Final report

PDS: Assessing Economic Benefits of Confinement Feeding

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Abstract

Late winter breaks are becoming more frequent in the Albany region of Western Australia and stubbles are depleted before the next growing season starts. As such, livestock producers identify the importance in providing feed for livestock in late autumn and immediately after the season break. Confinement feeding has allowed producers to maintain ewe condition score by reducing energy expenditure and allowed pasture growth to be maximized. From this project, economically, whole farm programs have been proven to be benefited when sheep are confined before and during the break of season. Over two years, a core group of eleven producers was established, of which six hosted confinement feeding producer demonstration sites (PDSs). Producer hosts worked with Stirlings to Coast Farmers to closely record costs, measure pasture growth and monitor each individual confinement feeding system to establish whether confinement feeding was economically beneficial. Confinement feeding was profitable in all six cases, varying from $6,500 to $25,300 profit in the year it was implemented, analysis not including any infrastructure costs. The project showed that confinement feeding benefits our industry in many ways; the cropping enterprise, as confinement allows cropping paddocks to be destocked earlier, the livestock enterprise, as confinement allows stock to be monitored more closely and hence managed more optimally, and paddock groundcover can be maintained, reducing erosion, and maximising rain infiltration.

Executive summary

Background

The purpose of this Producer Demonstration Site (PDS) was to demonstrate a range of sheep confinement feeding systems that optimise sheep management and supplementary feeding programs, by achieving appropriate pregnant ewe condition scores and increasing food on offer (FOO) in deferred pastures, for a profitable and sustainable sheep enterprise. The condition scores measured were used to show the sheep were not declining in confinement, and pasture cuts were used to demonstrate how pastures that were allowed to establish produced more feed, other than those immediately stocked at the break of season.

The target audience was sheep producers in the Great Southern region of Western Australia. Outcomes will also have relevance to producers in the sheep/wheat belt of WA and other regions which experience a significant feed gap and would normally hand feed their sheep through this period. We have shared learnings from the project with groups such as MLA, Western Australia Livestock Research Council (WALRC) and other grower groups to expand the reach of project findings to sheep producers in other regions.

Objectives

The objectives of this confinement feeding project included:

- 6 site hosts successfully demonstrated the use of confinement feeding on a portion of their flock.
- Each member of the core producer group reported an increase in confidence, knowledge and skills relating to confinement feeding practices due to workshops, field days and peer to peer learning.
- 70% of observer producers improved their knowledge of and confidence in the benefits and strategies around confinement feeding.

Methodology

Eleven Stirling's to Coast Farmer's members being selected as core producers, in which six held confinement feedings sites over the two years from 2021 to 2023.

The methodology included data collection on the following:

- Feed tests for ration determination were taken prior to sheep entering confinement feeding.
- Pasture cuts, two timings - prior to confinement and on release of sheep out of confinement.
- Stocking density, condition scores, ration type, pen sizes, shade type, feeding schedule and feeding method.
- Animal deaths, treatments, or health issues during and post confinement.

Economic analysis and case studies to determine the economic benefits of confinement feeding.

Producer entry and exit surveys.

Numerous field days, workshops, and discussions.

Results/key findings

The demonstration site outcomes

- The economic value of confinement feeding is significantly linked to autumn and winter growing conditions.
- Confinement feeding was profitable in all six cases.
- Pasture deferment makes up >95% of the economic value of confinement feeding.
- Confinement feeding before the break of season is less profitable because pasture is not being deferred.
- The value of confinement feeding for a producer's enterprise is primarily due to reduced labour and costs of supplementary feeding, reduced supplement waste, increased energy efficiency of stock and importantly, increased pasture production due to deferring.
- The project showcased a variation of vastly different confinement feeding set-ups which all proved to be profitable.

Cost benefit analysis and/or economic evaluation

- All six confinement feeding systems proved to be economically beneficial to the producer's farming enterprise.
- The gross margin increase of all six PDS's varied between $6,585 to $25,300 per year.
- Pasture deferment value of the six hosts ranged from $19,034 to $126,797 per year.
- Supplementary feed costs varied from $0.00 to $102,300 per year.
- The economic value of confinement feeding varies due to external market and climate conditions, and internal management practices including: time of lambing, stocking rate, pasture area, grazing management prior to adopting confinement feeding, confinement set up and confinement period.

Extension and communication

Many extension and communication activities were completed throughout the life of this PDS.

1. Three field days and three workshops completed with discussion carried out at host farms.
2. Completion of a case study and two short videos.
3. Three newsletter articles and yearly trial review articles for the life of the project.
4. Fourteen social media posts.
5. There were eleven core producers involved with the project and over 250 observers were reached through extension and communication activities.

To review full extension and communication activities review appendix 9.1-9.4.

Monitoring and evaluation

A monitoring, evaluation and reporting (MER) plan was created to include all inputs and outputs expected by the PDS. As a minimum, monitoring and evaluation included:

- Clear identification of practices and metrics being demonstrated and measured
- The collection of data on producer numbers and animals, and area potentially impacted by the project

- Pre project surveys of producers to benchmark current knowledge and skills in relation to the subject and to benchmark current practices in relation to the subject
- Post projects surveys of producers to enable assessment of changes in reactions (perceptions, enthusiasm etc.) as a result of the project, knowledge, attitudes, skills and aspirations and practices.

This PDS would demonstrates the benefits of confinement feeding to defer pastures and achieve suitable ewe condition scores with optimum nutritional standards. This was measured through:

- An economic analysis of rations
- A measure of additional Food on Offer (FOO) produced in deferred pasture paddocks
- Measuring and monitoring ewe condition scores
- Nutritional analysis of rations

Benefits to industry

The PDS results prove that confinement feeding can benefit our industry in many ways.

1. Even though many producers have varied confinement feeding systems/sets-ups and producer strategies, confinement feeding can continue to pay off.
2. Confinement feeding allows sheep condition and feed intake to be closely monitored, with better ease and time management across various producer systems.
3. Grazing pressures for farmers are decreased when confinement systems are put into place.
4. Confinement feeding increases flexibility to cropping operations for mixed enterprise farmers.
5. Confinement feeding has the ability to either maintain or increase ewe survival and thrift.

Future research and recommendations

Further recording of actual liveweight data of sheep in confinement compared to sheep not in confinement could help in further demonstrating the economic benefits of confinement feeding. In this PDS project, liveweight data was not collected, only an average condition score for those in confinement. It was assumed that the stock that were not confined were following the same condition score gains as those in confinement, however, this was not measured as liveweight in either group of stock.

PDS key data summary table

Project Aim:
The purpose of this Producer Demonstration Site (PDS) is to demonstrate a range of sheep confinement feeding systems that optimise sheep management and supplementary feeding programs, by achieving appropriate pregnant ewe condition scores and increasing FOO in deferred pastures, for a profitable and sustainable sheep enterprise.

	Comments	Sheep	Unit
Production efficiency benefit (impact)			
Pasture productivity – kg DM/ha		64-1507	Kg DM/ha
Labour efficiency		3.75-24	Hrs/week
Mortality rate (%)		0– 1	%
Feed costs $/head/day		$0.20 - $0.81	$/head/day
Reduction in expenditure Reduction in labour i.e. DSE/FTE, LSU/FTE, AE/FTE;	reduction in labour @$40/hr inc. super and workers compensation	$600-$4,800	$ over each total confinement period
Increase in income	Varied from $5.62/ha to $30.00/ha averaging $14.09/ha	$14.09	/ha
Additional costs (to achieve benefits)		$0.00	/ha
Net $ benefit (impact)		**$0.00**	**/ha**
Number of core participants engaged in project		11	Producers
Number of observer participants engaged in project		15 + 235 through wide extension and communications	producers
Core group no. ha		45931	hectares
Observer group no. ha		40840	hectares
Core group no. sheep		98400	hd sheep
Observer group no. sheep		84730	hd sheep
% change in knowledge & skill– core		Pre 40% Post 54% Increase by 14%	
% change in confidence – core		Pre 59.5% Post 81% Increase by 21.5%	
% change in knowledge & skill – observer		Pre 37% Post 50% Increase by 13%	
% change in confidence – observer		Pre 56% Post 88% Increase by 32%	
% of total ha managed that the benefit applies to	*E.g. % of hectares which are deferred pastures hectares in producers practice*	35%	
Key impact data			

Gross Margin / Ha	**$5.62-$30.00/ha**

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1. Background

Due to the increasing frequency of late winter breaks in the Albany region of Western Australia, mixed enterprise producers in our region find that their crop stubbles are becoming depleted before the season starts. Our producer members have identified the importance of providing feed for livestock in late autumn and immediately after the seasonal break. Confinement feeding allows producers to maintain ewe condition score while pasture growth is maximised early in the season. Extra feed is often supplied to sheep as trail-fed grain in paddocks. Ewes are usually in varying stages of pregnancy at this time. Confinement feeding (also referred to as containment areas/feeding or drought lots) aids producers to optimise ewe condition score by reducing their energy expenditure spent foraging.

Confinement feeding rations are more accurate, and confinement feeding reduces labour handfeeding, and enables rested pastures to accumulate greater biomass before grazing. Annual pastures trying to germinate at the start of the growing season achieve better growth and density by not having grazing pressure applied at this critical growth and establishment stage. All livestock producers are affected by late seasonal breaks and often struggle to get annual pastures established, particularly mixed livestock and cropping producers. Confinement feeding removes the grazing pressure (sheep) for an extended period to aid in pasture growth and establishment and frees up cropping paddocks for timely seeding.

1.1 Impact on producers and the industry

There are few scientifically supported reports on the economic value of confinement feeding. Confinement feeding systems and the producer's strategies are highly variable. In Dr Susan Robertson's review "Optimising Ewe Reproductive Performance in Containment Areas" (2020), Dr Robertson comments that, despite evidence that containment feeding should improve lamb marking rates, this is not always the case, and the reasons why are unclear (Robertson 2020). Body condition score is an indicator of long-term nutritional status (Jefferies 1961) and has close ties to reproductive performance at all stages. Confinement feeding where condition and feed intake can be closely monitored and regulated should increase lamb marking rates. Dr Robertson's report mentioned that containment feeding should enable producers to maintain stock numbers through the autumn feed gap period, with frequent reference to the associated value of taking sheep off paddocks to protect pastures and minimise soil erosion (Robertson 2020). Some of our "first adopter" producers have estimated they would need to confinement feed four out of every six years due to the drought-like conditions experienced in our Mediterranean environment. The Standing Committee on Agriculture, (SCA), 1990 reported that confining animals to small areas reduces the energy expended by an estimated 20%. As such, as animal should require 20% less energy to maintain its condition in a confined space instead of running in a paddock (SCA 1990).

1.2 Impact on producers in the Albany Port Zone

Stirlings to Coast Farmers producer members have identified interest in the other benefits confinement feeding could offer, such as maintaining optimum ewe condition scores and thus lamb survival and thrift. Other producers reported interest in understanding the reduced time and travel spent trail feeding in paddocks, improved pasture growth rates and increased flexibility to cropping operations. Increased flexibility is crucial for mixed farmers not wanting to compromise on their sheep or cropping programs.

