 0.4 DSE/ha, this gives a gross margin per ha of \$18.50 at 100% marking rate and \$24.80/ha with a 135% marking percentage.

4.3.2 EID cost-benefit

The decision by State and federal agricultural ministers to make eID tags compulsory in the national sheep flock for all lambs born after January 2025 has made the decision of whether or not to use eID tags redundant. The decision now for producers is whether or not to utilise this opportunity to collect management/production data and to use this for better management decision making to increase the productivity of the enterprise.

Commercial flocks in this region have traditionally operated on a mob basis, where almost all decisions and analysis of performance, is based on averages for the group of animals, rather than the individuals themselves. Inevitably this will result in sub-optimal performance of an enterprise where decision making is based only on averages. For many this is likely to continue to be the approach adopted.

The opportunity that eID presents is to move toward individual animal management. It has been demonstrated many times that there is a range in performances of individuals in a flock for any given production measure.

Fig. 7 shows the distribution of the number of fetuses scanned per individual ewe over the three years of the project for Flock 1. 14% of ewes scanned with a total of six or more fetuses over the three years, whereas 20% of ewes scanned with a total of three or less fetuses for the three years.

In a shedding sheep flock, individual animal identification provides the ability to track individual ewes for fecundity and make culling decisions based on this information. This information can be overlaid with records of wet/dry status at weaning or marking.

The reproductive rate of the flock will be improved over time if low performing or passenger ewes are culled and if superior performers are retained in the flock for longer, rather than being automatically culled on age. The temptation can be, when making culling decisions based only on the visual appearance of the ewe, to be unfairly critical of the best performers and to be drawn visually to the heavier, higher condition score ewes who it is likely have the lowest level of productivity. Having information on the past performance of an individual can remove this temptation.

Sometimes the greatest benefit from individual animal management may be derived from understanding what individual animals are achieving within the operation. For example, it may be picked up that there is a large percentage of twin bearing ewes returning the following year to only scan with singles. This would point to a need to examine whether nutrition is sufficient and management of twins through lactation, weaning, and leading back up to joining is adequate.

Another example might be in monitoring growth rates of maiden ewes and examining any relationship between conception and weight at joining. This has the potential to identify the target

weight for joining for maidens in the flock and could make a case for extra supplementary feeding to get a greater percentage up to joining weight.

The value of this type of decision making will only be realised if the enterprise is adopting practices such as pregnancy scanning, condition scoring, differential management and other practices aimed at improved reproduction outcomes. Where reproductive rate is constraining an enterprise, eID may play a role in informing some decision making. However, eID is not a silver bullet, and there will often be a number of other areas that a business should focus their attention on initially.

What compulsory eID may do is act as a catalyst to individual animal data collection, as without it, the equivalent information would never have been captured within the enterprise. However, ultimately it is the decisions that are made based on the data collected through the use of eID that will improve enterprise productivity or profitability, not the eID tag in itself. It is not possible to associate a cost benefit to eID as a standalone investment, as it is the decision making that produces the ultimate return and the quality of decision making has an enormous impact upon the value obtained from the use of eID.

Other benefits that could possibly be attributable to the use of eID include improved biosecurity, product integrity, and attracting the next generation of farmers to sheep enterprises. In the process of a producer making a decision to adopt individual animal management, careful consideration needs to be given to managing capital investment so as to only purchase equipment that will genuinely contribute to enhanced productivity, as well as consideration of how and by whom any data generated will be managed.

4.4 Extension and communication

Table 13 outlines the extension and communication activities undertaken throughout the PDS project.

Table 13: L.PDS.2017 Engagement and success of extension and communication activities

Activity	Key messages	Date	Reach
Workshop 1	PDS project launch Intro to & demo of electronic ear tags & value of monitoring individual ewe performance Condition scoring ewes (hands on)	Feb 2020	13 core & observer producers
Workshop 2	Feed budgeting – assessing FOO; Interpreting feed test results; managing supplementary & containment feeding Overview of project results to date Udder faults observed Condition scoring refresher	Feb 2021	14 core & observer producers
Workshop 3	Pre-joining inspection & management of rams Discussion of other health issues	Sept 2021	14 core & observer producers
Workshop 4	Concluding field day to share insights from the demonstration project Revisit of previous project learnings including: <ul style="list-style-type: none"> • assessing Food on Offer • understanding feed test results • feed budgeting • managing supplementary feeding based on animal requirements • condition scoring ewes • pregnancy scanning for foetal number • Campylobacter vaccination • udder soundness • ram management 	Sept 2022	9 core & observer producers
Personal communications	Three 2-page update newsletters were produced. These provided updates on the progress of the data collection within the project and what we were learning. These were shared via email and hard copy. (Copies are included in appendices 11, 12 and 13.)	June 2020 Sept 2020 Jan 2022	20-25 via email and 14-15 hard copies.
DSSA & ADWDA newsletter article	Key project findings	Mid-2023 tbc	10000
Presentation	Presentation to SA Livestock Consultants	May 2023	20
Press article	Stock Journal article tbc	2023	3000

4.5 Monitoring and evaluation

4.5.1 Knowledge and skills

Prior to this project the average knowledge score for those producers completing the pre-project survey was a score of 1.25 out of a possible 7. The area with the highest knowledge was around reducing mob size at lambing, but questions on timing of pregnancy scanning, condition scoring and feed budgeting demonstrated a very low level of understanding.

The average score for those completing the same questions in the post-project survey was 4.1 out of 7, which is an increase in knowledge and skills score of 228%. The greatest increase in knowledge score was for pre-joining ram checks. A well attended and well received workshop was held specifically on this topic, and a number of producer members have indicated a change of practice in this area.

The question showing the least increase in knowledge was about the optimal time for pregnancy scanning. This is disappointing, as it was discussed a number of times throughout the course of the project. However, it is likely that producers don't really believe that they need to retain this level of information detail, as it is more than likely that they will rely on their scanning contractor to advise them the best scan dates based on their joining dates. It would still be useful for industry to have access to some producer friendly literature and/or on-line resources that discuss such things as the optimal timing of pregnancy scanning and preparation of ewes for scanning.

4.5.2 Confidence and skills

Producer confidence in undertaking three management practices was assessed prior to and post the project. This showed an increase in confidence in condition scoring, assessing rams pre-joining and in interpreting a feed test result.

The post-project scores were somewhat influenced by the fact that 20% of those completing the post-project survey had not been involved for the duration of the project and only attended the final workshop. If the results from these two producers are not included, the greatest increase in confidence was in interpreting a feed test which increased by 3.0 points but still sits at a relatively low 6.1 out of 10. On the other hand, post-project the confidence in assessing rams pre-joining was 8.1 out of 10 (an increase of 2.7 points). The lowest increase in confidence was a 1.5-point increase in confidence in condition scoring. A number of opportunities to improve this skill were provided to participants throughout the course of the project, and this relatively low increase in confidence possibly reflects some hesitation, likely due to a perception of lack of time, in producers practicing this skill in their own flock.

4.5.3 Practice change

Project participants were surveyed on their implementation of seven different practices as a result of participating in the PDS. The most commonly adopted practice was pre-joining ram checks, with 100% of producers adopting or intending to adopt this practice. Half of those surveyed post-project had already fully implemented this practice change and an additional one third intended to, while the remainder had used the practice prior to the PDS.

The practice change next most effected through participation in the PDS was wet and drying ewes at marking, with again 100% of producers adopting or intending to adopt this practice. 70% of producers had fully implemented this practice.

The least adopted practice was the use of electronic identification tags. This was not a key practice intended for adoption as a result of participation in the PDS, but rather a practice that was demonstrated as part of the data collection process of the project. Even so, one producer had fully adopted eID as a result of participation in the PDS and a further 70% said they intended to or had partially adopted. These adoption decisions have now been superseded by the decision by State and federal agricultural ministers to make eID tags compulsory for all sheep in Australia.

The next least adopted practice change was differential management of twin and single bearing ewes. While 25% of producers said they were already doing this practice prior to the PDS, 63% said they intended to adopt this practice or had partially adopted, and the balance did not intend to. Adoption of this practice is generally closely related to the adoption of pregnancy scanning. The same producers that were already managing twin and single bearers differently indicated that they were already pregnancy scanning prior to the PDS. All other responding producers had the same attitude to adoption of pregnancy scanning as to the adoption of differential management based on foetus number, with the exception of one producer who had fully adopted scanning as a result of participation in the PDS but indicated he did not intend to adopt differential management.

The most often quoted reason for not implementing practice change was “limited time”, which is a common scenario in mixed farming enterprises where there is a significant focus on the cropping operation. One participant commented that he felt that a lack of yards was limiting his ability to implement change.

The other practice change that was observed but was not included as part of the KASA assessment was checking for udder soundness. During the course of the PDS the facilitators observed that a number of the flocks had a percentage of ewes with unsound udders. While it was not originally included as a potential area for practice change, some time was spent during the PDS educating producers on the value of the practice of checking ewes’ udders. This was specifically mentioned by one producer on the post-survey as an area where he made practice change and conversations with other producers would indicate that others had also adopted this practice, either fully or partially.

Another practice change that was observed during the course of the PDS, but was not specifically asked about in the survey, was time of weaning. At least one producer had brought forward his normal weaning date so as to give the ewes more recovery time prior to the next joining.

Other practice changes mentioned by producers as a result of participation in the PDS included lambing and mating in smaller mobs and conducting feed tests on hay and grain before providing as supplementary feed.

In general, the increase in knowledge and skills was greater for the two committed core producers compared to observer producers, presumably because they were always more committed to the intent of the project and were involved without exception in all project activities.

5 Conclusion

Despite Dorpers and other shedding sheep breeds having a reputation for being able to survive and thrive on a relatively poorer quality diet and with minimal management intervention, this project has demonstrated that, in this production environment, both conception and weaning rates will benefit from investment of time and resources in adopting recommended best management practices for ewe and lamb management.

Conception rates in younger ewes appear to be more influenced by body weight than condition score. In ewes two years and older, body condition score appears to be a key determinate of

conception rates. Ewes that are joined at condition score 3 and above will have higher conception rates, and these will be highest at score 4 and above.

This project was only working with relatively small groups of animals. The industry would benefit from more detailed research with greater numbers of animals to fully understand the relationships between bodyweight, condition score and conception rates.

Furthermore, it was apparent that foetus survival to marking is also heavily influenced by ewe body condition score. It was beyond the scope of this project to quantify this relationship. Further analysis and understanding of lamb survival rates from birth to marking in shedding breeds, and the factors impacting this, would also be beneficial.

There were a number of management practices in addition to condition scoring, that were not commonly adopted by producers in this group prior to the PDS, that once adopted will have an ongoing impact on reproduction rates in their flocks, resulting in increased turn off of red meat per DSE:

- Improved record keeping to understand and track performance
- Pregnancy scanning
- Differential management of twin and single bearing ewes
- Lambing multiple bearers in smaller mobs
- Pre-joining ram inspection
- Assessment of ewes as fit to join
- Timely weaning
- Feed testing and budgeting

There is an opportunity to incorporate messaging specifically targeted at shedding sheep producers in any industry extension and adoption programs, with the aim to increase shedding sheep producers' understanding of the importance of monitoring ewe weight and condition score, and the value proposition from being able to differentially manage twin bearing ewes. Messaging should also encompass the other management practices that have been demonstrated in this PDS.

6 Key Findings

With attention to detail in ewe and ram management, and adoption of best management practices, reproduction rates can be improved in Dorper flocks run in a low rainfall cereal zone.

