



Final report

L.PDS.1904 Increasing profit with dual-purpose crops

Project code: L.PDS.1904
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Date published: 15 July 2024

PUBLISHED BY
Meat & Livestock Australia Limited
PO Box 1961
NORTH SYDNEY NSW 2059

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

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Abstract

Dual-purpose crops are specific crops sown to be grazed during winter to cover feed gaps and reduce supplementary feeding with an additional value to be harvested as a cash crop. This project has demonstrated the benefits of dual-purpose crops in a mixed farming enterprise within the Great Southern region of Western Australia. Nine producer demonstration sites compared a dual-purpose crop paddock, with a similar-sized pasture paddock and/or a control that is sown with the same dual-purpose crop variety. At some sites, livestock weight and/or condition scores were taken upon entry and exit of the sites with a comparison of these weights and final yields of crop analysed at the end of each season. Livestock were removed from each site before crops became too advanced where yield could be significantly impacted.

While results are from producer demonstration sites rather than research sites per se' the key findings from the project include:

- Grazing crops has the potential to increase profit between \$19/ha and \$30/ha depending on the yield penalty incurred by grazing
- Grazing small quantities of crop for short periods in mid-winter may substantially improve farm profitability. Grazing intensity (DSE / Ha), grazing duration and time of removal of livestock all have an impact on yield quantity
- Yield impact generally negatively increases if grazing is carried over to August and September in southern WA
- There are other benefits of crop grazing including resting of pastures to increase FOO, better establishment of new pastures and better management of twin-bearing ewes.
- Modelling indicates that the benefit of crop grazing increases as livestock prices increase, and grain prices decrease.

Only small changes to the whole farm strategy are likely to be needed, with the most significant being an increase in the stocking rate of the model farm, a decrease in the level of supplementary feeding needed and increasing pasture area.

Executive summary

Background

Producers in the Great Southern region of Western Australia face a re-occurring on-farm autumn feed gap. The MLA 'Benefits of Dual-Purpose Crops Producer Demonstration Site (PDS)' addressed the benefits of implementing dual-purpose crops within a mixed farming enterprise.

Dual-purpose crops such as long-season wheat, DS Pascal, fodder oats, barley, and triticale offer a solution by providing high-quality feed through grazing, reducing the need for supplementary feeding as well as still resulting in a competitive cash crop.

The main target audience for this demonstration included mixed farming enterprises, particularly the 80% of Southern Dirt members who are mixed farmers with flock sizes ranging from 2,000 to 5,500 breeding ewes, and some larger enterprises with around 7,000 ewes. These producers seek localised research data to enhance their production capabilities and overall farm profitability.

The results of the demonstration have provided valuable insights into the benefits of integrating dual-purpose crops into mixed farming systems.

Grazing crops provide high quality green feed for livestock and can typically be grazed between June to August. Green crops have a higher energy content than green pasture meaning a lower crop FOO is required to meet the livestock needs. There can however be a yield penalty associated with this activity. Crop grazing can be used in several possible ways to boost profitability including to:

- allow twin-bearing ewes to gain weight at the end of pregnancy leading to bigger lambs with higher chance of survival,
- increase stocking rate,
- reduce supplementary feeding cost and/or
- producing out-of-season finished lambs.

Objectives

By February 2024, the project aimed to:

1. Demonstrate and quantify the benefits of integrating dual-purpose crops into mixed farming systems to address the autumn feed gap with three new demonstration sites each year (9 in total). 1 in 2020, 3 in 2021, 3 in 2022, 2 in 2023
2. 80% of core producers will have adopted dual-purpose crops as a part of their whole farm management system.
3. 10% of Southern Dirt members will have adopted dual-purpose crops as part of a whole farm management (currently there is less than 5% of members using dual-purpose crops in their mixed farming enterprises)
4. Demonstrate the impact of grazing crops on harvest yield (kg/ha) and live weight gain (expected less than 10% yield penalty and 10% increase in liveweight gain (kg/hd/day) on dual-purpose crops compared to grazing pasture paddocks).
5. Conduct an economic analysis on grazing the dual-purpose crops which will include crop

yield and weight gain of sheep (considering factors such as reducing supplementary feed costs, crop yield penalties and weight gain)

6. Undertake communication activities (6 field walks and 2 events / workshops) to extend the results to encourage adoption of the practice by Southern Dirt members (target to increase knowledge and confidence in implementing grazing crops into farming management practices by a minimum of 80 farmers by 15%)

Methodology

Nine trial sites were established in the Southern Dirt region, including at Kojonup, Broomehill, Katanning, Darkan, and Boyup Brook over four consecutive years 2020-2023. Dual-purpose crops included differing varieties: DS Pascal wheat, Bennett wheat, fodder oats, barley, and triticale. The demonstration sites compared a dual-purpose crop paddock, with a similar-sized pasture paddock and/or a control that is sown with the same dual-purpose crop variety but not grazed. Assessments collected throughout the sites over the four years included forage availability (FOO), Normalised Difference Vegetation Index (NDVI), livestock weights, condition scores, grazing durations, grazing economics and final crop yield. The trial analysed stocking rates, seasonal conditions, weight gain, and crop yield impact. An economic analysis has been completed for all sites to quantify data, and to demonstrate the benefits of integrating dual-purpose crops in mixed farming systems.