Some of our "first adopter" producers have estimated they would need to confinement feed four out of every six years due to the drought-like conditions experienced in our Mediterranean environment.

2. Objectives

By the completion of the project, in the southern coastal region of Western Australia:

1. 6 site hosts will have demonstrated successful confinement feeding of a portion of their flock by
    a) Having pregnant ewes leave confinement in a suitable condition score for their pregnancy status (Condition Score- 3 for singles, 3.5 for twins and 3 for dries)
    b) Increased pasture production by deferring grazing through confinement feeding of stock, the amount of which will be seasonally dependent.

Objective 1a & 1b successfully achieved.

2. Carry out three workshops across the two years for core producer group members to discuss nutrition, economics, experiences, and feedback.

Objective 2 successfully achieved.

3. Host a minimum of one open field trip to a confinement feeding PDS site, in addition to two site visits for core producer group members to showcase the sites and encourage peer to peer learning and discussions.

Objective 3 successfully achieved.

4. 6 site hosts will have a nutritional and economic analysis performed on their ration.

Objective 4 successfully achieved.

5. 10 out of 10 members of a core producer group will report an increase in confidence, knowledge and skills relating to confinement feeding practices due to workshops, field days and peer to peer learning.

Objective 5 successfully achieved throughout the project, although we didn't get all 10 core producers to complete post project surveys to measure their increase in knowledge and confidence and skills of the entire project, all core producers noted that an increase in confidence, knowledge ad skill was recognised in the workshop evaluation forms after all workshops/field days.

6. 70% of observer producers will have improved their knowledge of and confidence in the benefits and strategies around confinement feeding.

Objective 6 successfully achieved throughout the project, although we didn't get 70% of observers to complete post project surveys to measure their improved knowledge and confidence of the entire project, over 70% of observers' improvement in confidence and knowledge was recognised in the workshop evaluation forms after all workshops/field days.

3. Demonstration Site Design

3.1 Methodology

A core producer group was created, consisting of 11 SCF producer members who had already or were interested in developing a confinement feeding program for their sheep production system. Three core producers were asked to host PDS's in each year of the project, with six sites across the two years (Table 1).

Table 1. Details of the six producer demonstration sites

	Location	PDS year	Confinement feeding set up	Number of sheep confined	Period of confinement
Jeremy Walker	Green Range, WA	2022	Communal feed troughs	4179	41 days
Clare Webster	Tenterden, WA	2022	Trail feeding	2100	56 days
Jason Griffiths	Gairdner, WA	2022	Fence mounted feed troughs	600 1400	25 days 43 days
Mark Zadow	Kojonup, WA	2023	Trail feeding	7000	76 days
Greg Hyde	Ongerup, WA	2023	Communal feed troughs	1500	28 days
John Howard	South Stirlings, WA	2023	Fence mounted feed troughs	1740	19 days

Each of the properties had different methods of confinement and utilised different rations to feed their sheep.

Jeremy Walker runs a 2400ha mixed farm operation, running a merino flock. 4179 ewes were confined for 41 days, March-mid May 2022. Feeding a full mixed ration and ad-lib hay, three times a week into a communal feed trough pen.

Clare Webster has a 2500ha mixed farm operation, running a self-replacing merino flock. 2100 head were confined for 56 days, April-mid-June and another 2277 head were confined for 76 days, April to end of June 2022. Ewes were trail feed a lupin-barley-oats mix that had been treated with Home n' Dry alkasystems product and ad-lib hay, three times a week.

Jason Griffiths runs a 7500ha mixed farm operation, running a self-replacing merino flock. 600 head were confined for 25 days and 1400 head were confined for 43 days, from the start of April until mid-May 2022. Feeding a grain mix daily into fence mounted troughs in each pen. Ad-lib straw was given three times a week.

Mark Zadow runs a 1431ha mixed farm operation, running 41% crop with Merino and Dohne flock. 7410 ewes, ewe lambs and wether lambs were confined (all livestock numbers) for 76 days, from mid-April – late-June 2023. Sheep were trail fed barley and lupins three times a week, in addition they added lime and salt mix into half tires and fed barley straw on the ground in each pen once a week.

Greg Hyde runs a 5600ha mixed farm running 73% crop with a self-replacing Merino flock. 1500 ewes were confined for 28 days, from the end of April to end of May 2023. Ewes were fed pellets

into communal troughs twice a day, whilst adding barley straw on the ground to each pen three times a week.

John Howard runs a 4800ha mixed farm operation, running 69% crop with Merino and Dohne flock. 1740 ewes were confined for 19 days, from end of May until mid-June 2023. Ewes were rationed pellets daily, via mounted troughs on each pen. In addition, barley hay and calcium lick blocks were placed on the ground in each pen four times a week.

All producers were supplying water through water troughs in each pen. The confining periods varied mainly due to lambing dates, producer farming schedules (seeding, spreading etc.), and variation of the season between locations.

All information was collected from the host producers by the project facilitator. This included existing confinement feeding setups such as pen size, stocking density and class, shade type, water supply, feeding schedule, ration type and feeding method. The producer hosts decided how many, what kind of sheep, and the duration of confinement.

Hosts supplied an outline of their feed schedule (frequency, type, volume) and a final value of the total feed fed for the confinement period for both the contained and control (if applicable) mobs. Any hay, straw or silage fed was measured on a "number of bales" basis. Hosts feeding through feeders (lick/self/adlib feeders) recorded how much feed was provided through the feeders to give a total weight fed.

At the introduction of sheep to the confinement pens, the PDS host recorded the date, the number of animals, their stage of pregnancy and any treatments given. Hosts also recorded average condition score (CS) of each mob. At least 10% of the mob had their CS assessed to give a mob average condition score. If available, condition scoring was also carried out on a mob of sheep of the same class that grazed paddocks, not confinement fed, to act as the control group.

Hosts and the SCF project facilitator recorded and reported any animal deaths, treatments or health issues that occurred in confinement or in the control mob that was being paddock grazed and fed. Each host had strategies around the removal or monitoring of sick sheep or shy feeders. SCF strongly encouraged producer hosts to follow best practices for biosecurity, animal health, and welfare.

SCF conducted pasture cuts of the paddocks that were set aside for grazing when the sheep were released from confinement. For producers who had confined all their sheep, the first cuts were performed when the producer indicated they would generally have to put sheep on winter grazed pastures if they were not confinement feeding. For those with a control mob, the first cuts were done when the control mob were moved on to their winter grazed pasture paddocks. The second cut was taken as sheep were released from confinement and put onto their winter grazed pasture paddocks.

When the producer was ready to remove sheep from confinement, a minimum of 10% was conditioned scored to give a mob average.

Hosts advised SCF of how they released the sheep onto pasture paddocks (transitional feeding, supplements etc.) and any animal deaths or health issues arising within two weeks of release from confinement, as an indicator of the success of the release/transition period.

3.2 Economic analysis

Data for the PDS was collected from producers by the SCF Project Officer and used by Michael Young at Youngs Farm Analysis to perform the economic analysis.

The analysis used a whole farm economic model to evaluate the profitability of confinement feeding on six mixed sheep and crop farm businesses in Western Australia. The economic analysis provided an understanding of the economics behind confinement feeding strategies and provided an understanding of how factors within the farming system effect the economics of confinement feeding.

Farm data collection was conducted to acquire crucial information about each farm's structure, including pasture area and stocking rate, and to assess its alterations resulting from confinement feeding practices. This data served as the foundation for calculating the additional supplement requirements during confinement (accounting for factors such as waste reduction and the decreased energy needs of livestock in confinement), and labour efficiency gains associated with supplement feeding in confinement versus paddock feeding.

To determine the quantity of extra feed on offer (FOO) at the conclusion of the confinement period, SFC conducted eight repetitions of pre- and post-pasture cuts across two paddocks on each producer's property. For the 2022 analysis, regional expected pasture production data was used to examine the FOO increase for the three producer host sites as there was limited pasture cuts data for this round of analysis.

The economic value of the additional FOO resulting from deferment during the confinement period was determined for each of the case study properties using the advanced whole-farm model known as AFO, Australian Farm Optimising model documentation. This calculation necessitated a comprehensive whole-farm, whole-year feed budget, that considered the biological aspects of pasture growth and quality, as well as livestock energy requirements and farm management, including factors such as stocking rates.

AFO is a whole farm linear programming model that supersedes the popular MIDAS model. The model represents the economic and biological details of a farming system including modules for rotations, crops, pastures, sheep, crop residue, supplementary feeding, machinery, labour and finance. Furthermore, it includes land heterogeneity by considering enterprise rotations on any number of soil classes.

For the analysis, AFO was calibrated to the case study farms where possible, including stocking rate, pasture area, stock genotype and flock structure, confinement time period, time of lambing and supplement fed.

3.3 Extension and communication

As part of the communication and extension component of the project it was proposed that the following be delivered:

Field days:

- annual field walk/site visit to a PDS property for core producers
- one field trip is open to core and observer producers and industry members that visit multiple sites if logistically possible.
- Presentations and discussions as part of SCF field and trial review days

Workshop/s:

- three x workshops for core producers

- One small workshop/meeting for year two site hosts

Video/s:

- Create two short videos to highlight the field walks and to summarise the discussions and experiences of each PDS. Videos to be distributed through social media and SCF website with links to the SCF YouTube channel.

In-depth articles:

- SCF newsletters x2 annually
- Annual trials review booklet articles x2

Case studies:

- A post-project case study featuring PDS hosts- covering site details, feed details, ration cost, extra FOO produced, personal learnings.

Other:

Social Media posts: (minimum)

- 4 Facebook posts annually
- 4 Twitter posts annually
- 1 YouTube video annually
- Text messages sent to all SCF members to advertise open events/ field days related to the PDS, min. 1 per event.

To review full extension and communication activities review appendix 9.1-9.4.

3.4 Monitoring and evaluation

As part of the monitoring and evaluation component of the project it was proposed that the following be delivered, as a minimum including:

- Clear identification of practices and metrics being demonstrated and measured
- Collection of data on producer numbers and animals, and area potentially impacted by the project
- Pre project surveys of producers to benchmark current knowledge and skills in relation to the subject
- Benchmark current practices in relation to the subject
- Post project surveys of producers to enable assessment of changes in:
- Reactions (perceptions, enthusiasm etc.) as a result of the project
- Knowledge, Attitudes, Skills and Aspirations
- Practices
- Extent of and impact from communication / extension activities outside of the PDS project participants

4. Results

4.1 Demonstration site results

The following is a summary of the demonstration site results for each of the six host producers. This includes feed test results and various performance metrics i.e., condition scores.