- Condition score has a significant impact on conception and weaning rates in mature ewes.
- Conception rates are reduced at condition score 3 and below.
- In ewes less than two years old, bodyweight appears to be more important in determining conception rates.
- Twin bearing ewes given the same nutrition as single bearing ewes throughout pregnancy will be on average 0.25 condition score lighter.
- Lactation has a very significant impact on condition score. Wet ewes will be at least 1.5 condition score less than dry ewes, given the same nutrition.
- To successfully run a six-monthly joining program in a low rainfall cereal zone environment requires a significant investment in supplementary feeding, and the requisite infrastructure and labour.
- Individual ewes within the flock contribute significantly more to profitability than their peers. Individual animal management through the use eID tags allows these animals to be identified.

- Pre-joining ram inspection is an effective and easily adopted management practice.
- Without feed tests and feed budgeting, it is impossible to know if different classes of animals are receiving adequate nutrition to meet their requirements.
- In this environment Ovastim® appears to deliver increased conception rates but the results here were inconclusive and it was not clear if this contributed to an increase in weaning percentage for those treated.
- Unsound udders are a potential source of production loss and should be monitored and culled for. Udder issues were observed in 6% of ewes in one flock and in 13% of ewes in the six-monthly joined flock.
- Effective record keeping is required to measure and record key performance indicators, in order to understand your flock's performance, make decisions and track the impact of any changes to management.
- A full understanding of key performance indicators for the flock enables the setting of production targets each year.

6.1 Benefits to industry

This project was able to demonstrate that it is possible to impact enterprise productivity through the adoption of accepted best management practices.

The immediate target audience for this PDS lives in a remote area of the State and historically have had limited access to extension and advisory services. Available service providers are based at least 500km away, and so there are significant travel and accommodation costs to service such a project. By virtue of the location of the project, there were smaller numbers of producers involved with the face-to-face activities, but all of these producers had significant scope for improvement of their enterprise management.

In addition, the project findings have application across the wider sheepmeat industry, in particular the ever-growing number of shedding sheep enterprises nationally.

7 References

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8 Appendices

8.1 Appendix 1: Baseline Survey

Survey for Baseline Data for Far West Dorper Reproduction Project

We are collecting this information to help us understand what production levels people are currently achieving with their Dorper flocks and where any slippage in reproductive efficiency might be occurring. We will use this information to help decide what activities we will focus on for demonstration and training within the MLA funded project "Maximising Dorper Reproductive Performance". None of the information that you supply will be made available to anyone other than the project managers (Daniel & Anne) without your express permission and any results or analyses that are published will only be of aggregated data, with no individuals identified.

Name: Date:

Q1. What is your normal joining strategy? What date would you normally put the rams in, and what is the length of the joining period?

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.....
.....
.....

Q2. What percentage of rams do you use?.....

Q3. What is your pre-joining management of your rams?

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.....
.....

Q4. How do you manage your young (maiden) ewes? What is their age at first joining and do they get any preferential treatment?

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.....
.....
.....

Q5. If you have been preg scanning, what were the results? *If you don't preg scan go to Q6. If you don't scan maidens separately, put 'na' in this column.*

	Preg Scanning Result					
	Maidens			Mature ewes		
	% empty	% single	% multiple	% empty	% single	% multiple
2020						
2019						
2018						
2017						
2016						

Q6. If you scan and then run single and twin bearing ewes separately, what results have you achieved over the last five years for marking percentage (as a percentage of ewes sil) and weaning percentage? *If you don't run multiple bearing ewes separately, go to Q7. If you complete Q6, skip to Q8.*

	Marking Percentage (%)				Weaning Percentage (%)			
	Maidens		Mature ewes		Maidens		Mature ewes	
	Singles	Twins	Singles	Twins	Singles	Twins	Singles	Twins
2020								
2019								
2018								
2017								
2016								

Q7. What results have you achieved over the last five years for marking percentage (as a percentage of ewes joined) and weaning percentage? *If you don't have five years of data, please fill in as many years as you can. If a cell is not applicable, eg. you don't run maidens separately, please mark as 'na'.*

	Marking Percentage (%)		Weaning Percentage (%)	
	Maidens	Mature ewes	Maidens	Mature ewes
2020				
2019				
2018				
2017				
2016				

Q8. Have you got any comments on these results?

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Q9. Have you got any comments on lamb survival rates, including any difference between twins and singles?

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Q10. Do you record how many ewes appear to have 'lambled and lost' or are otherwise dry at lamb marking time and if so, what have you observed?

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Q11. What size mob of ewes would you normally lamb down?

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Q12. What predator issues do you have and what do you do to try and manage them? Does it differ across years? What do you assess is their impact on your lambing outcomes?

.....

.....

.....

.....

Q13. What would you normally expect would be your ewe death rate?

Q14. How do you make decisions on what ewes to cull?

Q15. What is the breeding history of your flock? Eg. started with Merinos and bred up to straight Dorper; started with Damara; bought in Dorper ewes.

Q16. Have you done any screening for reproductive diseases, including brucellosis? Have you implemented vaccination for Campylobacter? If so, what have you observed as a result?

Q17. What have been your supplementary feeding strategies in the past? Have you implemented differential management of twin and single bearing ewes? Have you fed fodder crops? Do you use feed testing to know the quality of feed supplied?

8.2 Appendix 2: Baseline Survey results

Baseline Production Survey Results – Far West Dorper Reproduction PDS

The baseline survey was completed by seven members of the producer group, Far West Eyre Peninsula Dorper Breeders, participating in the MLA funded Producer Demonstration Site Project L.PDS.2017 Maximising Dorper Reproductive Performance, including the three core producers.

Ram Management

The joining strategy for the Dorper flocks surveyed varied significantly.

- Two producers were joining every six months, both putting the rams out in April and in October. One of these producers joined for four weeks and the other for 45 days. However, this second producer mentioned he is considering shortening his joining period to 28 days.
- One producer said that he joined his ewes two months after the previous lamb drop, so at no set time, but this would likely work out at joining about every eight months.
- Two producers had one set joining period each year, putting the rams in in early January for either 7 or 8 weeks.
- The other two producers were effectively running the rams with the ewes continuously, although both suggested that they would normally take the rams out for 1-2 months each year.

The percentage of rams used also varied significantly from 1 to 4 percent. The six-monthly joiners used higher ram percentages of either 3 or 4%, whereas one of the continuous joiners was only using 1% rams.

Pre-joining management of rams varied, with some producers providing no specific treatment to their rams pre-joining. At least 70% of producers did give their rams some preferential treatment which generally involved feeding grain, including oats and peas, usually for a month pre-joining. Only one producer mentioned that they gave their rams a health check, checking their testes and feet.

Maiden Ewe Management

Not all producers provided information on any preferential treatment for their maiden ewes. Both continuously joined flocks ran ewes of all age groups together.

The other flocks joined their maidens at 6-8 months of age, with one producer aiming to have them at 45kg by 6-7 months for joining.

A couple of producers try to give their maidens the better feed and will sometimes supplement them with hay and/or grain. One producer mated his maidens in a feedlot last season for the first time and was very happy with how well it went and says he will do it again.

Pregnancy Scanning and Lambing Percentages

There are only two of the producers who regularly pregnancy scan, although a third did so for the first time in 2020. Only one producer was able to supply records of scanning percentages for more than one year and only one producer had separate records for maidens. Quoted scanned potential in mature ewes averaged 129% (range = 123 – 137%). One producer achieved a scanned potential in his maidens in 2020 of 115%. The percentage of scanned empty mature ewes ranged from 4% to 22%, with an average of 10%. The reported percentage of maidens scanned empty ranged from 3% to 26%, averaging 17%.

Only one producer reported separate marking percentages from single bearing mature ewes (85%) and twin bearing ewes (167%). Only two producers reported marking percentages, with one reporting for the whole flock (mature plus maidens) with a range of 105% to 121%, averaging 111%. The other producer reported an average of 108% in his mature ewes and an average of 58% in his maidens.

Some of the comments made by producers in relation to their lambing percentages included:

- Only 3 maidens from 94 were scanned empty (first time pregnancy scanning), which was a surprise. I was expecting something around 25-30 dry as in the past there has been a lot more dry maiden ewes at the end of lambing. (This producer has tested positive to Campylobacter but not yet started vaccinating.)
- I don't keep exact results but for the last 2 years have got just over 100% for a June drop. Used to get heaps more lambs (120%+) with an August drop but the lambs grow out quicker with a June drop.
- Would like to get maiden lambing % and conception up and would like to get a higher and more consistent number of ewes scanned with twins.
- As the rams are always working, we usually assess a percentage at sale (percentage of lambs sold annually) which is generally around 150%.

No producers reported weaning percentages, so there is no record as to whether there are any losses from marking to weaning.

Lamb and Ewe Survival

Producers were asked to comment on their lamb survival rates. Comments included:

- Singles are better than twins
- Weather – either hot or frosty can kill a few lambs
- Think I am losing too many between scanning and marking
- In 2019 ewes were lambing on lush feed - some ewes would walk off with mob and leave behind one twin. They seemed better in March drop when was drier.

Producers weren't routinely recording how many ewes had lambed and lost, although one producer estimated that he generally had about 10% dry at marking. One producer said that he doesn't record this but does pick out the drys and mate them again, then if they don't produce a lamb, they go. Another producer commented that he had seen 40-50% dry in his maidens quite a few times. He has now started using Campyvac, but is not sure yet if it has made a difference.

All producers reported issues with predators, mostly foxes and eagles, but one producer also had significant issues with wild dogs from time to time. No one was too sure exactly what the impact was, but one producer felt eagles had more of an impact than foxes. A number reported that they baited for foxes.

The expected ewe mortality reported by producers was between 0.5% and more than 5%. Interestingly these two extremes were both reported by the two continuously joined flocks. It would be reasonable to expect that with these very low input flocks, the producers might struggle to know this figure accurately. The other flocks reported between 1 and 5%, but it was clear that for some the figure quoted was a best guess. One producer knew that the losses in his maidens were higher than in his mature ewes at 3-4% compared with 1-2%.

Ewe Management

Flocks had used a range of alternatives to get into Dorpers in the first place, including:

- Started with Damaras and then crossed with Dorper rams (2 flocks)
- Purchased Dorper ewes (2 flocks)
- Merinos to SAMMs to Dorpers
- Merinos to Dorpers
- SMM ewes crossed with Dorper rams

Producers' ewe culling decisions are influenced by seasonal conditions, how pure their flock is (where they have crossed up from a Merino base) and whether they pregnancy scan or not. The two producers that regularly pregnancy scan their ewes, cull principally on the basis of scanned empty, although one of these producers additionally culled for structural issues especially shoulders and also age.

Those who were not preg scanning were culling on the basis of age or anything that is too woolly. One producer was a little more strategic culling the oldest line of ewes each year as well as assessing all age groups for structure. One producer has recently started preg scanning and so now culls on scanned empty.

All producers do not routinely manage twin bearing ewes differentially to single bearing, principally because the majority do not preg scan. One producer managed them separately sometimes, likely dependant on the season. Two producers commented that they ran their ewes in small mobs, implying this meant differential management was less important. These two producers lambed down in mobs of 100-120 ewes or 100-200.

The continuously joined flocks lambed down in mobs of 500-800. Other producers lambed down in mobs of 100-300.

A number of producers have recently vaccinated for Campylobacter. Some because they had tested for it and been positive and others because they were aware that other local producers had tested positive. Others are planning to vaccinate but haven't started yet and others are not screening for reproductive diseases at all. For those who have vaccinated, the reported benefits have varied. One reported lambing percentages picking up by 20% while two others reported no change, although one did feel that his maidens may have benefitted.