Results/key findings

Across the nine Producer Demonstration sites in Western Australia's Great Southern region, dual-purpose crops showed significant benefits for mixed farming systems.

In terms of overall project site results, one site grazing William's oats, resulted in lambs gaining 341.95 g/head/day, compared to 215.84 g/head/day on pasture, exceeding expected growth rates. This highlighted the potential of short-term crop grazing to boost livestock growth while also allowing pastures to regenerate.

Trials have recorded varying yield penalties from 0.4% to 23% but the consensus is that the yield penalty is minimal if the crop is grazed early and lightly. Despite challenges such as delayed grazing affecting yield reductions at several sites, favourable spring conditions allowed for crop recovery and improved livestock conditions, showcasing the resilience and potential of dual-purpose crops in enhancing farm productivity and sustainability.

Overall, grazing crops increased profit between \$19/ha and \$30/ha depending on the yield penalty incurred by grazing. However, to maximise the benefits of crop grazing, other key management changes must be made.

The value of crop grazing significantly decreases for low livestock prices. At high grain prices light crop grazing is still profitable however profit drops significantly for higher grazing intensities.

Farmers can be confident that some crop grazing will be profitable regardless of the size of their cropping enterprise in a mixed-farming system.

In terms of the monitoring and evaluation process of producers involved, all core producers post project surveyed stated that participating in this PDS project had increased their knowledge of Dual-Purpose Crops. Eighty percent (80%) of core producers post project surveyed also said that it has increased their skills significantly while 20% stated that their skills were increased slightly. From the post project survey, we can also conclude that 60% of core producers stated they have made or intend to make other changes to their business as a result of participating in this PDS.

Benefits to industry

Dual-purpose crops help producers manage seasonal feed gaps more effectively, increasing the agricultural industry's resilience to climate variability and mitigating production risks. With correct management, grazing these crops results in minimal yield penalties, allowing for optimal livestock and crop production. This approach enhances overall productivity, provides a greater return on often underutilized land, and contributes to economic stability within the sector. Furthermore, the successful implementation and demonstration of dual-purpose crops encourages knowledge sharing and innovation, promoting a collaborative approach to farming challenges and sustainable practices, leading to a greater return on investment for the producer and industry.

Future research and recommendations

Based on the project findings, this project has shown that crop grazing can be profitable in certain circumstances. However, to improve crop grazing management guidance, further work can still be undertaken. Some gaps in data include:

How does yield penalty change for:

- different crops
- grazing severity
- grazing time
- on different soil types

Follow on impacts of crop grazing - several producers displayed concerns that crop grazing can increase weed seed set, and thus they avoid crop grazing in their continuous cropping paddocks.

Future research could be focused on optimising grazing timing within variable seasonal conditions, particularly exploring the impact of late starts/early warm finishes (non-optimal seasonal rainfall/weather/climate periods/conditions) or extended grazing periods on crop yields.

The observed higher yield penalties when grazing extended into August suggest a need for strategies to minimise such impacts, emphasising the importance of timely grazing management to maximize both crop productivity and livestock benefits.

Further research should also explore the optimal application of fertilisers/chemicals that enhance the recovery of dual-purpose crops, thereby maximising yields and reducing yield penalties post-livestock grazing.