4.1.1 Summary of Feed test Results

Table 2. Barley straw feed test summary

	Crude protein	Digestibility (DOMD)	ME
Walker Straw	2.60%	42.50%	5.6MJ/kg
Webster old straw	2.90%	39.30%	5.0MJ/kg
Griffiths straw	4.30%	45.70%	6.3MJ/kg
Hyde straw	5.50%	26.10%	2.9MJ/kg
Zadow straw	1.90%	39.20%	5.1MJ/kg

As outlined in the barely straw results (Table 2) Griffiths straw was good quality with crude protein, digestibility and metabolisable energy (ME), all higher than industry average. Hyde ME and digestibility were on the lower side, possibly because the ash content was higher. This indicates there may have been more contamination in the straw, i.e., soil either when cutting/baling or sampling. Crude protein (CP)% for Zadow's is low but this is not uncommon. Other values were as expected for barley straw.

Table 3. Pellet feed test summary

	Crude protein	Digestibility (DOMD)	ME
Howard - finishing pellet	14.00%	71.70%	11.9MJ/kg
Hyde pellets	15.10%	73.10%	12.0MJ/kg

Pellet results are as expected given the analysis of these products provided by the company (Table 3).

Table 4. Pasture hay feed test summary

	Crude protein	Digestibility (DOMD)	ME
Webster	11.90%	60.60%	9.3MJ/kg
Griffiths Ryegrass	6.70%	54.70%	8.1MJ/kg
Griffiths Wimmera	6.20%	54.50%	8.1MJ/kg
Griffiths pasture mix	11.10%	58.60%	8.9MJ/kg

For the pasture hay feed test results (Table 4) Webster's pasture hay results were all higher than industry average, however there is significant range in crude protein between samples. This is expected due to the variability of pastures grown throughout the Albany Port Zone. Digestibility and ME were all similar.

Table 5. Barley hay feed test summary

	Crude protein	Digestibility (DOMD)	ME
Walker hay @ sheds	6.80%	51.30%	7.4MJ/kg
Walker hay @ 2nd Farm	6.00%	43.80%	5.9MJ/kg
Webster old season	8.60%	62.00%	9.6MJ/kg
Webster new season	5.00%	56.70%	8.5MJ/kg
Griffiths hay	6.20%	52.80%	7.7MJ/kg
Howard hay - 2021 season	2.90%	48.30%	6.7MJ/kg
Howard hay - 2022 season	1.90%	45.20%	6.2MJ/kg

For the barley hay feed test results (Table 5) there was a large range in Crude Protein levels and a large range in digestibility with one sample having lower digestibility and ME than some of the straws. Webster old season barley hay was above industry averages.

Both of Howards hay samples are showing evidence of excess plant maturity when cut. The fibre content of the feed was high by the elevated Neutral Detergent Fibre (NDF) and Acid Detergent Fibre (ADF) percentages. This means the potential daily intake of the feed is lower as it takes longer to digest and clear from the rumen. The excess maturity has resulted in lower-than-average energy, digestibility, and protein content.

Table 6. Lupins feed test summary

	Crude protein	Digestibility (DOMD)	ME
Walker	30.50%	84.50%	14.1MJ/kg
Griffiths	30.70%	85.60%	14.3MJ/kg
Webster 'Home N Dry'	21.60%	86.60%	13.5MJ/kg
Zadow	28.40%	87.60%	14.6MJ/kg

As outlined in the lupin feed test results (Table 6), the lupins had very even samples. Excellent high protein, digestibility and ME throughout. All sites were slightly lower in fats. Zadow has higher than average metabolisable energy levels otherwise the rest of the values are as expected.

Table 7. Barley feed test summary

	Crude protein	Digestibility (DOMD)	ME	Starch
Walker	9.70%	87.40%	13.5MJ/kg	73.40%
Walker 2020	11.70%	86.10%	13.3MJ/kg	69.90%
Griffith 2020	11.10%	85.30%	13.2MJ/kg	70.70%
Griffith 2021	10.40%	86.50%	13.3MJ/kg	74.40%

For the barley feed test summary (Table 7), all sites showed similar protein levels to the oats (see below) and not a huge range. Walker had the lowest protein however higher than industry average of digestibility and ME. ME was very even across the samples. Digestibility results were also very even and there was a slight range in starch levels. Greater starch levels could lead to greater acidosis risk but good feed value once sheep are transitioned onto barley feed.

Table 8. Oats feed test summary

Oats	Crude protein	Digestibility (DOMD)	ME	Starch
Griffiths 2018	11.60%	69.60%	12.2MJ/kg	47.90%
Griffiths 2020	11.00%	67.30%	12.2MJ/kg	44.20%
Walker	8.30%	66.70%	12.2MJ/kg	45.00%
Hyde	9.50%	69.00%	12.6MJ/kg	48.10%
Zadow	7.50%	71.20%	13.3MJ/kg	55.10%

For the oats feed test summary (Table 8), Walker oats were quite low in protein and slightly lower in digestibility but high in fats. ME was the same between all Walker and Griffiths samples. Starch levels were much lower than barley (as expected) so it was safer to start sheep on the oats however they were of less value once transitioned to barley.

Both Hyde and Zadow samples had higher than average ME levels which is an advantage from a feeding perspective as it means less needs to be fed to meet energy requirements. Along with this comes higher than average starch levels which is expected but does increase ruminal acidosis risk slightly. Crude protein of Zadow oats was slightly lower than average. Otherwise, values were as expected.

Industry averages can be found via https://feedtest.com.au/index.php/about/feedtest-information

Rations/feed plans were created for producers based on each individual feed test result by the guidance of Bronwen Fowler, Nutrien Ag Solutions Limited, in 2022, and Bridie Luers, Nutrien Ag Solutions Limited, in 2023.

4.1.2 Summary of Performance Metrics

Table 9. All PDS host performance metrics

Performance Metrics in Confinement	**Walker**	**Griffiths**	**Webster**	**Howard**	**Hyde**	**Zadow**
Condition score in	2.8	2.7	2.6	3.3	4	2.8
Condition score out	3	3.1	3	3.4	4.2	2.8
Reduced feeding time	35%	75%	54%	61%	50%	30%
Labour efficiency gains (hrs/week)	10.75	16.4	24	11	3.75	3.75
Hectares deferred (ha)	960	550	570	350	274	851
Pasture production gains (kg/DM/ha)	64	67	241	410	350	1507
Energy efficiency gains (mj/d/head)	0.8	0.76	0.73	0.78	0.8	0.76
Mortality rate reduction	1%	0.50%	no change	no change	no change	no change
Costs (-) and Benefits (+) in Confinement						
(-) Supplement/feed	$0	-$13,750	-$30,591	-$13,134	-$16,940	-$102,300
(+) Pasture deferment	$19,034	$19,449	$32,376	$26,101	$25,150	$126,797
(+) Labour reduction (@$40/hr inc super & wc)	$2,520	$4,040	$4,800	$1,280	$600	$800
(+) Mortality reduction	$739	$369	$0	$0.00	$0.00	$0.00
Gross Margin *Wgha - winter grazing hectares	**$22,293** **$3.6/DSE** **$23.20/Wgha**	**$10,108** **$3.4/DSE** **$5.62/Wgha**	**$6,585** **$1.0/DSE** **$11.90/Wgha**	**$14,200** **$1.14/DSE** **$8.00/Wgha**	**$8,800** **$0.83/DSE** **$5.80/Wgha**	**$25,300** **$2.3/DSE** **$30.00/Wgha**

The performance metrics for each PDS host for the period of confinement is shown in Table 9. Livestock condition was either maintained or slightly increased, due to less energy expenditure, resulting in energy efficiency gains to vary between 0.73-0.8 megajoules/day/head (mj/d/head). Time spent feeding livestock in confinement compared to a non-confinement practice was reduced in all scenarios and varied in reduction between 30%-75%. This directly correlated with labour efficiency, with an increase across all demonstration sites varying between 3.75hours/week (hrs/week) – 24hrs/week. Therefore, producers could better spend their time elsewhere on their farm by reducing their time spent feeding livestock.

Figure 1. PDS host increases in individual labour gains (hrs/week)

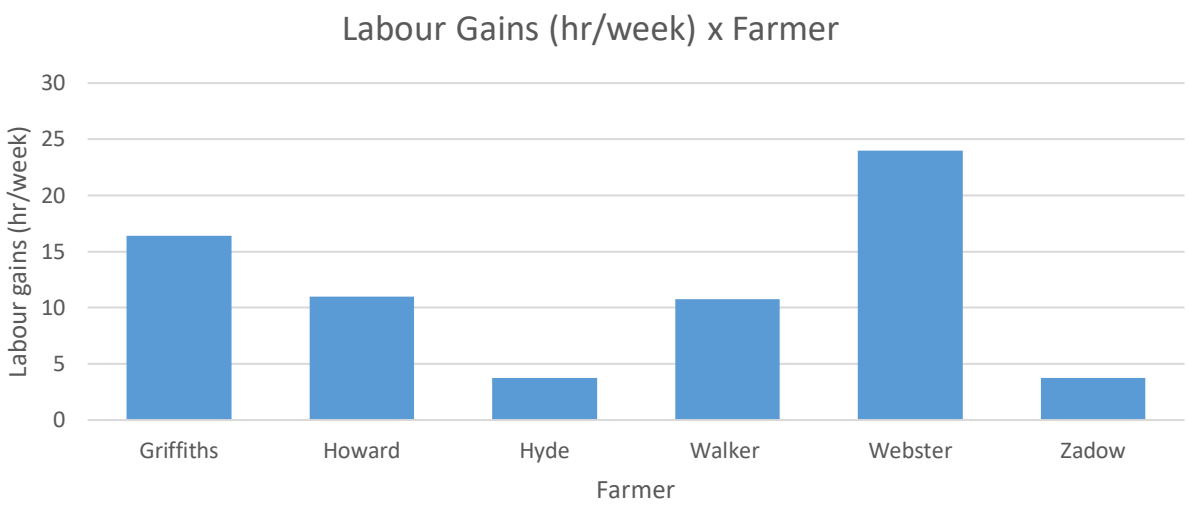


Fig. 1 shows each PDS host's increase of labour gains in hours per week, by having sheep in confinement scenarios. This data shows that all varying confinement feeding set ups/systems saved at between 3.75 to 24 hours a week on labour compared to running their livestock under a conventional pastures/trail feeding system. This time saved could enable mixed producers to spend more time on their cropping program, other jobs or allowing them to maintain a better work/life ratio.