Feeding Management

One producer didn't do any supplementary feeding but all others had some form of strategy including:

- Oat self-feeders from Feb to the break in the season
- Lick feeder if needed
- Supplementary feed twin bearing ewes
- Feed hay if needed. Only feed grain to sale lambs.
- Trail feed grain depending on the season
- Supplementary hay at lambing, and then grain

Two producers said that they had used fodder crops but did not provide any details.

None of the producers had used feed tests.

Key Opportunities for Improvement

This baseline data suggests several opportunities where producers may be able to consider management changes that will improve reproductive outcomes.

1. More attention to **ram management**, including health/soundness checks and nutrition management where appropriate
2. Improved **ewe management** including management of maidens, monitoring of condition score, informed culling decisions including selling repeat dry ewes and for suspect udder function.
3. Improved **record keeping**. It is apparent that most producers are not measuring and recording key performance indicators effectively. In order to fully understand flock performance and track the impact of any changes to management, producers need to have effective records. "If you don't measure it, you can't manage it."
4. Improved understanding of **nutrition** management and feed budgeting.

8.3 Appendix 3: Communications Plan

Draft Communications Plan: Producer Demonstration Sites

Project name: Maximising Dorper Reproductive Performance

Date: 30 March 2020

Project overview

MLA Program Manager	Alana McEwan (Russell Pattinson – PDS national coordinator)
MLA \$	\$74 990
In kind investment \$	\$47 600
Project objectives	By January 2023, on three prime lamb properties in the far west Eyre Peninsula region of South Australia: <ol style="list-style-type: none">1. Establish base line productivity measures in all participating flocks (9), but with a particular focus on the three demonstration sites (one flock with biannual mating, one with annual mating and one with continuous mating).2. Demonstrate that the adoption of best management practice, including lambing twin bearing ewes in small mobs, can improve the conception rate, lambing percentage, weaning rate and production efficiency (kg of lamb turned off annually per ewe and per hectare) of Dorper (& White Dorper) flocks by 10% in mixed farming systems3. Undertake a cost benefit analysis of the use of eID to monitor individual reproductive performance and inform culling decisions.4. Undertake a range of training and extension programs with commercial shedding sheep producers on condition scoring, pre-joining management of rams and feed budgeting etc so that:<ol style="list-style-type: none">a. 80% of core producers and 40% of observer producers will have adopted best practice management for Dorper reproductionb. 100% of core producers and 60% of observer producers will have improved their knowledge and skills in relation to the reproductive performance of Dorpers

5. Changes in marking and weaning percentages following the adoption of a Campylobacter vaccination program will be documented and shared with 25 producers.

What are the 'outcomes' for producers?

Measure of success of communication plan and/or activities (KPIs and how measured)

Primary audience (include regions/species)

Secondary audience (include regions/species)

1. Increased weaning percentages
2. Reduced ewe mortality
3. Improved enterprise profitability and sustainability
 - Achieve targets for changes in knowledge and skills
 - Delivery of communication plan activities

Far west Eyre Peninsula, SA dorper breeders

State-wide and national dorper breeders and their service providers.

Communications Plan / Activities

Activity	Responsibility	Target Audience	Key messages and must-have elements	Timing	Estimated reach
Field days	Anne & Daniel	Core and observer producers	At time of eID implementation and first pregnancy scan an open day will be held at each location demonstrating the technology.	Mar 2020	15
			Concluding field day to share insights from the demonstration project with all interested parties.	Sept 2022	30
Workshops	Anne & Daniel	Core and observer producers	Condition scoring	March 2020	15
			Feed budgeting	March 2021	15
			Reproductive soundness assessment of rams	August 2021	15
Personal communications - email	Anne & Daniel	Core and key observer producers	Project updates.	Throughout duration of project	15
DSSA newsletter article	Anne & AgCommunicators	National dorper producers – commercial and stud	Dorper Sheep Society Australia Australian Dorper & White Dorper Group	2022	?5000
Facebook posts	Anne	National and international audience of dorper producers and service providers		2020 2021 2022	DSSA 7000 AD & WD Group 3000
Presentation	Anne	Service providers		2023	20
In depth article	Anne, Daniel, MLA, SJ reporter	State-wide & national audience of producers & service providers	Stock Journal article	2023	3000
			Feedback Local newsletters	2022/2023 2023	10 000 1500
Producer guides	Anne & Daniel	Dorper producers nationally	Summary of all findings from project and guidelines for producers.	2023	3000

8.4 Appendix 4: Pre-Project KASA Survey



MLA Producer Demonstration Sites

Pre-Project Survey - Observer Participants

PDS Name: Maximising Dorper Reproductive Efficiency

PDS Code: L.DS.2017

The following questions are used to determine your level of understanding of maximising sheep reproduction rates. The knowledge and skills audit is used at the start and completion of the project to track individual skill development and adoption of new practices. It will also be used:

1. To improve the content of future project meetings; and
2. As part of the evaluation process for the project.

The information will be completely confidential and individuals will not be identified in the analysis of data.

Name:	
Date:	

MLA may contact me to further assess the impact of their programs? Yes No

MLA may send me newsletters and inform me of future events? Yes No

Section A – Demographic Information

A1. Your contact details

Property name	
Property address	
Postal address	
Email address	
Phone	

The information you are providing in this form may be personal information under the Privacy Act. Such personal information is collected for the business purposes of MLA including the PDS program and will not be disclosed to anyone else except as notified here, as set out in the PDS Participant Consent & Release* and in accordance with its privacy policy or where your consent has been obtained. MLA's privacy policy can be obtained directly from MLA by calling 1800 675 717, or from its website at <https://www.mla.com.au/general/privacy/>. By providing your personal information, you consent to MLA collecting, holding, using and disclosing that information in the manner specified in this form, in the PDS Participant Consent & Release* and as otherwise specified in its privacy policy. If you do not provide such personal information, MLA may not be able to provide you with products or services or keep you informed about market news, industry information and other communications from them. You can request access to and correction of your personal information by calling MLA on 1800 675 717 or 02 6332 2135.

A2. What area do you manage?

Hectares	or Acres
----------	----------

A3. What numbers of sheep do you run?

Number of ewes	
Number of rams	
Number of lambs turned off per year	

Section B – Knowledge and Skills *(If you do not know, please select the 'Unsure' option)*

B1. The optimal time for pregnancy scanning for multiple foetuses is: *(Tick one option)*

- a. 70 - 80 days after the rams come out.....
- b. 70 – 80 days after the rams go in
- c. 80 – 90 days after the rams come out.....
- d. 80 – 90 days after the rams go in
- e. Unsure.....

B2. In comparison to single bearing ewes, twin bearing ewes will: *(Tick one option)*

- a. Have similar nutritional requirements pre-lambing & during lactation
- b. Have a 5-10% higher energy requirement pre-lambing & during lactation.....
- c. Have a 15-25% higher energy requirement pre-lambing & during lactation.....
- d. Have a 35-45% higher energy requirement pre-lambing & during lactation.....
- e. Unsure.....

B3. Condition score (CS) is assessed by: *(Tick one option)*

- a. Feeling the fat cover over the tail
- b. Feeling the amount of fat cover over the twelfth rib (GR site)
- c. Feeling the amount of tissue (fat & muscle) over the twelfth rib (GR site)
- d. Feeling the amount of tissue (fat & muscle) over the loin area.....
- e. Unsure.....

- B4. Reducing mob size at lambing should:** *(Tick one option)*
- a. Only make a difference to lamb survival in single bearing ewes
 - b. Decrease lamb survival because of increased predator impact
 - c. Not affect lamb survival at a constant stocking rate
 - d. Increase lamb survival in multiple bearing ewes
 - e. Unsure
- B5. Signs that Campylobacter is present within a flock include:** *(Tick one option)*
- a. Abortion storms particularly in older ewes only
 - b. Abortions, still born and weak non-viable lambs especially in maiden ewes
 - c. Low marking % of scanned in lamb maidens
 - d. Ill-thrift in young ewes
 - e. Low pregnancy scanning rates
 - f. All of the above
 - g. b. and c. above
 - h. Unsure
- B6. The 5 Ts that should be checked in rams pre-joining include:** *(Tick one option)*
- a. Toes, Testes, Temperament, Teeth, Travel
 - b. Toes, Testes, Teeth, Temperature, Tossle
 - c. Toes, Testes, Tossle, Torso, Teeth
 - d. Toes, Testes, Testosterone, Teeth, Torso
 - e. Unsure
- B7. When completing a simple feed budget, how much green dry matter (DM) is allocated per dry sheep equivalent (DSE)?** *(Tick one option)*
- a. 0,9 kg
 - b. 1.0 kg
 - c. 1.2 kg
 - d. 1.5 kg
 - e. Unsure

Section C – Confidence and Practices

C1. How confident are you in condition scoring?

(please rate out of 10, with 1 being poor and 10 being very good, by checking your choice below)

1	2	3	4	5	6	7	8	9	10
Poor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Excellent
<input type="checkbox"/>									<input type="checkbox"/>

C2. How confident are you in assessing rams pre-joining

1	2	3	4	5	6	7	8	9	10
Poor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Excellent
<input type="checkbox"/>									<input type="checkbox"/>

C3. How confident are you in interpreting a feed test result?

1	2	3	4	5	6	7	8	9	10
Poor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Excellent
<input type="checkbox"/>									<input type="checkbox"/>

C4. Do you currently use the following practices?

	Normal practice	Sometimes	Rarely	Never	Not Applicable
Pregnancy scanning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condition scoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wet/dry at marking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Differential management of twin & single bearing ewes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Campylobacter vaccination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pre-joining ram health check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electronic Identification	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8.5 Appendix 5: Post-Project KASA Survey



Post-Project Survey – {Core/Observer} Participants

PDS Project Code: L.PDS.2017 PDS Project Name : Maximising Dorper Reproductive Performance

The following questions are used to determine your level of understanding of maximising sheep reproduction rates following your participation in the above producer demonstration site project. The knowledge and skills survey is used at the start and completion of the program to allow individuals to track their skill development and adoption of new practices. The information will be used as part of the evaluation process for the project and MLA's PDS program. The information will be completely confidential, and individuals will not be identified in the analysis of data.

Participant Name: _____

Company/Business Name: _____

Section A - Your thoughts on the PDS

Please rate each of the questions below out of 10 (where 1 is negative and 10 is positive)

A1. Overall, how satisfied are you with this PDS? _____/10

A2. How valuable was this PDS in assisting you manage your livestock enterprise? _____/10

Please tick your response and provide short answer responses for the below questions

A3. Would you recommend MLA's PDS program to others? Yes No Not Sure

A4. Please provide any feedback to help us improve the PDS program:

Section B – Knowledge and Skills (If you do not know, please select the 'Unsure' option)

B1. The optimal time for pregnancy scanning for multiple foetuses is: (Tick one of the options below)

- a. 70 - 80 days after the rams come out.....
- b. 70 – 80 days after the rams go in
- c. 80 – 90 days after the rams come out.....
- d. 80 – 90 days after the rams go in
- e. Unsure.....

B2. In comparison to single bearing ewes, twin bearing ewes will: (Tick one of the options below)

- a. Have similar nutritional requirements pre-lambing & during lactation.....
- b. Have a 5-10% higher energy requirement pre-lambing & during lactation
- c. Have a 15-25% higher energy requirement pre-lambing & during lactation.....
- d. Have a 35-45% higher energy requirement pre-lambing & during lactation.....
- e. Unsure.....