Figure 1 – PDS host increases in individual pasture gains (kg DM/ha)

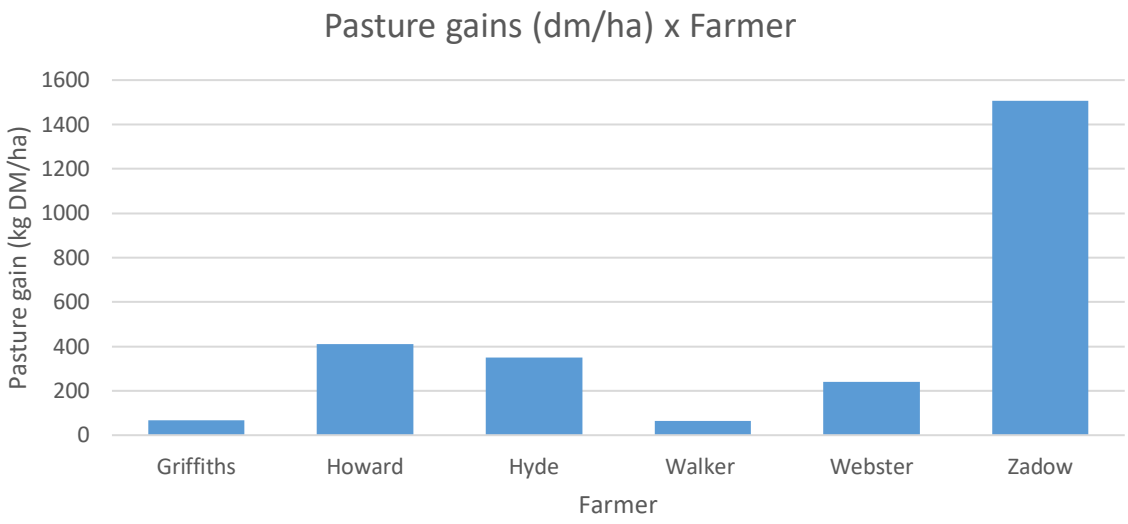


Fig. 2 shows each PDS hosts increase of pasture kilograms of dry matter/hectare (KgDM/ha) by confining their livestock. Each host confined their livestock for different periods of time and at different times of the season. Pasture was productive in all cases varying from 64kg/DM/ha to 1507kg/DM/ha. By confining their stock, all producers were able to defer large amounts of pasture hectares. On a whole farm scale with the deferred hectares, pasture production over the confining period can be quite substantial, enabling livestock to benefit majorly when released from confinement.

4.2 Economic analysis

Data was collected and used by Michael Young at Youngs Farm Analysis who performed the analysis for each of the six host producers. Below is a summary of each (Tables 10 – 21).

4.2.1 Howard economic analysis results

Table 10. Howard economic evaluation

Metric	Confinement gains
Labour efficiency gains during confinement period	11 hrs/week
Pasture production gains [1]	410 kg DM/ha
Hectares deferred [2]	350 ha
Energy efficiency gains of stock in confinement [3]	0.78 mj/d/hd
Mortality rate reduction	No change

[1] Additional pasture growth on deferred paddocks during confinement period. Calculated from in-paddock measurements.
[2] Calculated based on stock confined and the stocking rate.
[3] Calculated as 8% of Metabolizable energy intake (MEI) during confinement dates. Changes between farm due to Tolerance index (TOL,) genotype and flock structure.

Table 11. Howard costs and benefits of confinement feeding

Costs	
Extra supplement	$13,134
Benefits	
Pasture deferment[1]	$26,101
Labour reduction (@$40/hr inc super and workers compensation (wc))	$1,280
Mortality reduction[1]	$0
Gross margin	
	$14,200
	$1.14/DSE
	$8.0/winter grazed ha)

1 Estimated using AFO with the case study farm parameters.

4.2.2 Hyde economic analysis results

Table 12. Hyde economic evaluation

Metric	Confinement gains
Labour efficiency gains during confinement period	3.75 hrs/week
Pasture production gains [1]	350 kg DM/ha
Hectares deferred [2]	274 ha
Energy efficiency gains of stock in confinement [3]	0.8 mj/d/hd
Mortality rate reduction	No change

[1] Additional pasture growth on deferred paddocks during confinement period. Calculated from in-paddock measurements.

2022 Calculated based on stock confined and the stocking rate.

2022 Calculated as 8% of MEI during confinement dates. Changes between farm due to TOL, genotype and flock structure.

Table 13. Hyde costs and benefits of confinement feeding

Costs	
Extra supplement	$16,940
Benefits	
Pasture deferment[1]	$25,150
Labour reduction (@$40/hr inc super and wc)	$600
Mortality reduction[1]	$0
Gross margin	
	$8,800 $0.83/DSE $5.8/winter grazed ha

1 Estimated using AFO with the case study farm parameters.

4.2.3 Zadow economic analysis results

Table 14. Zadow economic evaluation

Metric	Confinement gains
Labour efficiency gains during confinement period	3.75 hrs/week
Pasture production gains [1]	1,507 kg DM/ha
Hectares deferred [2]	851 ha
Energy efficiency gains of stock in confinement [3]	0.76 mj/d/hd
Mortality rate reduction	No change

[1] Additional pasture growth on deferred paddocks during confinement period. Calculated from in-paddock measurements.

2022 Calculated based on stock confined and the stocking rate.

2022 Calculated as 8% of MEI during confinement dates. Changes between farm due to TOL, genotype and flock structure.

Table 15. Zadow costs and benefits of confinement feeding

Costs	
Extra supplement	$102,300
Benefits	
Pasture deferment[1]	$126,797
Labour reduction (@$40/hr inc super and wc)	$800
Mortality reduction[1]	$0
Gross margin	
	$25,300 $2.3/DSE $30.0/winter grazed ha

1 Estimated using AFO with the case study farm parameters.

4.2.4 Walker economic analysis results

Table 16. Walker economic evaluation

Metric	Confinement gains
Labour efficiency gains during confinement period	10.75 hrs/week
Reduced supplement wastage (5%)	2.33 kg/hd
Pasture production gains [1]	64 kg DM/ha
Energy efficiency gains of stock in confinement [2]	0.8 mj/d/hd
Mortality rate reduction	1%

[1] Additional pasture growth during confinement period.

2022 Calculated as 8% of MEI during confinement dates. Changes between farm due to TOL, genotype and flock structure.

Table 17. Walker costs and benefits of confinement feeding

Costs	
Extra supplement	$0 [1]
Benefits	
Pasture deferment	$19,034
Labour reduction (@$40/hr inc super and wc)	$2,520
Mortality reduction[2]	$739
Gross margin	
	$22,293
	$3.6/DSE
	$23.2/winter grazed ha

[1] Farm 1 fed the same level of supplement per head both in confinement and in paddock. Likely due to in paddock wastage and higher stock energy requirement.

2022 Estimated using AFO with the case study farm parameters.

4.2.5 Griffiths economic analysis results

Table 18. Griffiths economic evaluation

Metric	Confinement gains
Labour efficiency gains during confinement period	16.4 hrs/week
Reduced supplement wastage (5%)	4.12 kg/hd
Pasture production gains [1]	67 kg DM/ha
Energy efficiency gains of stock in confinement [2]	0.76 mj/d/hd
Mortality rate reduction	0.5%

[1] Additional pasture growth during confinement period.

2022 Calculated as 8% of MEI during confinement dates. Changes between farm due to TOL, genotype and flock structure.

Table 19. Griffiths costs and benefits of confinement feeding

Costs	
Extra supplement	$13,750
Benefits	
Pasture deferment	$19,449

Labour reduction (@$40/hr inc super and wc)	$4,040
Mortality reduction[1]	$369
Gross margin	
	$10,108
	$3.4/DSE
	$5.62/winter grazed ha

[1] Estimated using AFO with the case study farm parameters.

4.2.6 Webster economic analysis results

Table 20 – Webster economic evaluation

Metric	Confinement gains
Labour efficiency gains during confinement period	24 hrs/week
Reduced supplement wastage (5%)	3.55 kg/hd
Pasture production gains [1]	241 kg DM/ha
Energy efficiency gains of stock in confinement [2]	0.73 mj/d/hd
Mortality rate reduction	No change

[1] Additional pasture growth during confinement period.

2022 Calculated as 8% of MEI during confinement dates. Changes between farm due to TOL, genotype and flock structure.

Table 21. Webster costs and benefits of confinement feeding

Costs	
Extra supplement	$30,591
Benefits	
Pasture deferment	$32,376
Labour reduction (@$40/hr inc super and wc)	$4,800
Gross margin	
	$6,585
	$1.0/DSE
	$11.9/winter grazed ha

4.2.7 Results of the economic analysis undertaken

The value of confinement feeding is primarily due to, reduced labour and cost of supplementary feeding, reduced supplement wastage, increased energy efficiency of stock, increased pasture production due to deferring.

The economic value of confinement feeding varies due to both external market and climate conditions and internal management practices including: (i) time of lambing; (ii) stocking rate; (iii) pasture area; (iv) grazing management prior to adopting confinement feeding; (v) confinement set up; (vi) confinement period. For example, Table 22 shows that the value of deferred pasture varies by up to 72% depending on seasonal conditions in 2022 and Table 23, shows that the value of deferred pastures varies by up to 99% depending on seasonal conditions in 2023.

The reason the value of deferment changes by season type is because of the inflexible nature of farming systems. For example, farmers must feed a similar number of stock irrelevant of the

seasonal conditions. So, in a poor year, when the grazing pressure is high, additional feed has a higher value.

Table 22. Value of pasture deferment in different seasons for 2022 host farms

	Good season	Medium season	Poor season
Pasture deferment [1]	$5,854	$16,834	$20,683

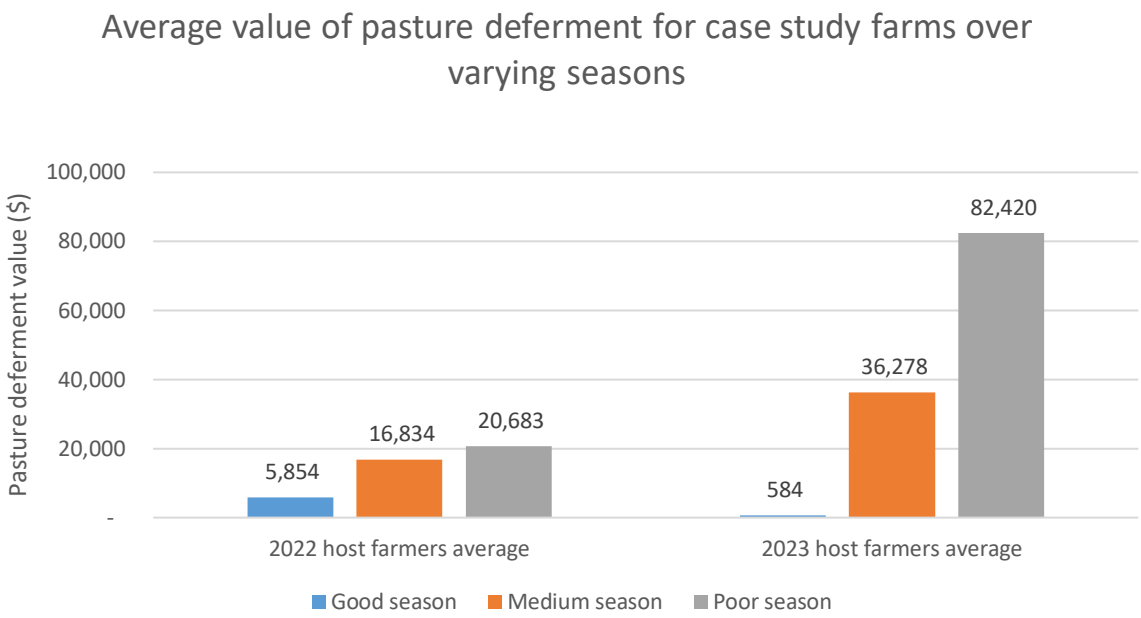
[1] Average of case study farms

Table 23- Value of pasture deferment in different seasons for 2023 host farms

	Good season	Medium season	Poor season
Pasture deferment [1]	$584	$36,278	$82,420

[1] Average of case study farms

Figure 3. Value of Pasture deferment x seasonal quality



In this analysis, we did not complete any sensitivity analysis (other than the season type sensitivity) to examine how varying the above factors affects the profitability of confinement feeding.

However, some key findings include the fact that confinement feeding was profitable in all cases, pasture deferment makes up approximately 80-90% of the economic value of confinement feeding, labour saved from confinement feeding offsets approximately 17-31% of the cost of additional supplement, and confinement feeding before the break of season is less profitable because pasture is not being deferred.

5. Extension and communication

A summary of the extension and communication activities conducted as part of this PDS in 2022 and 2023 is included below (Table 24).

To review full extension and communication activities review appendix 9.1-9.4.

Table 24. Summary of the communication and extension activities

Timing	Communications channel (e.g. Feedback magazine, media release)	Messages	
Late Feb/Early March 2022 June-September 2022 June-October 2023	Workshops for core producers x3	- Project and group introduction - Delivery of confinement feeding best practice content - Discussion of feed test results and ration analysis	- *March 2022: pre-confinement workshop held for all core group members.* - *Late July 2022: post-confinement debrief workshop and site visits.* - *March 2023: pre confinement workshop held for core group members.*
March 2022	SCF 2021 Trials Review booklet- print and digital	- Introduce the project - Outline the project objectives - Specify who is involved - Possibly have feed test results back in time to report on these -	- *Trials Review Day cancelled but project was still summarised in the Trials Review Book. Digital copy available on the SCF website on the project page.*
Spring or Summer 2022	SCF Focus- seasonal newsletter. Print and digital copies. (Edition published in will depend on space available)	- Summarise activities of the PDS to date - Summarise findings of the PDS to date - Share core producers' experiences/ thoughts on the project - Outline future activities planned	- *An article was published in the Summer 2021 SCF Focus newsletter, outlining the project plan and objectives.* - *Newsletter article was published in the Summer SCF focus, sent to all members in December 2022.*
Late 2022	Video summarising a field walk/ site visit	- Demonstrate event success - Give overview of the site features - Interview host about	- *Footage collected at July 2022 field walk. Video compiled and is published to our youtube channel.* - *Interviews for host and attendees, footage captured at workshop held 14th March 2023.* - *Two videos published to SCF youtube channel, Twitter, Facebook sites*

		experience with confinement, description of the site, benefits of confining for their enterprise - Interview an attendee about their reasons for visiting, their experience and what they've learnt from the field walk.	
Late Feb/ Early March 2023	Workshop for second year site hosts- other core producers also welcome	- Summary of project plan for the year - Discussion of feed test results and ration analysis -	- *Workshop held on 14th March 2023.* - *Interviews completed for video.*
March 2023	SCF 2022 Trials Review booklet- print and digital	- Summarise key learnings from 2022 - Written as a scientific report summary	- *Key learnings summarised and published in trials review booklet, which was released to our members, website and printed in June 2023.*
Winter, Spring or Summer 2023	SCF Focus- seasonal newsletter. Print and digital copies (Edition published in will depend on space available)	- Summarise activities of the PDS to date - Summarise findings of the PDS to date - Share core producers' experiences/ thoughts on the project - Outline future activities planned	- *Confinement feeding article released in our summer newsletter (December 2022).* - *Confinement feeding article with a summary of the June 2023 field day was released in SCF E-News, July 2023.* - *Confinement feeding Case Study article released in SCF summer newsletter. (December 2023)*
Late 2023	Video summarising the project experience of	- What they have learnt/ things they will change	- *Two videos have been created in 2023 and approved to be release to our members and online platforms. These document the experiences of local farmers confinement feeding trials and their thoughts on the trial.* - *Field Day – https://youtu.be/qY96rhejLIA*

	core group members.	- Benefits of confining for them - Challenges - The PDS experience - Plans for confining in the future	- *Learning Experiences – https://youtu.be/sDr1Zb3kZRA*
October 2023	Written producer case study	- Outline producers' location, enterprise structure and sheep numbers - Summarise key personal learnings from the project - Explain benefits of confining to their system/farm - Promote PDS involvement - Promote SCF's project management/ organisation	- *A case study template was given to our host producers by August 2023 and case studies submitted with the final report due in November 2023.* - *https://static1.squarespace.com/static/5c00a4b3620b859f65cfa797/t/65dfdbc1ddd40d358939bcd0/1709169602387/P.PSH.1346+Assessing+Economic+Benefits+of+Confinement+Feeding+-+PDS+Case+Study.pdf*
Across 2022 and 2023 in line with activities/ events	Facebook posts x4	- Advertise events - Summarise events - Share project data collection activities	- *This project has been mentioned in two Facebook posts from our SCF account.* - *The first, in February 2022, referenced the collection of hay and grain samples for feed testing and reached 834 people and had 20 interactions.* - *The second, in March 2022, referenced the Trials Review Day YouTube video and reached 1503 people and had 60 interactions.* - *Post on the 9th March 2023, promoting CF workshop on 14th March. https://www.facebook.com/photo?fbid=705921361329520&set=a.572496761338648* - *Post on March 13th 2023, promoting CF workshop on 14th March. https://www.facebook.com/photo?fbid=708063501115306&set=a.572496761338648* - *Post on 19th June 2023, promoting CF field walk on the 21st June. https://www.facebook.com/photo?fbid=763310652257257&set=pcb.763310808923908*
Across 2022 and 2023 in line with activities/ events	Twitter posts x4	- Advertise events - Summarise events - Share project data collection activities	- *This project has been mentioned in three Twitter posts from our SCF account.* - *The first, in November 2021, promoted the successful contracting of this project and invited additional core members. It had 7,187 impressions and 172 engagements.* - *The second, in February, referenced the collection of hay and grain samples for feed testing and had 330 views and 26 engagements. https://twitter.com/Stirlings2Coast/status/1495681596942614529* - *The third, in March, referenced the Trials Review Day presentation YouTube video and had 2959 views and 44 engagements. https://twitter.com/Stirlings2Coast/status/1506515683454062595* - *Post on 9th March 2023, promoting CF workshop being held. https://twitter.com/Stirlings2Coast/status/1633710499698462722*

			- *Post on 13th March 2023, promoting CF workshop being held.* https://twitter.com/Stirlings2Coast/status/1635126723720409089 - *Post on 14th March 2023, showcasing CF workshop attendance and presentations.* https://twitter.com/Stirlings2Coast/status/1635498594911518721 - *Post on 15th June 2023, promoting CF field walk on the 21st June.* https://twitter.com/Stirlings2Coast/status/1669273791812501505 - *Post on 19th June 2023, promoting CF field walk on the 21st June.* https://twitter.com/Stirlings2Coast/status/1670650111515578370 - *Post on 20th June 2023, promoting CF field walk on the 21st June.* https://twitter.com/Stirlings2Coast/status/1671099450826305536/photo/1
2022 and 2023	SCF Spring Field Day Peer to Peer learning/ information sharing	- Present and discuss project findings to-date	- *With the cancellation of our 2022 Trials Review Day, we instead created videos of our project presentations, which are shared on YouTube. The presentation on this project has so far had 62 views. Available at: https://www.youtube.com/watch?v=JC1QmaVsD-g* - *Results and findings for 2022 discussed at CF workshop held on 14th March 2023.* - *Results and findings for 2022 & 2023 thus far were presented at field walk held on 21st June 2023.*

6. Monitoring and evaluation

6.1 Analysis of pre and post survey reports

Pre and post surveys were undertaken to assess core and observer producers' current level of knowledge, attitude, skills and aspirations in regard to the use of confinement feeding in their enterprise. Eleven observer and ten core producers pre surveys were completed, with four observer and seven core producers completing post project surveys.

From these surveys core and observer producers overall % change in knowledge and skill was calculated by the number of questions obtained correct in the pre-survey knowledge and skills section compared to percentage obtained correct in the post survey. Core produces got 40% correct in the pre surveys and 54% correct in the post surveys, an increase of 14% over the time of the project. Whereas observer produces got 37% correct in the pre surveys and 50% correct in the post surveys, an increase of 13% over the time of the project.

To calculate the % change in confidence core producers were asked to rate their confidence in confinement feeding and their confidence in formulating a ration, from 1 to 10. The core producers surveyed had an average confidence level of 59.5% in the pre project surveys and 81% in the post surveys, an increase of 21.5% over the duration of the project. While observer producers were only asked to rate their confidence in confinement feeding. On the whole observers increased their average level of confidence by 32%, recording a level of confidence averaging 56% in the pre project surveys and 88% in the post project survey.

The summarised findings of these surveys are presented below.