B3. Condition score (CS) is assessed by: (Tick one of the options below)

- a. Feeling the fat cover over the tail
- b. Feeling the amount of fat cover over the twelfth rib (GR site)
- c. Feeling the amount of tissue (fat & muscle) over the twelfth rib (GR site).....
- d. Feeling the amount of tissue (fat & muscle) over the loin area
- e. Unsure.....

B4. Reducing mob size at lambing should: (Tick one of the options below)

- a. Only make a difference to lamb survival in single bearing ewes
- b. Decrease lamb survival because of increased predator impact.....
- c. Not affect lamb survival at a constant stocking rate
- d. Increase lamb survival in multiple bearing ewes
- e. Unsure.....

B5. Signs that *Campylobacter* is present within a flock include: *(Tick one of the options below)*

- a. Abortion storms particularly in older ewes only
- b. Abortions, still born and weak non-viable lambs especially in maiden ewes
- c. Low marking % of scanned in lamb maidens
- d. Ill-thrift in young ewes
- e. Low pregnancy scanning rates
- f. All of the above
- g. b. and c. above
- h. Unsure

B6. The 5 Ts that should be checked in rams pre-joining include: *(Tick one of the options below)*

- a. Toes, Testes, Temperament, Teeth, Travel
- b. Toes, Testes, Teeth, Temperature, Tossle
- c. Toes, Testes, Tossle, Torso, Teeth
- d. Toes, Testes, Testosterone, Teeth, Torso
- e. Unsure

B7. When completing a simple feed budget, how much green dry matter (DM) is allocated per dry sheep equivalent (DSE)? *(Tick one of the options below)*

- a. 0.9 kg
- b. 1.0 kg
- c. 1.2 kg
- d. 1.5 kg
- e. Unsure

Section C – Confidence and Practices

C1 How confident are you in condition scoring?

Please rate out of 10 by marking your choice below, 1 = Not at all confident, 5 = somewhat confidence, 10 = very confident

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C2 How confident are you in assessing rams pre-joining?

Please rate out of 10 by marking your choice below, 1 = Not at all confident, 5 = somewhat confidence, 10 = very confident

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C3 How confident are you in interpreting a feed test result?

Please rate out of 10 by marking your choice below, 1 = Not at all confident, 5 = somewhat confidence, 10 = very confident

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C4 As result of participating in this PDS have you begun implementing changes in any of the following practices:

	Adopted prior to PDS	Yes, fully implemented	Yes, partially implemented*	I intend to adopt	No, and I have no intentions to	Not applicable
Pregnancy scanning						
Condition scoring						
Wet/dry at marking						
Differential management of twin & single bearing ewes						
Campylobacter vaccination						
Pre-joining ram health check						
Electronic Identification						

*(Please indicate % of your enterprise this practice has been adopted) (ie < 25%, 50%, > 75%, 100%)

4.1. Have you made/do you intend to make any other changes to your business as result of participating in this PDS? If yes, please advise what changes



4.2. What are the reasons you have not implemented the above practices on your property? *(Tick any of the options that apply to you)*

- | | | |
|-----------------------------------------------------------------|---------------------------------------------|-------------------------------------------------|
| <input type="checkbox"/> Not a significant issue on my property | <input type="checkbox"/> Lack of confidence | <input type="checkbox"/> Lack of skills |
| <input type="checkbox"/> Limited funds | <input type="checkbox"/> Limited time | <input type="checkbox"/> Other (please specify) |
-

CS is only applicable where practices change/adoption has occurred as a result of participating in the PDS.

C5 What impact did implementing the above practices have on *(Please do not answer if you are unsure)*:

Conception rate (%) _____

Lamb marking percentage _____

Weaning percentage _____

Far West Eyre Peninsula Dorper Breeders

(Improving Reproductive Efficiency)

MLA Project Launch Day

Introduction to Electronic Ear Tags

Condition Scoring in Dorpers



Presented by Daniel Schuppan, Nutrien Ag Solutions and Anne Collins, AC Ag Consulting with funding support from MLA

- Learn more about the three year project
- Condition scoring training exercise —learn or polish your skills
- Introduction to electronic ear tags and monitoring individual ewe performance

2.00pm Wednesday 26th February

Anyone welcome to attend this event

Ben Polkinghorne's property, Penong

Should go for around 2 hours; light refreshments to follow.

For more details contact Anne Collins 0427 486 115 or Daniel Schuppan 0477 315 931



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8.7 Appendix 7: Workshop 2 Advertising Flyer

Far West Eyre Peninsula Dorper Breeders

(Improving Reproductive Efficiency)

◆ Feed Budgeting

- Assessing Food On Offer
- Interpreting feed test results
- Managing supplementary and containment feeding

◆ Review of Project results so far

◆ Condition Scoring refresher



Presented by Daniel Schuppan, Nutrien Ag Solutions and Anne Collins, AC Ag Consulting with funding support from MLA

- Understand the value of the paddock feed you have on offer and the nutritional requirements of pregnant/lactating ewes
- Learn how to interpret feed test results and provide cost effective supplementary feeding
- Condition scoring refresher —learn why it's an important tool for managing your flock

11.00am Tuesday 23rd February

Anyone welcome to attend this event

Ben Polkinghorne's property, Penong

Should be finished by 4.00pm; please bring your own lunch; light refreshments to follow.

For more details contact Anne Collins 0427 486 115 or Daniel Schuppan 0477 315 931



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Far West Eyre Peninsula Dorper Breeders
(Improving Reproductive Efficiency)

**Pre-joining Ram Inspection
& Management**

Workshop delivered by **Dr Felicity Wills** of
Coopers Animal Health

- Importance of ram preparation for joining
- Breeding soundness examination
- Understanding the 5 Ts
- Management leading up to joining
- Other health issues that may be impacting your flock



3.00pm Tuesday 21st September

Kindly hosted by

Lynton Murray, Penong Station



Anyone welcome to attend
this event

For more details contact Anne
Collins 0427 486 115 or Daniel
Schuppan 0477 315 931



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COOPERS®
EST. 1843 


Producer
Demonstration Site

Far West Eyre Peninsula Dorper Breeders

(Improving Reproductive Efficiency)

Final PDS Project Workshop

Discussion of project learnings
Understanding the value of:

- Assessing Food On Offer
- Understanding feed test results
- Feed budgeting
- Managing supplementary feeding based on animal requirements
- Knowing the condition score of your ewes
- Pregnancy scanning for foetal number
- Assessing rams prior to joining
- Other “one percenters” to increase marking rates



Presented by **Daniel Schuppan**,
Nutrien Ag Solutions and **Anne
Collins**, AC Ag Consulting with
funding support from MLA

Hear from **Ben & Neville** on their
experiences and learnings as project
demonstration sites

9.00am –12.00 noon

Wednesday 28th September

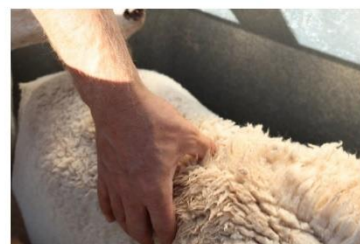
**Please bring
your own chair**

Anyone welcome to attend this event

Ben Polkinghorne's property, Penong

Will conclude with a BBQ lunch (provided).

*For more details contact Anne Collins 0427 486 115 or
Daniel Schuppan 0477 315 931*



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8.10 Appendix 10: L.PDS.2017 Member Update 1

Far West Eyre Peninsula Dorper Breeders PDS Update 1—June 2020

What has been completed so far:

Ben's: Annual joining flock; 200 2018 drop ewes weighed and conditioned scored (CS) at the end of joining. Ewes CS again 2 weeks prior to lambing.

Neville's: 6 monthly joining flock; 72 sil green tag ewes weighed and CS prior to lambing. 115 mixed age ewes with laf CS mid-lactation.

Bryan's: Continuously joined flock; we will tag, weigh and CS 200 ewes in July.

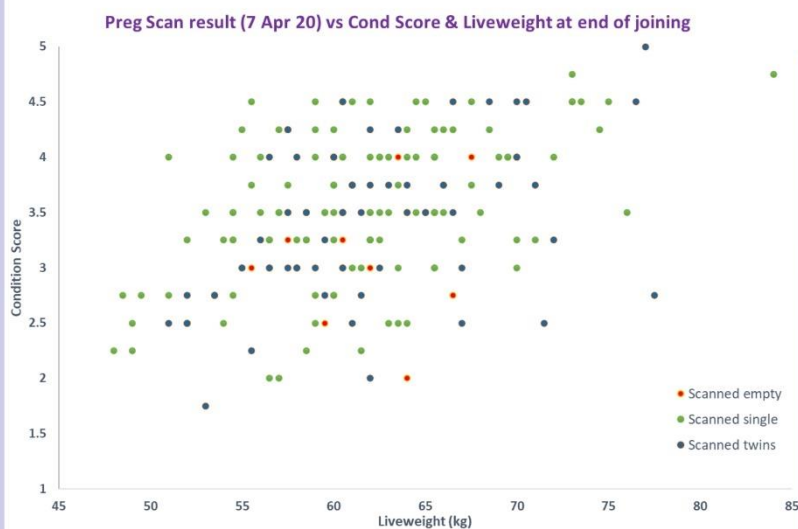


Key Discussion Points

1. Individual animal identification using EID has already enabled us to capture some great data in the first 4 months of the project – *Get on board now for the future*
2. There is a large variation in body weight at the same condition score in a mob. What is the optimum standard reference weight and what ewes will be the most productive?
3. Condition scoring Dorpers is an important management tool, but we need to better understand the interaction with liveweight and frame score

Results to date from Ben's place

The following tables and graphs will be discussed in more detail at our next meeting. This graph shows a plot of the preg scan result against the ewes' liveweight and CS and the end of joining. It is difficult to see any clear trend here. More details of the preg scan result are presented on the next page, including a table where we look at the interaction between liveweight, CS and preg status.



Which ewes are the most productive? We don't know at this stage, but it appears there is an interaction between weight & CS. The larger frame, 2-4 CS ewes gave the best result in this situation (see table on next page). Ewes with a CS >4 in this weight category, had a lower potential lambing percentage.

Far West Eyre Peninsula Dorper Breeders PDS Update 1—June 2020 p.2

	No. Ewes	Percentage of group	Potential lambs	Avg CS	Avg LWT
Twin	59	30.6%	118	3.4	62.8
Single	124	64.2%	124	3.5	60.9
Empty	10	5.2%	0	3.6	61.5
	193		242	125.4% potential	

The scan result was not fantastic with an overall potential of only 125%.

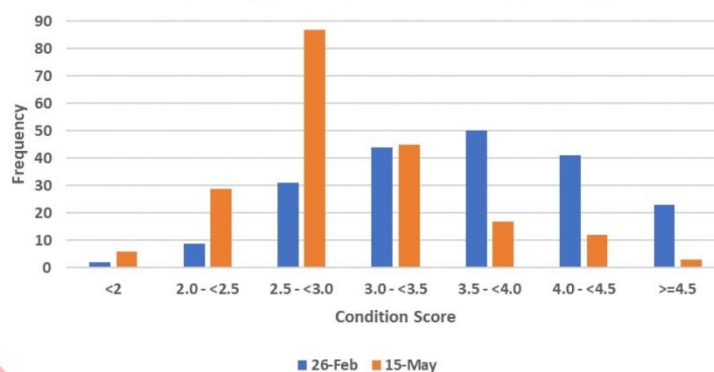
The twin bearing group is slightly heavier and it is not because they have a higher CS.