Figure 4. Producers overall project satisfaction

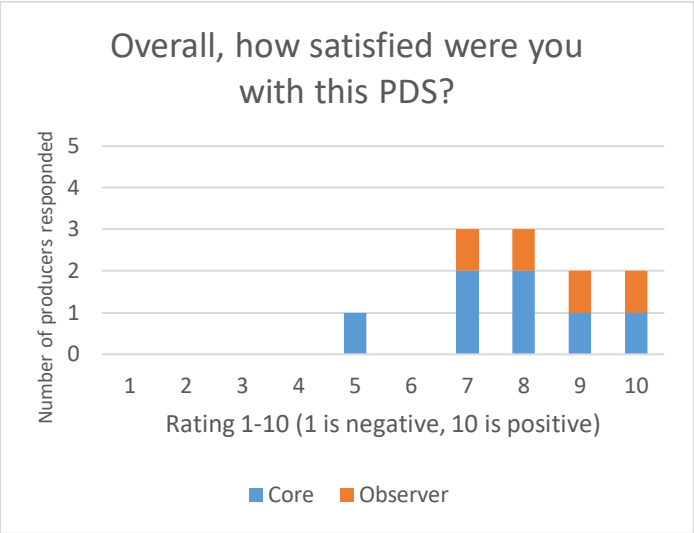
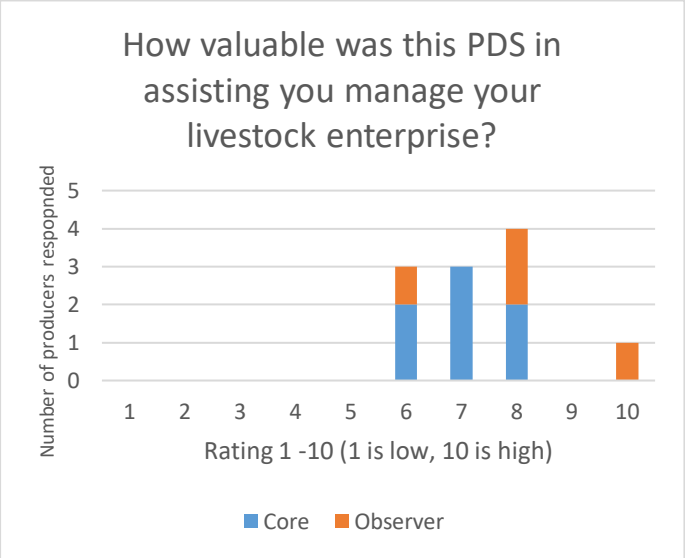


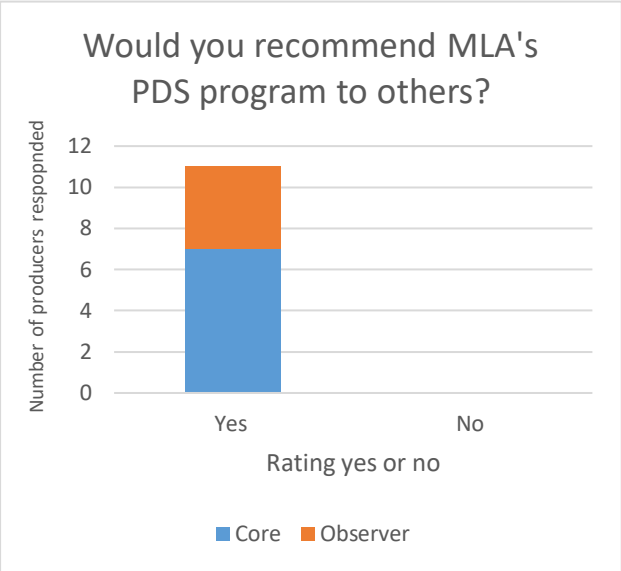
Figure 5. Value of PDS to producers



From the responses collected for the post project survey there was an overwhelmingly positive response to the PDS with no one being satisfied less than 5 out of 10 with an average satisfaction rating of 8 out of 10 (Fig. 4).

Producers felt they got high value out of the PDS, between 6 and 10 with an average value of 7.4 out of 10 (Fig. 5).

Figure 6. Would producers recommend MLA's PDS program to others?

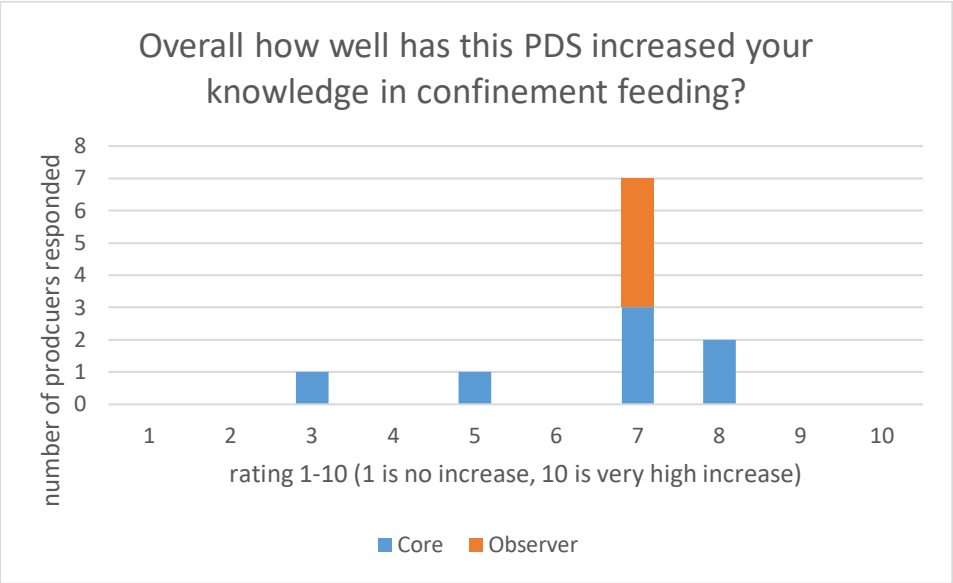


Out of all the responses collected for the post project survey there was not a producer that would not recommend MLA's PDS program to others (Fig. 6). Feedback from producers regarding the improvement of the PDS program is seen in Table 23.

Table 25 Feedback provided in the post surveys from core and observer producers to improve the PDS program.

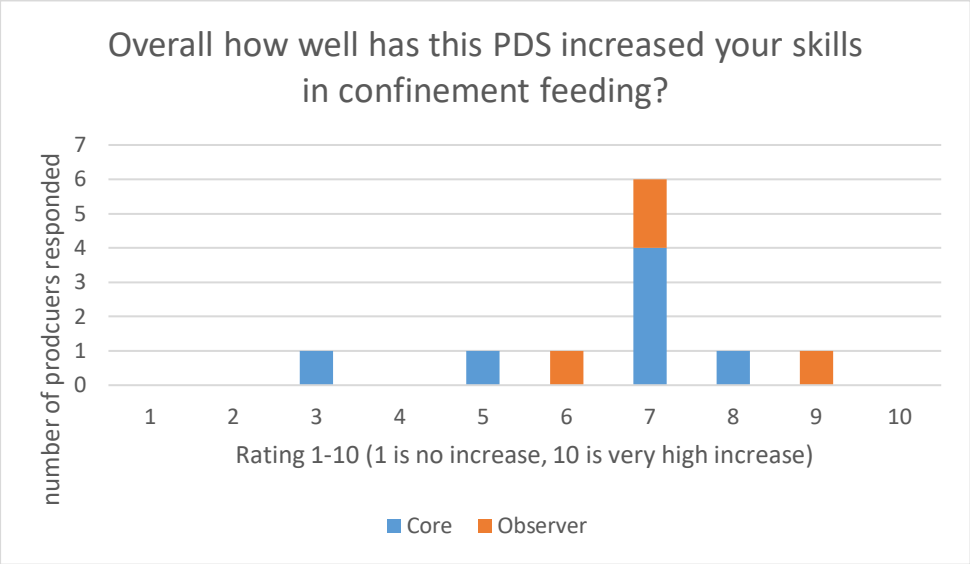
Please provide any feedback to help us improve the PDS program:	
Core	Great for networking and seeing new ideas up close. Extremely well conducted.
Core	More trials and getting more people to be involved. What worked at Metcalfe's didn't work to the same extent at our place. Need to get a bigger spectrum to see how everyone uses it in their system. More replications.
Core	Great for networking and seeing new ideas up close. Need more cost comparisons
Core	Very good tool to help to be more precise in the management of livestock especially pregnant livestock.
Core	Local focus for local issues. This project could easily keep going with learning all the time, with seasonal and market changes affecting management.
Observer	Need more funding and less lengthy reporting requirements in recognition of big increase in costs of doing these projects.
Observer	More funding more easily available and larger amounts and increase funds to W.A.
Observer	The thing about the group is it gave us knowledge of where to find the references. I'm afraid I don't keep the answers in my head, but I do have a much clearer idea on where to access it when required, and that time is soon.

Figure 7. Overall increase of knowledge of confinement feeding



Producers surveyed improved their current knowledge of confinement feeding from a slight (3/10) to a high, (8/10) increase. On average producers felt they had a medium increase of knowledge, 6.6 out of 10 (Fig. 7).

Figure 8. Overall increase of skill with confinement feeding



Overall, producers thought that this PDS project increased their skills in confinement feeding from slight (3/10) to very high (9/10) increase. On average producers felt they had a medium increase of skill, 6.6 out of 10 (Fig. 8).

6.2 Monitoring, evaluation and reporting (MER) plan inputs and outputs

A Monitoring, evaluation and reporting (MER) plan was created to include all inputs and outputs expected by the PDS. This included records of all project plans and activities, budgets, and data from demonstration sites to be captured in milestone reports, compilation of media activities, copies of case studies and fact sheets developed, and number of stakeholders present at events.

See Table 26 for the completed M&E plan.

Table 26. Completed M&E plan

Evaluation level	Project Performance Measures	Evaluation Methods	Progress of each item
Inputs – What did we do? *Describe the planned and expected inputs involved in your project*, including *funds, resources, development & projects structures*	• Core producer group formed of 10 local producers. • Six local demonstration sites over two years, representing over 70,000 sheep and 50,000 hectares of farmland. • 85 observer farm businesses, representing approximately 300,000 sheep and 250,000 hectares. • Project manager/ facilitator appointed. • Engage animal nutritionist and economist	• Good records of project objectives • Six demonstration site producers submit project data. • Invoices and receipts of payments • Pre and Post KASA Survey results and summaries • Livestock numbers and areas recorded via the surveys • Budgets	• Records are all being kept in digital summaries. Sheridan Kowald (SCF Project Officer) is now Project Facilitator/ Manager. Nutrien Animal Health team are supplying the nutritional advice as required and Michael Young will be conducting the economic analyses on behalf of SCF. • Site data for the first three site hosts has been verbally collected and digitally summarised. Feed tests (grains and hay/ straw) and pasture cuts have been taken and results recorded and summarised. • Site data for the second three site hosts has been verbally collected and digitally summarised. Feed tests (grains and hay/ straw) and pasture cuts have been taken and results recorded and summarised. • The SCF Finance Officer is collating all receipts and invoices for this project.

			• Pre-project surveys have been collected from all core producers and ten observer producers. • Survey questions have given required information about stock numbers and land management. The first three site hosts represent 26,000 sheep and 10,400 hectares of land. The ten core group members together represent over 51,000ha of land and 97,000 sheep. • The second three site hosts represent 9975 sheep.
Outputs - What did we do? *Describe the outputs planned/expected from your project, including engagement activities & products from demonstration sites*	• Improved knowledge, attitude and confidence in confinement feeding by core and observer producers. • Data collected around confinement feeding components (eg. ration analysis, economic analysis, mortality, condition score, animal health, deferred pasture production) • 2-3 visits to hosts' confinement feeding sites. • Project discussed at major SCF events. • Frequent social media posts to promote the project and associated events.	• Good records of project objectives and actions. • Pre and post-project surveys conducted. • Milestone reports to summarise data and findings. • Summary of media activities and interactions. • Attendance sheets at events • Social media statistics. • Data records of confinement feeding components	• Records of project objectives and actions are being kept, with dates of all activities recorded and data collected. • Pre-project surveys have been completed and a summary is attached with this milestone report. Future field walks/extension activities will provide opportunities for more surveys to be completed. • Media activities and interactions are summarised in the attached communications plan update.

			• A site visit was conducted in conjunction with the first workshop, with 21 people attending in total. This was held in Narrikup on Wednesday 2nd of March 2022. • A second site visit/ Field day was conducted on the 18th July 2022, with 25 producers in attendance. • A third site visit was conducted in conjunction with the second workshop on 14th March 2023 at core producer John Howards property with 24 people attending in total. • A fourth site visit was conducted on the 21st June 2023 at core host producers Mark Zadow's where 14 people attended. • Data on each confinement feeding demonstration site has been collected and is summarised in the final technical report.
Changes in knowledge, attitudes, and skills - How well did we do it? *Describe the changes in KASA that you are planning to achieve*.	• 100% of core producers have learnt something from their fellow producers about confinement feeding. • 100% of core producers intend to carry out confinement	• Verbal feedback • Survey results and comparison between pre and post survey results • Case study of a core producer	• Verbal feedback after the first workshop was very positive. Producers enjoyed the hands-on, activity with the Nutrien nutritionist, formulating balanced rations on the NSW DPI Drought Feed

	feeding in the future. • 100% of core producers and 70% of observer producers who visited a project site see the project outcomes as beneficial. • Core producers understanding of the importance of ration formulation and balancing is improved. • Importance of maintaining/ achieving desirable condition scores and animal health in confinement is understood. • Cost of feeding in confinement is understood and can be compared to cost of paddock feeding.		Calculator phone app. The site visit was also very well received with lots of questions asked and producers staying for an extended period to continue looking, talking and asking questions. Great peer-to-peer learning opportunity. • A facilitated session with a panel of host producers and an Animal Production Specialist was held on 29 September 2022 with 46 producers in attendance. Good discussion on the different producer setups was generated. • Further changes are possible to measure as secondary surveys have been conducted. • A case study has been produced and submitted with the Final Technical Report. • 2x videos have been completed and were submitted to MLA before project completion.
Practice changes – Has it changed what people do? *Describe the practice changes that you are expecting to achieve by the*	• 100% of core producers will be implementing a form of confinement feeding (if not already) • 10% of observer producers plan to implement a form	• Post PDS survey • Post project communications with core and observer producers	• Post-survey results have been collected and measured in the final technical report. • As an observation, two producers who have been involved as observer producers indicated

end of your project	of confinement feeding as a result of project findings. • 50% of core producers intend to conduct feed tests on their ration in the future.		that they would be implementing confinement feeding in their program in 2023.
Benefits – Is anyone better off? *Describe the benefits that you are expecting to achieve as a result of the project*	• Producers have a greater confidence in and knowledge of strategies for confinement feeding. • Increased early season pasture growth due to deferment of pastures. Potential increase in stocking rates. • Mortality rates in confinement are reduced due to better animal health management knowledge. • Core producers reduce feed costs by providing the optimum ration at best value for money. • Peer to peer discussions is bound to uncover numerous other benefits to confinement, not covered in the scope of this project. • Core group members will discuss findings and learnings with other producers, not involved with the project. • Barriers to adoption are likely to be cost	• Post project core and observer producer surveys. • Response to social media content. • Verbal feedback • Supply of ration economic evaluation findings	• Initial verbal feedback suggests we are on track to achieve objectives. • Post-project surveys will be completed prior to conclusion of the project and will provide evidence of achievement of project objectives. • Social media content response is summarised in the communications plan update. • First-year pasture sampling shows between 3-14% of extra early season pasture growth (FOO) achieved by deferring grazing, which is made possible due to confinement feeding. • SCF contracted an agricultural economist, Michael Young, to complete the economic assessment. This will be provided in the final report. • Economic analysis for 2022 and 2023 has been completed and submitted to MLA, with a summary included

	of system set up, although it is intended that the benefits this PDS explores, will overcome the resistance to that barrier.		in the Final Technical Report.
General observations / outcomes – Is the industry better off?	• An increase in confinement feeding may have environmental benefits from less over grazing, less GHG emissions from driving around paddocks to hand feed, opportunity to feed products that reduce methane production. • Greater stocking rates due to alternative methods of managing sheep during the seasonal feed gap. • Benefits to cropping productivity. • Increased rate of pasture improvement activities. • A greater understanding and confidence in confining sheep may lead to a similar practice change in cattle and goat production systems.	• Post project survey • Feedback from SCF members through general communications.	• Post-project surveys were produced and sent to all participating producers. Some post project surveys were not completed by all participants. However, majority were received back completed. They have been analysis and results are showcased in the Final technical report. • Feedback from SCF member producers to date regarding this project has been positive. The facilitated session on confinement feeding at the 2022 SCF Spring Field Day rated equal highest by producers for field day highlights in feedback survey.

7. Conclusion

This MLA-funded PDS project successfully demonstrated to local producers the value of confinement feeding in the region. Below are the key findings and an explanation as to how the data from this project will benefit the sheep industry in this local region and possibly, Australia-wide.

7.1 Key Findings

This PDS showed that confinement feeding was profitable in all demonstration sites with the following key findings:

- Pasture deferment made up greater than 95% of the economic value of confinement feeding at all six producer demonstration sites.
- Confinement feeding before the break of season would be less profitable at all sites as pasture production is not being deferred.
- The labour efficiency which was saved from confinement feeding offsets approximately 17-31% of the cost of additional supplement across all six PDS sites.
- The economic value of confinement feeding is significantly linked to autumn and winter growing conditions.
- There was significantly reduced labour hours and cost of supplementary feeding at all sites.
- By confining sheep, there was a significant reduction in supplement wastage at all sites. This is due to the feed being in one spot and the sheep maximising all feed source, leaving very limited amounts behind compared to when trail fed out in open paddocks (normal practice when confinement feeding systems are not in place).
- By confining sheep into one area, it is believed that there was a significant increase in energy efficiency of stock at all sites, this is due to the sheep being limited on foraging space and therefore not having to exert more energy chasing the 'green pick' in a paddock scenario.
- All sites gained a significant increase in pasture production due to deferring paddocks by confining stock. Pasture was able to reach optimum density and growth before being grazed by sheep.
- Mortality rates in confinement were reduced due to better animal health management and knowledge.
- Producers had reduced feed costs by providing the optimum ration at best value for money.
- Confinement feeding systems allowed sheep and cropping systems to coexist and create more profitable and sustainable farming systems.
- Local producers now have a greater confidence in and knowledge of strategies for confinement feeding due to this PDS.
- Increased early season pasture growth due to deferment of pastures allows for the potential increase in stocking rates.

7.2 Benefits to industry

Implementing and extending information on the strategies and economic benefits of confinement feeding uncovered in this PDS will provide many advantages to the broader red meat industry. These benefits include, but are not limited to, an increase in pasture production (and as a result a potential to increase stocking rates), ability to maintain condition of stock over autumn and early winter (more accurate feed rations and reduced energy expenditure), and reduction in soil erosion and dust pollution (relating to social licence issues).

Confinement feeding systems have allowed local producers to retain stock whilst deferring grazing. This in turn, maximised the value of improved pastures by also having the option to produce high-quality conserved fodder such as hay, straw, or silage and to feed this out during confinement.

Allowing pasture deferment by confinement feeding enables a sustainable amount of ground cover to grow without disturbance from sheep grazing. This ensures that land degradation and soil erosion is at a minimum in these deferred paddocks. When paddocks are bare (by not deferring pastures)

the soil surface is exposed and loosened and at risk of wind and water erosion. Higher dust levels in the air can pose a health risk to humans and animals.

Energy expenditure for livestock is decreased when placed in a confinement system, by preventing sheep 'chasing the green pick' they are expending less energy, and more easily maintaining their condition. In scenarios where 'green pick' is low, sheep can drastically lose condition when in larger paddocks. In addition, monitoring of stock is much harder to do, however, when in confinement closer observations of stock (especially those in poorer condition) is enabled.

Confinement feeding systems can also be used as the most cost-effective way of finishing out-of-season lambs and ewes to meet market specifications.

Going forwards, confinement feeding may also benefit the broader industry by having the ability to feed out products that reduce methane emissions. As we look to carbon neutrality, confinement feeding could be key.

Overall, a greater understanding and confidence in confining sheep may also lead to a similar practice change in cattle and goat production systems, leading to broader benefits.

7.3 Knowledge Gaps, Challenges, and Implications

There are a number of knowledge/confidence gaps that could be further investigated in relation to confinement feeding. These include:

- Key challenges remain with adoption. Although the project experienced some success with practice change, challenges to adoption still exist and the main challenge identified, is producers' own perception of the need for the practice change to occur.
- An implication with confinement feeding is that it comes at a cost when first starting/setting up a new system. Some producers will not adopt confinement feeding due to these initial start-up costs.
- There are several gaps in the knowledge that exists about the environmental impact of sheep confinement feeding systems - what environmental risks does confinement feeding pose and how can these risks be minimised through site selection, design and management.
- During the project, there was not enough pasture cuts data collated for the 2022 host sites. Therefore, the FOO increase in the economic analysis for these sites were based from regional expected pasture production data.
- Liveweight vs. condition score? A comparison of liveweight readings and condition score may be a more accurate measure of economic benefits, for example, comparing liveweight gains/losses and condition score in a paddock scenario to a confinement feeding scenario.

8. References

Jefferies, B. (1961) Body Condition Scoring and Its Use in Management. Tasmanian Journal of Agriculture, 32, 19-21

Robertson, S. (2020) Optimising ewe reproductive performance in containment areas. Meat and Livestock Australia Limited, North Sydney, Australia.

SCA (1990) Feeding Standards for Australian Livestock. Ruminants. Standing Committee on Agriculture. CSIRO Publications, Melbourne, Australia.

9. Appendix

9.1 Media

Stirlings to Coast Farmers @Stirlings2Coast · Apr 4

For those that missed our digital Trials Review Day, here is our playlist that contains everything from Harvest Losses & Sub-surface drainage to Ripper gauge & Non wetting right through to Alternate forage crops & Confinement feeding.
youtube.com/playlist?list=…

View Tweet activity

389

Stirlings to Coast Farmers
Published by Samantha Jeffries · September 28, 2022 ·

OUR WEST SPRING FIELD DAY IS TOMORROW!!

With a later start time, lunch & sundowner provided and more out-in-the-field trips than before, it is set to be a great day!

Have you registered yet? If not head to the link below:
https://SCFSFDWEST.eventbrite.com.au

STIRLINGS TO COAST FARMERS

SCF WESTERN SPRING FIELD DAY 2022

WESTERN

KENDENUP COUNTRY CLUB
BEVERLEY ROAD
29 SEPTEMBER
10:00AM - 5:30PM

All welcome! SCF Members are strongly encouraged to bring a friend free of charge.

A bus will be available and is encouraged to be used for the field portion of the day for biosecurity reasons.