These are very early results but it appears that, in this situation, the heavier ewes have the best potential so long as they are CS 4 or less.

	Over 60 kg liveweight					60kg & under liveweight				
	No. ewes	Avg LWT	Avg CS	Potential lambs	Potential	No. ewes	Avg LWT	Avg CS	Potential lambs	Potential
1-3 score	21	64.7	2.7	30	143%	39	54.8	2.6	48	123%
>3-4 score	58	65.1	3.7	82	141%	40	57.1	3.5	42	105%
> 4 score	27	68.8	4.5	30	111%	8	57.6	4.3	10	125%

The ewes lost weight and CS in the 11 weeks from joining to lambing. It is okay to lose some weight over this period, but these ewes have probably slipped a bit too much, with 28 ewes with twins on board sitting at CS 2.5 or lower. These ewes are at risk of not being able to successfully deliver and raise two lambs. Of the ewes scanned with twins, over 90% were below what we might consider a reasonable target CS for multiple bearing maternal ewes of 3.3–3.7.

Frequency of CS
End of joining (26 Feb) & Pre-lambing (15 May)



	CS 26 Feb 2020	CS 15 May 2020	Change in CS
Average	3.47	2.83	-0.64
Maximum	5.0	4.5	-2.0
Minimum	1.75	1.5	+0.75
Average Scanned with 2	3.39	2.62	-0.77
Average scanned with 1	3.49	2.86	-0.63
Average scanned with 0	3.60	3.35	-0.25

These ewes were run as one mob until a couple of weeks prior to lambing, at which time they were split into single and twin bearing groups, so that those with twins could get extra supplementary feed. This feeding should have started earlier.

8.11 Appendix 11: L.PDS.2017 Member Update 2

Far West Eyre Peninsula Dorper Breeders PDS Update 2—September 2020

What has been completed so far:

Ben's: Annual joining flock; 200 2018 drop ewes weighed and conditioned scored (CS) at the end of joining. Ewes CS again 2 weeks prior to lambing. No. of lambs marked and dry ewes recorded.

Neville's: 6 monthly joining flock; 72 sil green tag ewes weighed and CS prior to lambing. 115 mixed age ewes with 1st CS mid-lactation, which was end of next joining. Preg scan results from this joining.

Bryan's: Continuously joined flock; 270 ewes tagged, weighed, CS and wet/dry in July.

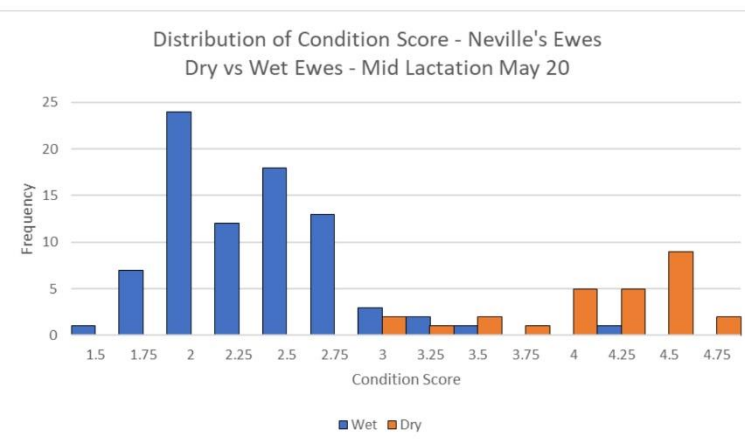


Key Discussion Points

1. In a couple of the demonstration flocks we have observed 5-6% of ewes with dodgy udders, usually with one side not working. These ewes will be compromised in their ability to raise twins effectively and their lambs will be expected to have reduced growth rates. *These ewes should be considered for culling.*
2. Check rams prior to joining for the 5 T's. We will run a group session on this in 2021.
3. Consider splitting ewes at weaning based on condition score and allocate the lightest ewes to the best feed.

Results to date from Neville's place

Neville is joining his flock every 6 months. The ewes that we have data on so far are a mob of 115 mixed age ewes that were scanned in lamb in February and have been running as one mob. These ewes were first condition scored mid-lactation which was towards the end of the next joining. There was a clear difference in CS between the wet and dry ewes, with some of the wet ewes having dropped to quite a low CS.



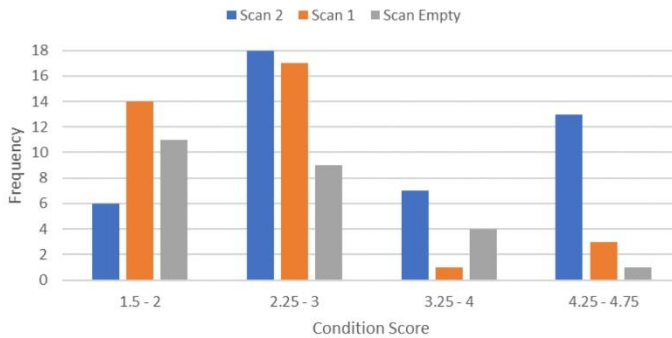
The risks with these ewes with the lower CS are an increased risk of mortality of both ewes and lambs; potential for lower growth rates of the lambs; and the risk of a poorer joining result. Lamb survival in this mob is 73%, so the lower CS has possibly impacted this. The green tag ewes (March 19 drop) appear to be the main culprits here with only 65% of them still wet. The details of this mob in May 2020 at mid-lactation and at the time of the next joining are shown in the table on the next page.

Far West Eyre Peninsula Dorper Breeders PDS Update 2—September 2020 p.2

Condition Score, Lamb Percentage & Wet/Dry Status Mid-Lactation May 2020			
Avg Cond Score for whole mob	2.79	No. ewes wet	85
Lowest Cond Score (twin laf)	1.5	% ewes wet	76%
Highest Cond Score (dry ewe)	4.75	No. ewes dry	27
Avg Cond Score for dries	4.12	% ewes dry	24%
Avg Cond Score for dry & scanned twin	3.70	No. green tags	43
Avg Cond Score for dry & scanned single	4.22	No. green tags wet	28
Avg Cond Score for wets	2.35	% green tags wet	65%
Total number laf	105	No. aged ewes	66
Total number ewes	112	No. aged ewes wet	54
Lambs at foot percentage	94%	% aged ewes wet	82%
Potential lambs from scanning	143		
Potential lambs from scanning (%)	131%		
Lamb survival (%)	73.4%		

There could be an argument for splitting the dry ewes off a group like this and pushing the wet ewes on to better feed to try and improve the outcome with this lambing and the subsequent one.

Neville's Ewes July 2020
Frequency of Preg Scan Result by CS

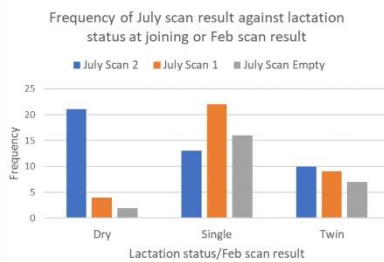


This mob was preg scanned in July and the outcome shown in the graphs and table below.

All ewes were sil in Feb but 24% failed to rear a lamb. A lot of this wastage was in the maiden ewes where 35% that were sil were subsequently dry. But there was still 18% of mature ewes that also failed to rear a lamb. Of the wet ewes 9 (11%) had lost one twin.

The majority (78%) of previously dry ewes (failed to rear previous lamb) are now pregnant with twins. Nearly all ewes (90%) scanned in July as empty or with a single foetus had at least one lamb at foot at the time of joining. Two ewes were dry and are now empty, the definition of a 'passenger'.

The average CS of ewes scanned in July with twins was higher than single or empty but this result was influenced by the number of dry ewes in this group with a higher CS. The average CS of wet ewes scanned with twins was only very slightly higher than empty or single.



July Scan Status	No.	Avg CS at joining	No. previously dry (Avg CS in brackets)	No. previously wet (Avg CS in brackets)
Empty	27	2.49	2 (4.25)	23 (2.34)
Single	35	2.51	4 (4.25)	31 (2.28)
Twins	44	3.26	21 (4.08)	22 (2.47)
Four	1	2.5	0	1
Total	107		27	77
Foetuses	127			

8.12 Appendix 12: L.PDS.2017 Member Update 3

Far West Eyre Peninsula Dorper Breeders PDS Update 3—January 2022

Key Discussion Points

1. Pregnancy scanning gives you the ability to manage the future feed demands of your ewes.
2. Check rams prior to joining for the 5 T's.
3. As feed quality and quantity decline, monitor ewe condition score and provide supplementary feed as required.

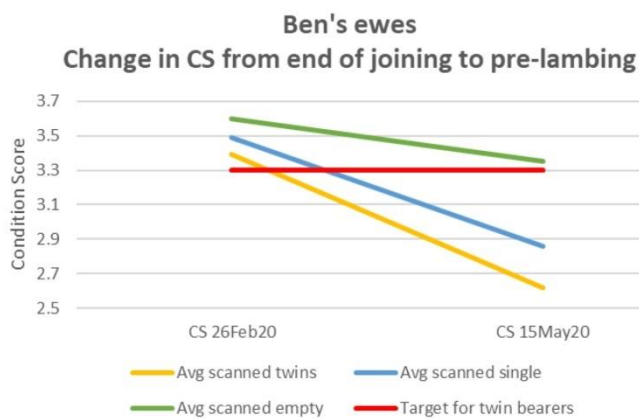
Pregnancy scanning—know what you are working with

Preg scanning in a flock with controlled joining has a number of advantages:

1. Ability to identify **empty ewes** and make a decision about them.
2. Ability to make plans to run **single and multiple bearing ewes separately**. The graph below is a reminder of the difference in condition score we observed in Ben's ewes in 2020 when he ran all ewes as one group, without any supplementary feeding, up until 2 weeks prior to lambing.
3. Knowledge of how many wet ewes and lambs at foot you will potentially have to aid with **planning lambing paddocks, lambing mob sizes and feed budgeting**.
4. A **measure** of the number of foetuses to compare with the number of lambs marked and the number weaned to enable an assessment of where any losses may be occurring.



Why not make this the year you give scanning a go, even just for one mob of ewes?



These ewes lost weight and CS in the 11 weeks from joining to lambing. If ewes are above the target CS, it is okay to lose some weight over this period, but these ewes slipped too much, with 28 twin bearing ewes at CS 2.5 or lower. These ewes are at risk of not being able to successfully deliver and raise two lambs. Of the ewes scanned with twins, over 90% were below what we might consider a reasonable target CS for multiple bearing maternal ewes of 3.3–3.7.

When to scan: the optimal time to scan for multiples is between 80 to 100 days from commencement of joining. If scanning for pregnancy status only, from 35 - 40 days after the removal of rams, up until lambing. Ben will likely scan in first week of April and Neville in first week of May if you wanted to coordinate and save on paying travel costs.

Who can scan: Scanners that we know of who will come to the district include Mick Kessell from Wirrulla (0417 811 410) and Cousins Merino Services from Burra (0407 607 899).

A few reminders about ram preparation for joining from our last workshop at Penong

Check the 5 'T's 12 weeks prior to joining



Testes: no lumps; at least 34cm for mature rams



Toes



Teeth



Torso: 3.5 Cond Score



Tossle: in working order

Manipulating Conception Rates—Ovastim Demonstration



Ovastim dose given at 6½ weeks prior to joining

We are looking at the impact of using Ovastim to increase foetus numbers in Ben's flock. Ovastim increases the ovulation rate of treated ewes, is given as two doses in the lead up to joining and costs around \$2.70 per dose. We gave the initial dose to half of his tagged ewes 6½ weeks prior to joining and the second dose was given 3 weeks later. (Only one dose required in subsequent years). Treated and untreated ewes will be run together as one mob until preg scanning when we will assess any impact of the drug.