10:00am	Registration
10:15am	AGM
11:00am	Farmers Panel - Confinement Feeding
11:45am	CBH - Barley Trading Discussion **Drew Robertson**
12:05	Rabobank - Land market update **Ian Donaldson**
12:30pm	Lunch (provided)
1:15pm	Hop on Bus
1:45pm	Phosphorus Rates and Manganese for Wheat, Tenterden **Dr Mark Gheradi**
2:45pm	Prestons Pacific Seeds Canola trial **Andrew Heinrich** GGA Legumes profitability **Mark Seymour**
5:00pm	Future Drought Fund- update **Philip Honey**
5:15pm	Sundowner with Biosecurity Update **Dr Jess Shilling**

REGISTER AT
SCFSFDWEST.EVENTBRITE.COM.AU

Proudly supported by Rabobank CBH GROUP

Stirlings to Coast Farmers
March 23 ·

In the first of our Meat & Livestock Australia PDS projects, Kelly Gorter is presenting on our new project, Assessing Economic Benefits of Confinement Feeding.

We have established a core group of ten SCF producers who are either already confinement feeding, starting to set up some sites or interested in starting to confine in the near future, with six of those acting as site hosts across the project.

The first three hosts have had feed samples taken of the grain, hay and/... See more

YOUTUBE.COM
SCF TRD - Sheep confinement feeding - Kelly Gorter
SCF has just started our new "Assessing Economic Benefits of Confinement Feeding" p...

Boost this post to reach up to 352 more people if you spend A$35. **Boost post**

Kelly Gorter and 11 others 3 Sh

Stirlings to Coast Farmers
Published by Kathi McDonald · March 13 ·

Want to know more about EID's? Come along to our Confinement Feeding workshop tomorrow to learn all you need to know about EID, confinement feeding and more! For further details and to RSVP contact Sheridan on 0455 581 729.

#meatandlivestockaustralia Meat & Livestock Australia

Assessing Econmic Benefits of Confinement Feeding

TUESDAY, 14 MARCH @ GM HOWARD & SONS, 946 DRAWBIN RD, SOUTH STIRLINGS WA

8:45am	**Registration**
9:00am	**Welcome** Lizzie Von Perger, Stirlings to Coast Farmers, CEO
9:10am	**MLA Assessing Economic Benefits of Confinement Feeding Project 2022 results discussion and 2023 project overview.** Sheridan Kowald – Stirlings to Coast Farmers, Project Officer
9:30am	**Confinement feeding, Nutrition and Animal Health Update** Bridie Luers, Nutrien, Vet
9:55am	**Morning Tea**
10:15am	**Confinement feeding site tour and set up objectives** Piers Roberts, GM Howard & Sons, livestock manager
10:45am	**EID Sheep Tag Information session – What you need to know** Andrew Longbottom, DPIRD, Senior Biosecurity Officer
11:10am	**Pastures and Technology** Phil Honey, Stirlings to Coast Farmers, Smart Farms Coordinator
11:30am	***Quick MLA Project overview - Alternative Forage Pastures & Opti-weigh*** Lizzie von Perger, Stirlings to Coast Farmers, CEO
	Lunch & close

mla MEAT & LIVESTOCK AUSTRALIA Producer Demonstration Site

For more info or to rsvp Sheridan 0455 581 729 or sheridan.kowald@scfarmers.org.au

3 3 shares

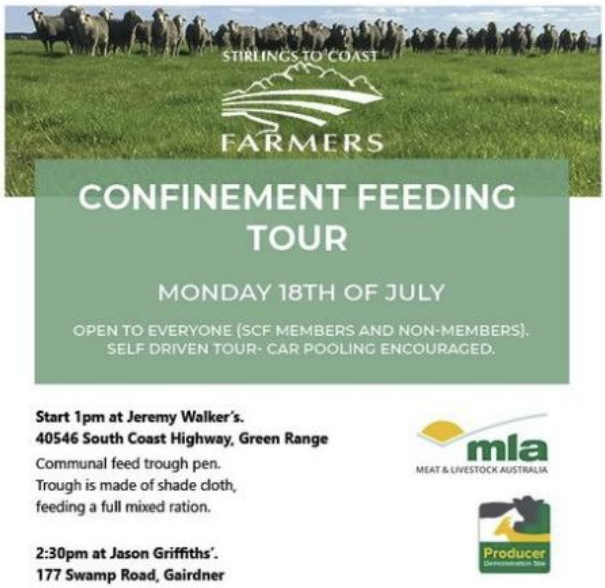
Stirlings to Coast Farmers
July 12 ·

Based on popular demand- confinement feeding tour. Three unique sites/ systems.

Monday 18th July starting at Green range heading to Ongerup.

All welcome, no RSVP needed. Quick visits to try and keep it to a half day program.

Part of a Stirlings to Coast Farmers @Meat & Livestock Australia Producer Demonstration Site project.

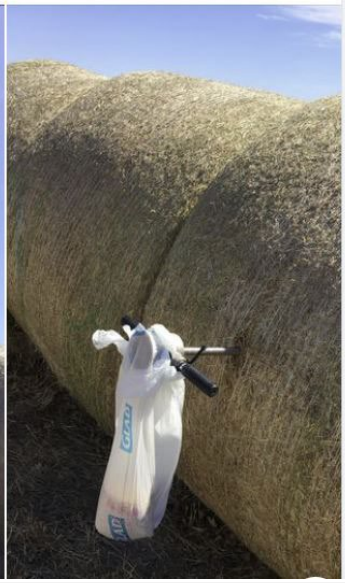


Stirlings to Coast Farmers
February 21 ·

Kelly Gorter busy collecting hay core samples for feed testing analysis.

Collected from oaten, different pasture mixes and straw bales. For confinement feeding project. Also collected feed grain samples.

To find out more about the project head to: www.scfarmers.org.au/confinement-feeding



Stirlings to Coast Farmers @Stirlings2Coast · Nov 9, 2021

1 of 2 // SCF are proud to announce that we have been successful in an MLA PDS grant, focusing on confinement feeding - optimizing sheep management and supplementary feeding programs. Stay tuned for more updates to come as the project kicks off.

Promote

1 2 21

Stirlings to Coast Farmers @Stirlings2Coast · Nov 9, 2021

2 of 2 // With a core group of 10 producers both experienced or new to the practice, SCF are looking for 2 more producers to join the group. If you're interested or want to find out more, reach out to the SCF team. Head to scfarmers.org.au/confinement-fe... for more info.

scfarmers.org.au
Confinement Feeding — Stirlings to Coast Farmers

1

Stirlings to Coast Farmers @Stirlings2Coast · Mar 23

2,988

In the first of our **@meatlivestock** PDS projects, **@kelly_gorter** is presenting on our new project, Assessing Economic Benefits of Confinement Feeding.

youtu.be/JC1QmaVsD-g

View Tweet activity

Stirlings to Coast Farmers @Stirlings2Coast · Jun 20 Promote

Tomorrow is our **confinement feeding** field walk - have you RSVP'd yet?

With a tour in Broome hill, a run down of some of the project's host setups & an update on findings so far from the project, it is set to be a great morning!

2 4 699

Stirlings to Coast Farmers @Stirlings2Coast · Jun 19 Promote

Want to check out some **confinement feeding** setups and pick the brains of those that have info to share?

Pop down to our **Confinement Feeding** field walk on the 21 June @ 8:30am.

6 8 1,347

Stirlings to Coast Farmers @Stirlings2Coast · Jun 15 Promote

Next Wednesday, we are hosting a tour of **confinement feeding** setups as well as running through some learnings from our @meatlivestock **Confinement Feeding** project.

Come down for a yarn @ 8:30am, Broomehill West. RSVP to @sheridan_kowald details below.

See you out there!

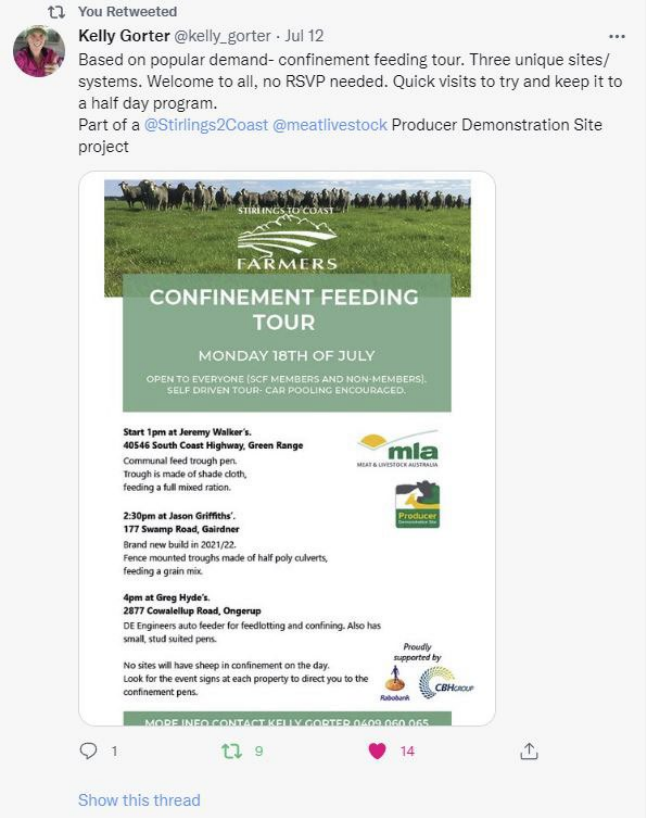
1 11 14 2,373

You Retweeted

Kelly Gorter @kelly_gorter · Jul 18

Great group and turnout at the @Stirlings2Coast confinement feeding tour today. Lots of great info and questions. Dodging the showers so far!

2 1 26



9.1.1 Facebook posts

https://www.facebook.com/photo?fbid=705921361329520&set=a.572496761338648
https://www.facebook.com/photo?fbid=708063501115306&set=a.572496761338648
https://www.facebook.com/photo?fbid=763310652257257&set=pcb.763310808923908

9.1.2 Twitter posts

https://twitter.com/Stirlings2Coast/status/1495681596942614529
https://twitter.com/Stirlings2Coast/status/1506515683454062595
https://twitter.com/Stirlings2Coast/status/1633710499698462722
https://twitter.com/Stirlings2Coast/status/1669273791812501505
https://twitter.com/Stirlings2Coast/status/1635126723720409089
https://twitter.com/Stirlings2Coast/status/1635498594911518721
https://twitter.com/Stirlings2Coast/status/1670650111515578370
https://twitter.com/Stirlings2Coast/status/1671099450826305536/photo/1

9.1.3 YouTube links and video files

Stirlings to Coast Farmers – Sheep confinement feeding – Project overview

Stirlings to Coast - Farmers confinement feeding field day

Stirlings to Coast Farmers - confinement feeding project learning experiences

9.2 Power-point presentations

Powerpoint presentation – March 14 2023 Workshop

9.3 Newsletter, Trial reviews booklet, E-News Articles

Newsletter Article Summer 2021

Trials Review Article 2021

Newsletter Article Summer 2022

Newsletter Article Winter 2023

Trials Review Article 2022

Newsletter Article Summer 2023

9.4 Case Study

Case study - Assessing Economic Benefits of Confinement Feeding