To get the full benefit from any treatment like this, correct application technique and timing is important, as is the provision of adequate care and nutrition for the treated ewes.

Update on each of the PDS demonstration flocks:

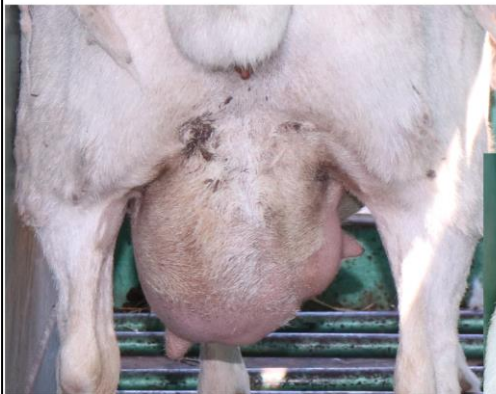
Ben's: We are continuing to track the original group of tagged ewes. This year half have received Ovastim prior to joining. Ben has also trialled flushing another group of ewes with peas prior to joining. He will also run a group of twin bearing ewes as a very small mob to demonstrate the impact of mob size on lamb survival in multiple bearers.

Neville's: Has moved back to annual joining this year due to the increased labour and cost of feeding required to maintain CS of ewes with 6 monthly joining.

Bryan's: We are no longer collecting data from this flock.

8.13 Appendix 13: Udder Soundness Presentation

Sheep Udder Assessment



- One sided udder
- Challenge when rearing twins
- Consider for culling

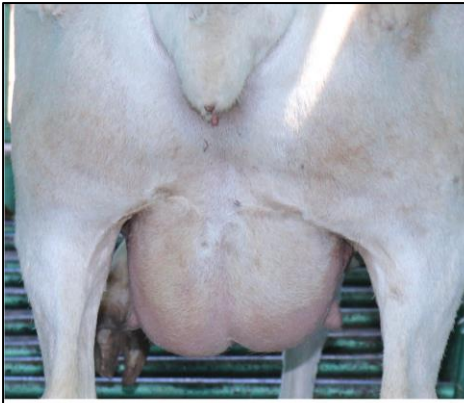


- Right side not functioning
- Plug over teat visible
- May be due to lamb favouring one side but could be one side dysfunctional



One sided udder

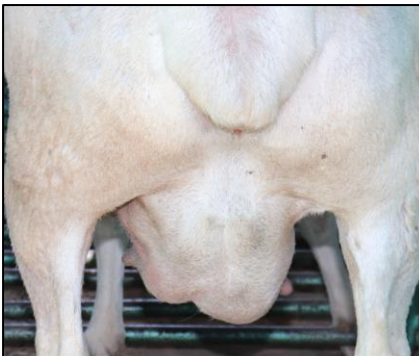
- Dried off or lost one side
- Challenge when rearing twins
- Consider for culling



Sound udder



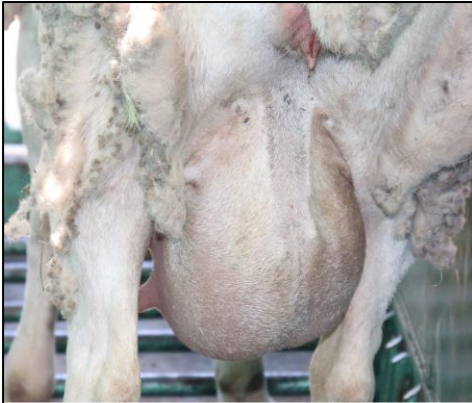
- Two clean teats – both sides being suckled

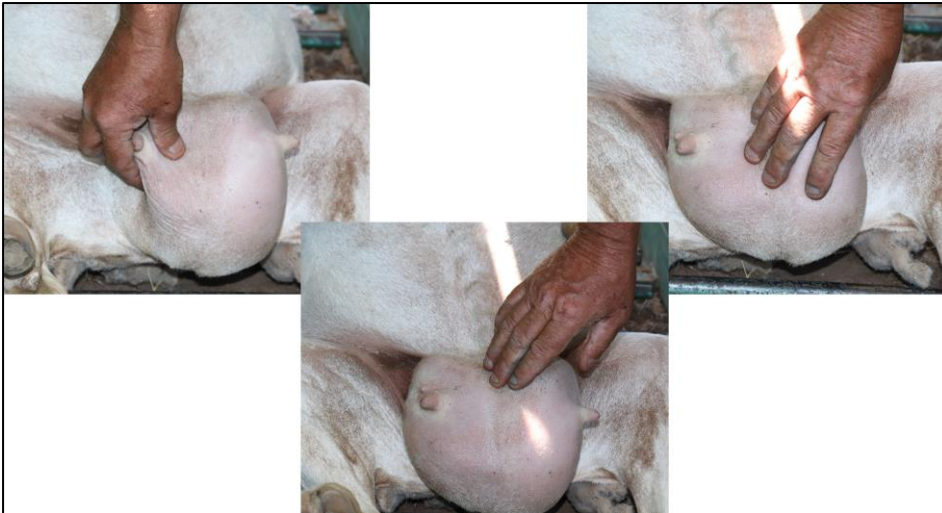


One sided udder

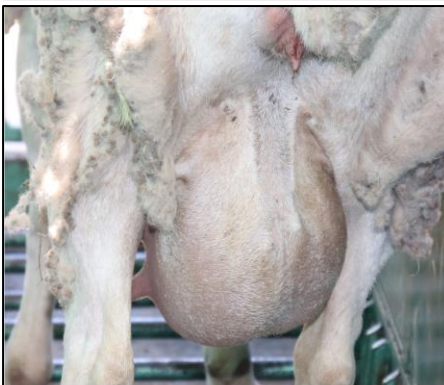


- Left side of udder not working
- Consider for culling



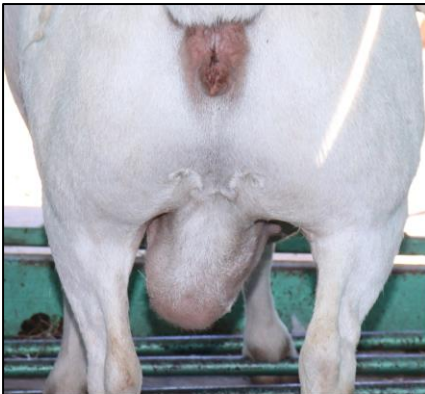


Udder with possibly compromised functionality



- Issues with this udder not apparent visually
- When put hand on one side is hot and lumpy
- Likely to result in permanent reduction in milk production

Lop sided dry udder

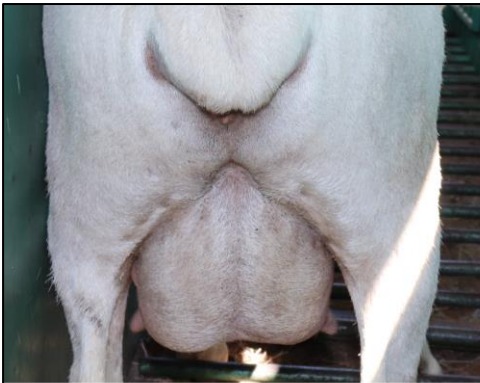


- This udder currently dry but clearly lop sided
- Right side may not function when wet
- Monitor and consider for culling



Lopsided udder

- Consider for culling




Sound udder

- Both sides full & warm (not hot)
- Both teats functioning
- No obvious lumps



8.14 Appendix 14: Simple Spreadsheet for Recording Reproduction

C20 | 1/12/2022



4 This is a simple spreadsheet for recording annual scanning percentages and lamb marking results when running mobs of single and multiple bearing ewes separately.
5 It allows tracking of single and twin pregnancies. No allowance is made for ewes scanned with more than two foetuses.

7 Instructions
8 Green cells = data entry
9 All other cells are protected/locked and can not be overwritten. This is to protect the integrity of the formulas.
10 The first line(s) in each table have been populated with an example. You will need to overwrite these in the green cells.

12 Planning for PREGNANCY Scanning
13 The accuracy of pregnancy scanning can be improved by:
14 • Scanning at the correct time. Based on the industry recommended five week joining period, pregnancy scanning should be conducted approximately 80-90 days after the rams go in.
15 • For joining periods longer than five weeks, scanning can be undertaken across a window of 70-100 days from rams in. However, accuracy will be highest between 80-90 days after the rams go in.
16 • Ideally ewes should be held off feed and water for a minimum of 6 hours prior to scanning.

17 Pregnancy Scanning Date Calculator
18 Input below the date that your rams went in with the ewes to calculate your ideal pregnancy scanning window. (Based on 80-90 days after rams go in.)
19 Rams in date: Window for optimum time of scanning: to

Developed by Anne Collins, AC Ag Consulting and Daniel Schuppan, Nutrien Ag Solutions as part of the MLA funded Producer Demonstration Site (PDS)
 L PDS 2017 "Maximising Dorper Reproductive Performance"
 © January 2023
 For technical assistance email Anne Collins: mailto:acagconsulting@bigpond.com

Snip saved to clipboard
 Select here to mark up and share the image

B25 | 90%

1 Record Annual Pregnancy Scanning Results by Paddock
2 Year:

Date	Mob	Scan 0		Scan 1		Scan 2		Total Foetuses Scanned	Total Ewes Scanned	Scan Percentage
		Number	%	Number	%	Number	%			
TOTAL		12	4.9%	120	49.4%	111	45.7%	342	243	140.7%

24 Foetus Survival Targets (%)
25 Singles: = 108
26 Twins: = 178
27 Target Lamb Number:
28 Target as a Percentage: (of total scanned ewes)

A5 | Wilga

1 Record Lamb Marking Result by Paddock when Singles and Multiples are Managed Separately
2 Year:

Paddock	Type	Ewes In	Ewes Out	Ewe Mortality	Potential Lambs	Marked	% Marked to Ewes In	Foetal Survival	Dry Ewes at Marking	Dry Ewe Percent
TOTAL		120	117	2.5%	120	105	87.5%	87.5%	15	12.8%
Whole of Flock		231	223	3.5%	342	267	115.6%	78.1%	39	17.5%

32 Marked Lambs to Total Ewes Scanned:

The number of single lambs marked plus dry ewes is greater than the total number of ewes. Possibly 3 sets twins present

8.15 Appendix 15: Feed Analysis Reports

8.15.1 Pasture hay



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Feed Analysis Report

Final Report

Job No: J2102-1000
Date Issued: 19-Feb-2021
Report Number: 83105

Attention: Anne Collins
Client: AC Ag Consulting
Address: PO Box 354
Quom SA 5433

Purchase Order: None
Date Sampled: 03-Feb-2021
Date Received: 09-Feb-2021

The following sample was analysed:

Sample ID

S2021-12222	Your Reference	Pasture Hay
	Sample Type	Pasture Fresh
	Description	Polkinghome

Analysis of this sample conducted on 09-Feb-2021

Analysis Results

	Determinant	Result Value
NIR Package (FT003)		
S2021-12222	Dry Matter	87.5 %
S2021-12222	Moisture	12.5 %
S2021-12222	Crude Protein	7.8 % of dry matter
S2021-12222	Acid Detergent Fibre	51.6 % of dry matter
S2021-12222	Neutral Detergent Fibre	76.4 % of dry matter
S2021-12222	Digestibility (DMD)	27.5 % of dry matter
S2021-12222	Digestibility (DOMD) (Calculated)	30.1 % of dry matter
S2021-12222	Est. Metabolisable Energy (Calculated)	3.1 MJ/kg DM
S2021-12222	Fat	2.4 % of dry matter
S2021-12222	Ash	<1.0 % of dry matter

The sample(s) referred to in this report were analysed for the following determinant(s):

Analysis	Method	Laboratory
NIR Package	FT/003	Feed & Fodder Testing Laboratory

Note: This report is not to be reproduced except in full.

Comments: Metabolisable Energy has been calculated using the following equation:
 $ME = (0.203 \times \text{DOMD}\%) - 3.001$

The results in this report were authorised by:

Name	Title
Joanne Warnes	Client Liaison FeedTest



FEEDTEST

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Feed Analysis Report

Final Report

Job No: J2102-1000
Date Issued: 19-Feb-2021
Report Number: 83105

Attention: Anne Collins
Client: AC Ag Consulting
Address: PO Box 354
Quom SA 5433

Purchase Order: None
Date Sampled: 03-Feb-2021
Date Received: 09-Feb-2021

The following sample was analysed:

Sample ID

S2021-12223 Your Reference Barley Hay
Sample Type Hay cereal
Description Polkinghome

Analysis of this sample conducted on 09-Feb-2021

Analysis Results

	Determinant	Result Value
NIR Package (FT003)		
S2021-12223	Dry Matter	87.5 %
S2021-12223	Moisture	12.5 %
S2021-12223	Crude Protein	12.5 % of dry matter
S2021-12223	Acid Detergent Fibre	28.6 % of dry matter
S2021-12223	Neutral Detergent Fibre	60.4 % of dry matter
S2021-12223	Digestibility (DMD)	63.0 % of dry matter
S2021-12223	Digestibility (DOMD) (Calculated)	60.2 % of dry matter
S2021-12223	Est. Metabolisable Energy (Calculated)	9.2 MJ/kg DM
S2021-12223	Water Soluble Carbohydrates	13.1 % of dry matter
S2021-12223	Fat	3.1 % of dry matter
S2021-12223	Ash	2.6 % of dry matter

The sample(s) referred to in this report were analysed for the following determinant(s):

Analysis	Method	Laboratory
NIR Package	FT/003	Feed & Fodder Testing Laboratory

Note: This report is not to be reproduced except in full.

Comments: Metabolisable Energy has been calculated using the following equation:

$$ME = (0.203 \times \text{DOMD}\%) - 3.001$$

AFIA Grade for cereal hay + silage : B1

The results in this report were authorised by:

Name	Title
Joanne Warnes	Client Liaison FeedTest

Feed Analysis Report

Final Report

Job No: J2102-1000
Date Issued: 19-Feb-2021
Report Number: 83105

Attention: Anne Collins
Client: AC Ag Consulting
Address: PO Box 354
 Quom SA 5433

Purchase Order: None
Date Sampled: 03-Feb-2021
Date Received: 09-Feb-2021

The following sample was analysed:

Sample ID

S2021-12224 Your Reference Oats
 Sample Type Oats
 Description Polkinghome

Analysis of this sample conducted between 09-Feb-2021 and 11-Feb-2021

Analysis Results

	Determinant	Result Value
NIR Package (FT003)		
S2021-12224	Dry Matter	89.9 %
S2021-12224	Molsture	10.1 %
S2021-12224	Crude Protein	13.4 % of dry matter
S2021-12224	Acid Detergent Fibre	9.1 % of dry matter
S2021-12224	Neutral Detergent Fibre	27.3 % of dry matter
S2021-12224	Digestibility (DMD)	79.8 % of dry matter
S2021-12224	Digestibility (DOMD) (Calculated)	78.8 % of dry matter
S2021-12224	Est. Metabolisable Energy (Calculated)	13.5 MJ/kg DM
S2021-12224	Fat	7.3 % of dry matter
S2021-12224	Ash	<1.0 % of dry matter
S2021-12224	Starch	59.8 % of dry matter
S2021-12224	Sugars	1.4 % of dry matter
Bulk Density (TP/016)		
S2021-12224	Bulk Density	54.2 kg/hL

The sample(s) referred to in this report were analysed for the following determinant(s):

Analysis	Method	Laboratory
NIR Package	FT/003	Feed & Fodder Testing Laboratory
Bulk Density	TP/016	Quality and Milling Laboratory

Note: This report is not to be reproduced except in full.

Comments: Metabolisable Energy has been calculated using the following equation:
 $ME = 0.858 + (0.138 \times DOMD\%) + (0.272 \times Fat\%)$



FEEDTEST

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Feed Analysis Report

Final Report

Job No: J2102-1000
Date Issued: 19-Feb-2021
Report Number: 83105

Attention: Anne Collins
Client: AC Ag Consulting
Address: PO Box 354
Quom SA 5433

Purchase Order: None
Date Sampled: 03-Feb-2021
Date Received: 09-Feb-2021

The results in this report were authorised by:

Name	Title
Joanne Warnes	Client Liaison FeedTest

Feed Analysis Report

Final Report

Job No: J2102-1000
Date Issued: 19-Feb-2021
Report Number: 83105

Attention: Anne Collins
Client: AC Ag Consulting
Address: PO Box 354
 Quom SA 5433

Purchase Order: None
Date Sampled: 03-Feb-2021
Date Received: 09-Feb-2021

The following sample was analysed:

Sample ID	Your Reference	Barley
S2021-12225	Sample Type	Barley
	Description	Polkinghome

Analysis of this sample conducted between 09-Feb-2021 and 11-Feb-2021

Analysis Results

Determinant	Result Value
NIR Package (FT003)	
S2021-12225 Dry Matter	90.4 %
S2021-12225 Moisture	9.6 %
S2021-12225 Crude Protein	14.5 % of dry matter
S2021-12225 Acid Detergent Fibre	7.2 % of dry matter
S2021-12225 Neutral Detergent Fibre	16.4 % of dry matter
S2021-12225 Digestibility (DMD)	86.1 % of dry matter
S2021-12225 Digestibility (DOMD) (Calculated)	84.8 % of dry matter
S2021-12225 Est. Metabolisable Energy (Calculated)	13.1 MJ/kg DM
S2021-12225 Ash	2.4 % of dry matter
S2021-12225 Starch	63.1 % of dry matter
S2021-12225 Sugars	1.3 % of dry matter
Bulk Density (TP/016)	
S2021-12225 Bulk Density	65.1 kg/hL

The sample(s) referred to in this report were analysed for the following determinant(s):

Analysis	Method	Laboratory
NIR Package	FT/003	Feed & Fodder Testing Laboratory
Bulk Density	TP/016	Quality and Milling Laboratory

Note: This report is not to be reproduced except in full.

Comments: Metabolisable Energy has been calculated using the following equation:
 $ME = 0.858 + (0.138 \times \text{DOMD}\%) + (0.272 \times \text{Fat}\%)$



FEEDTEST

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Feed Analysis Report

Final Report

Job No: J2102-1000
Date Issued: 19-Feb-2021
Report Number: 83105

Attention: Anne Collins
Client: AC Ag Consulting
Address: PO Box 354
Quorn SA 5433

Purchase Order: None
Date Sampled: 03-Feb-2021
Date Received: 09-Feb-2021

The results in this report were authorised by:

Name	Title
Joanne Warnes	Client Liaison FeedTest

Feed Analysis Report

Final Report

Job No: J2102-1000
 Date Issued: 19-Feb-2021
 Report Number: 83105

Attention: Anne Collins
 Client: AC Ag Consulting
 Address: PO Box 354
 Quorn SA 5433

Purchase Order: None
 Date Sampled: 03-Feb-2021
 Date Received: 09-Feb-2021

The following sample was analysed:

Sample ID

S2021-12226 Your Reference Peas
 Sample Type Field Peas
 Description Polkinghome

Analysis of this sample conducted on 11-Feb-2021

Analysis Results

Determinant	Result Value
NIR Package (FT003)	
S2021-12226 Dry Matter	88.9 %
S2021-12226 Moisture	11.1 %
S2021-12226 Crude Protein	23.3 % of dry matter
S2021-12226 Digestibility (DMD)	93.7 % of dry matter
S2021-12226 Digestibility (DOMD) (Calculated)	92.2 % of dry matter
S2021-12226 Est. Metabolisable Energy (Calculated)	13.4 MJ/kg DM
S2021-12226 Fat	<1.0 % of dry matter
S2021-12226 Ash	4.2 % of dry matter
Acid Detergent Fibre (FT005)	
S2021-12226 Acid Detergent Fibre	7.7 % of dry matter
Neutral Detergent Fibre (FT006)	
S2021-12226 Neutral Detergent Fibre	15.1 % of dry matter

The sample(s) referred to in this report were analysed for the following determinant(s):

Analysis	Method	Laboratory
NIR Package	FT/003	Feed & Fodder Testing Laboratory
Acid Detergent Fibre	FT/005	Quality and Milling Laboratory
Neutral Detergent Fibre	FT/006	Quality and Milling Laboratory

Note: This report is not to be reproduced except in full.

The results in this report were authorised by:

Name Title
 Joanne Warnes Client Liaison FeedTest



8.15.2 Rye Hay



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Feed Analysis Report

Final Report

Job No: J2106-0098
Date Issued: 04-Jun-2021
Report Number: 100423

Attention: Anne Collins
Client: AC Ag Consulting
Address: PO Box 354
Quom SA 5433

Purchase Order: None
Date Sampled: 26-May-2021
Date Received: 02-Jun-2021

The following sample was analysed:

Sample ID

S2021-47390 Your Reference Rye Hay (2020)
Sample Type Hay

Analysis of this sample conducted on 02-Jun-2021

Analysis Results

	Determinant	Result Value
NIR Package (FT003)		
S2021-47390	Dry Matter	91.0 %
S2021-47390	Moisture	9.0 %
S2021-47390	Crude Protein	8.8 % of dry matter
S2021-47390	Acid Detergent Fibre	34.6 % of dry matter
S2021-47390	Neutral Detergent Fibre	65.5 % of dry matter
S2021-47390	Digestibility (DMD)	55.2 % of dry matter
S2021-47390	Digestibility (DOMD) (Calculated)	53.6 % of dry matter
S2021-47390	Est. Metabolisable Energy (Calculated)	7.9 MJ/kg DM
S2021-47390	Water Soluble Carbohydrates	9.3 % of dry matter
S2021-47390	Fat	2.8 % of dry matter
S2021-47390	Ash	6.2 % of dry matter

The sample(s) referred to in this report were analysed for the following determinant(s):

Analysis	Method	Laboratory
NIR Package	FT/003	Feed & Fodder Testing Laboratory

Note: This report is not to be reproduced except in full.

Comments: Metabolisable Energy has been calculated using the following equation:

$$ME = (0.203 \times \text{DOMD}\%) - 3.001$$

AFIA Grade for legume and pasture hay + silage : C3

The results in this report were authorised by:

Name Title
Joanne Wames Client Liaison FeedTest

Feed Analysis Report

Final Report

Job No: J2106-0098
 Date Issued: 04-Jun-2021
 Report Number: 100423

Attention: Anne Collins
 Client: AC Ag Consulting
 Address: PO Box 354
 Quorn SA 5433

Purchase Order: None
 Date Sampled: 26-May-2021
 Date Received: 02-Jun-2021

The following sample was analysed:

Sample ID

S2021-47391 Your Reference Hoffricter Oaten Hay (2020)
 Sample Type Oaten Hay

Analysis of this sample conducted on 02-Jun-2021

Analysis Results

	Determinant	Result Value
NIR Package (FT003)		
S2021-47391	Dry Matter	89.3 %
S2021-47391	Moisture	10.7 %
S2021-47391	Crude Protein	9.9 % of dry matter
S2021-47391	Acid Detergent Fibre	28.1 % of dry matter
S2021-47391	Neutral Detergent Fibre	56.0 % of dry matter
S2021-47391	Digestibility (DMD)	65.4 % of dry matter
S2021-47391	Digestibility (DOMD) (Calculated)	62.3 % of dry matter
S2021-47391	Est. Metabolisable Energy (Calculated)	9.6 MJ/kg DM
S2021-47391	Water Soluble Carbohydrates	19.8 % of dry matter
S2021-47391	Fat	2.6 % of dry matter
S2021-47391	Ash	4.3 % of dry matter

The sample(s) referred to in this report were analysed for the following determinant(s):

Analysis	Method	Laboratory
NIR Package	FT/003	Feed & Fodder Testing Laboratory

Note: This report is not to be reproduced except in full.

Comments: Metabolisable Energy has been calculated using the following equation:

$$ME = (0.203 \times \text{DOMD}\%) - 3.001$$

AFIA Grade for cereal hay + silage : A2

The results in this report were authorised by:

Name	Title
Joanne Wames	Client Liaison FeedTest



8.16 Appendix 16: Campylobacter Testing Results

ACE Laboratory Services

ABN 82115191056
12 Gildea Lane, Bendigo East, VIC 3550
PO Box 6101 White Hills, Vic 3550
Phone: (03) 5443 9665 **Fax:** (03) 5443 9669
email: info@acelabservices.com.au

RESULT SHEET

To: Felicity Wills

FROM:
ACE Laboratory Services

LAB REFERENCE NUMBER:
08564/21

SUBMITTER: Felicity Wills
Coopers Animal Health
Locked Bag 2234, Nth Ryde NSW 1670

DATE COLLECTED: 22/09/21
DATE RECEIVED: 28/09/21

SUBMITTER REFERENCE:
[REDACTED]
Denial Bay Rd, Denial Bay SA 5690

Date of interim serology report

Date of final report: 01/10/21

8 ovine blood samples received

Results

08564/21 MSD - [REDACTED]

Lab No	ID	Age	<i>C. fetus fetus</i> Agglutination Test	<i>C. jejuni</i> Agglutination Test
			Titre	Titre
1	Watraba	Mature	1:160	1:40
2	Watraba	Mature	1:40	1:20
3	Watraba	Mature	1:160	1:40
4	Watraba	Mature	1:320	1:20
5	Watraba	Mature	1:160	<1:10
6	Watraba	Mature	1:320	<1:10
7	Watraba	Mature	1:160	1:20
8	Watraba	Mature	1:40	1:40

Report authorised by Natalie Winnell – Senior Scientist

ACE Laboratory Services actively seeks and welcomes your feedback, phone (03) 5443 9665

8.17 Appendix 17: Rainfall at Ceduna 2020-2022

The rainfall for the three years of the project compared with the long-term average for the Ceduna Airport weather station are shown below.

Figure 14: Monthly rainfall at Ceduna for 2020 compared to the long-term average

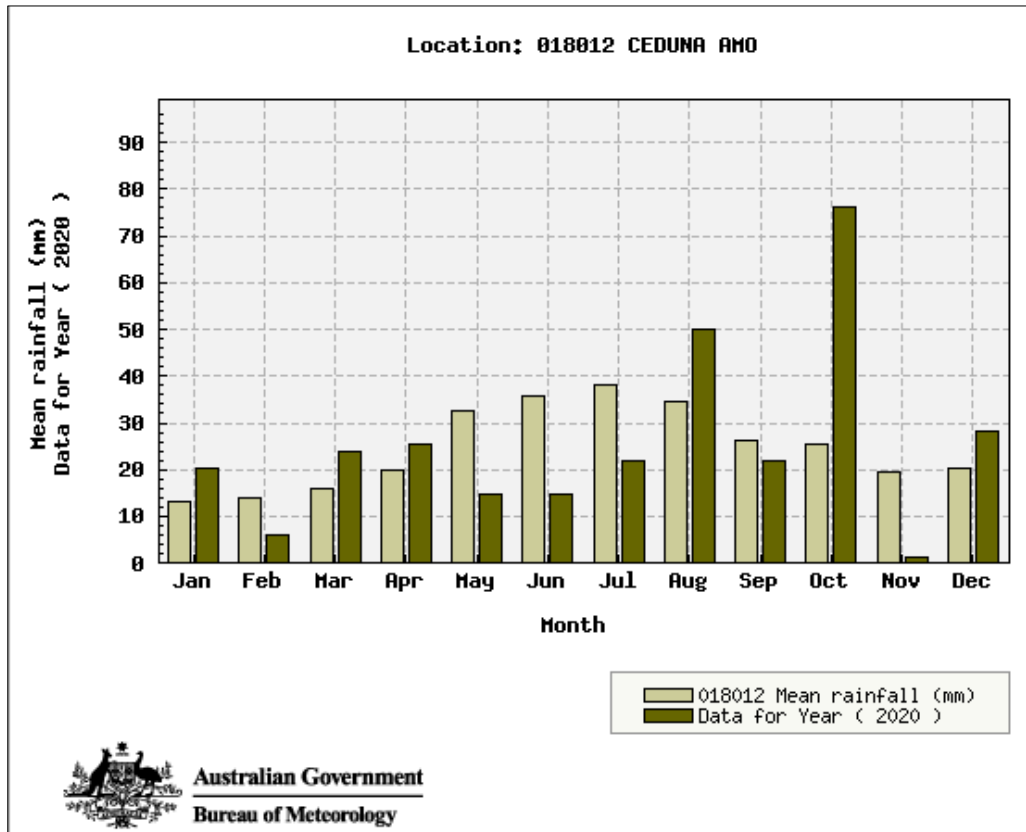


Figure 15: Monthly rainfall at Ceduna for 2021 compared to the long-term average

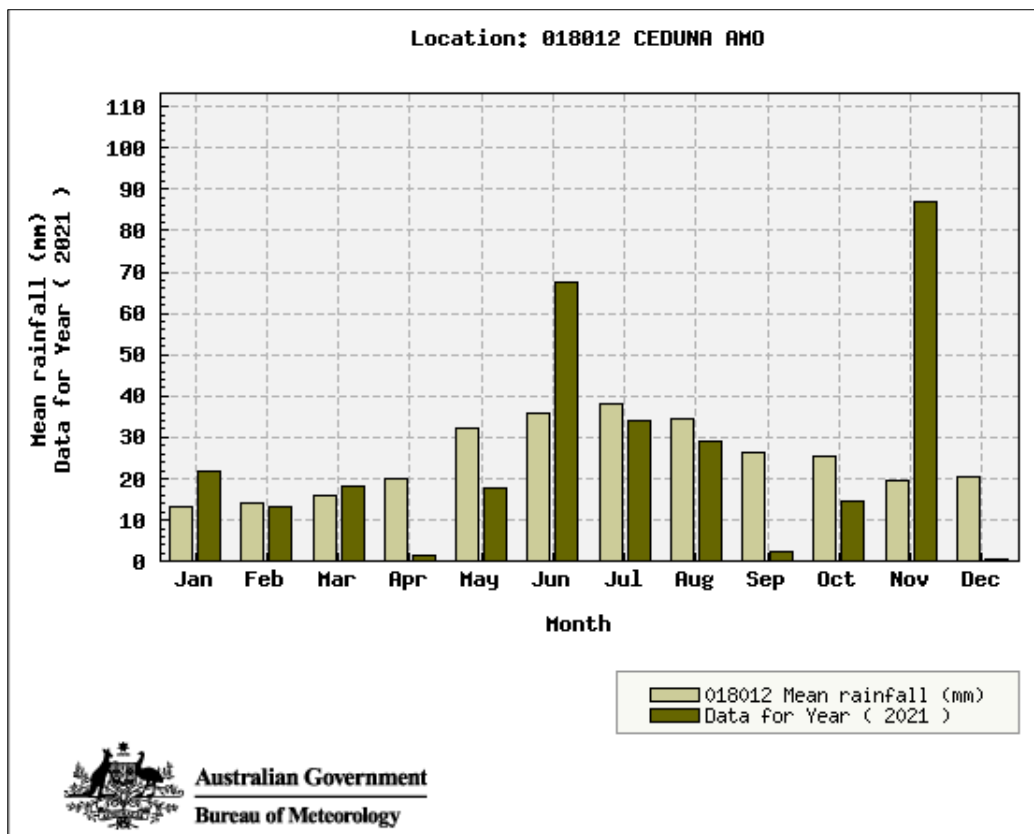
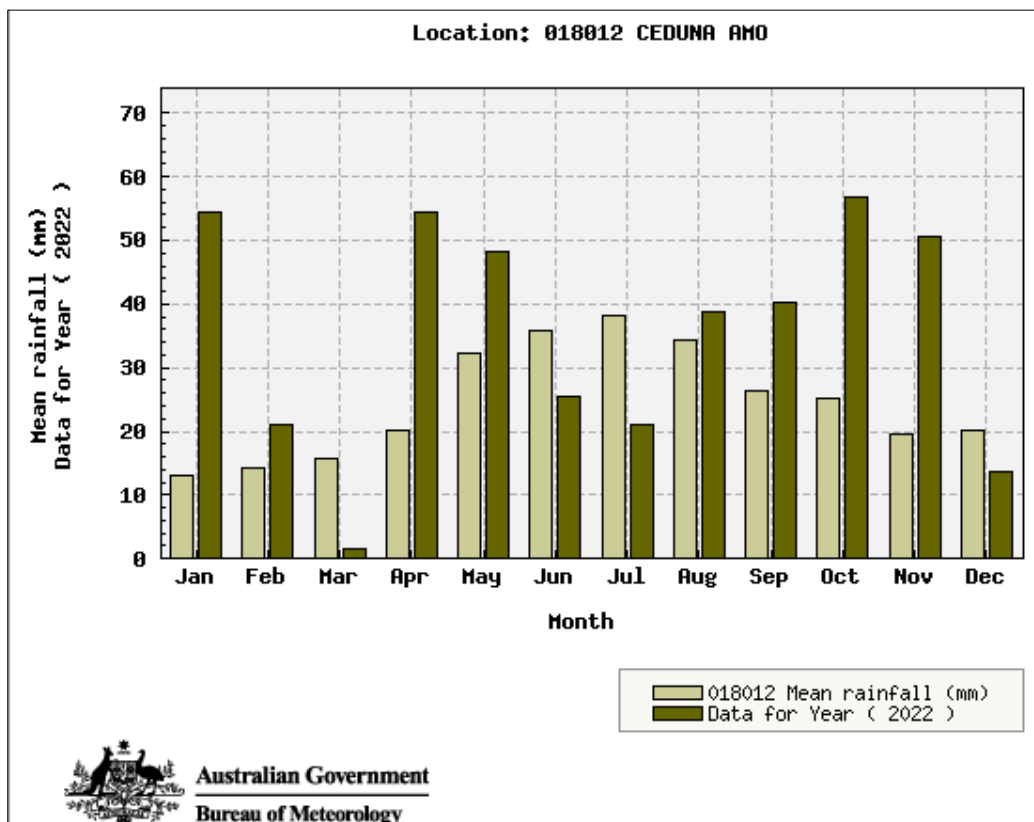


Figure 16: Monthly rainfall at Ceduna for 2022 compared to the long-term average



8.18 Appendix 18: Media Articles



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