PDS key data summary table

Project Aim: Demonstrate that dual-purpose cropping is a viable strategy to bridge the Winter feed gap and boost farm profitability in the Great Southern of WA.			
	Comments	Change	Unit
Production efficiency benefit (impact) Animal production efficiency - kg LWT/ha; kg LWT/DSE, AE or LSU Pasture productivity – kg DM/ha Stocking rate – DSE, AE or LSU/ha Reproductive efficiency – marking %, weaning % Mortality rate (%)	0.5-1 DSE/ha additional stocking rate when grazing crops.	0.5-1	DSE/WgHa
Reduction in expenditure Reduction in labour i.e. DSE/FTE, LSU/FTE, AE/FTE; Reduction in other expenditure	No change in labour per head. Reduction in supplementary feeding	0 25	DSE/FTE Kg/DSE
Increase in income	Meat and wool sales Reduced Supplement	\$76 \$20.5	/ha /ha
Additional costs (to achieve benefits)	Reduced yield	\$73.5	/ha
Net \$ benefit (impact)		\$23.0	/ha
Number of core participants engaged in project		8	
Number of observer participants engaged in project		400	
Core group no. ha		~ 20,624	
Observer group no. ha		~ 273,268	
Core group no. sheep		58,890	hd sheep
Observer group no. sheep		513,146	hd sheep
Core group no. cattle		0	hd cattle
Observer group no. cattle		0	hd cattle
% change in knowledge, skill & confidence – core	Graze crops to fill winter feed gap and increase carrying capacity.	100%	
% change in knowledge, skill & confidence – observer	Graze crops to fill winter feed gap and increase carrying capacity.	100%	
% practice change adoption – core	Graze crops to fill winter feed gap and increase carrying capacity.	100%	
% practice change adoption – observers	Graze crops to fill winter feed gap and increase carrying capacity.	80%	
% of total ha managed that the benefit applies to	% of total ha, available for crop grazing (this is less than the total crop area).	15-20%	
Key impact data			
Net \$ benefit /ha (total ha managed)	\$96.5/ha		
Gross Margin / Ha	\$23/ha		

Table of contents

Abstract	2
Executive summary	3
PDS key data summary table	6
1. Background	9
2. Objectives	9
3. Demonstration Site Design.....	10
3.1 Methodology	10
3.2 Economic analysis	13
3.3 Extension and communication	14
3.4 Monitoring and evaluation.....	14
4. Results	15
4.1 Demonstration site results	15
4.1.1 Site 1 – Kojonup District High School, Kojonup - Year 2020	15
4.1.2 Site 2 – Ben Webb, Qualeup – Year 2021	18
4.1.3 Site 3 – Rodney Hester, Bridgetown – Year 2021	19
4.1.4 Site 4 – Jeremy Kowald, Katanning – Year 2021	21
4.1.5 Site 5 – Ben Webb, Qualeup - Year 2022	23
4.1.6 Site 6 - Rodney Hester, Bridgetown – Year 2022	24
4.1.7 Site 7 – Kent Stone, Muradup - Year 2022.....	26
4.1.8 Site 8 - Ben & Emily Webb - 2023.....	27
4.1.9 Site 9 - Nathan & Didi Leitch	29
4.1.10 Summary of all sites.....	31
4.2 Economic analysis	32
4.3 Extension and communication	32
4.4 Monitoring and evaluation.....	34
5. Conclusion	38
5.1 Key Findings.....	38
5.1.1 Key findings of nine dual-purpose crop producer demonstration sites.....	38
5.1.2 Summary of Key Individual Site Findings Sites 1-9.....	38
5.2 Conclusion	40
5.3 Benefits to industry.....	40

6.	Appendix.....	41
6.1	Communication plan.....	41
6.2	Communication outputs	44
6.2.1	Newsletter & in-depth articles	44
6.2.2	Case studies	44
6.2.3	Southern Dirt Annual Research report	44
6.2.4	Social media.....	44
6.3	Monitoring, Evaluation and Reporting Plan.....	46
6.4	Knowledge, Skills, Practices & Adoption Surveys and Survey Results.....	48
6.4.1	Pre-Project Survey Template	48
6.4.2	Post Project Survey Template	52
6.5	Economic Analysis – Farm Optimisation Group	56

1. Background

Growers in Western Australia have become more aware and interested in the opportunities that long season wheats and other dual-purpose crops can provide to them in their mixed farming enterprises. Research has shown that a wide range of options exist to optimize future available feedstock. One of these options is dual-purpose crops, utilising long season wheat and other crops.

Livestock productivity in mixed livestock and cropping enterprises is often limited by a period of feed scarcity that extends from late autumn, when dry residues of crops and pastures from the previous growing season are being exhausted, through to early winter, when green feed is just commencing. Dual-purpose crops have been developed as a source of winter green feed, while still being a source of grain at harvest.

Grazing crops provide high quality green feed for livestock and can typically be grazed between June to August. Green crops have a higher energy content than green pasture, meaning a lower crop FOO is required to meet the livestock needs. There is however a yield penalty associated with this activity. Crop grazing can be used in several possible ways to boost profitability including to;

- i) allow twin bearing ewes to gain weight at the end of pregnancy leading to bigger lambs with higher chance of survival,
- ii) increase stocking rate,
- iii) reduce supplementary feeding cost,
- iv) produce out-of-season finished lambs,
- v) allow time for new pastures to establish, and
- vi) increase dry matter for later in the season

Since 2000, there has been a general increase in summer rainfall and a corresponding decrease in winter rainfall (AEGIC data 2018). Southern DIRT rainfall records show this is also the case for the growers in the High Rainfall Central Zone (HRCZ) of WA. As a result, not only are crop yields being affected, but there is a larger winter feed gap for livestock with grain supplementary feeding needed for longer. Grazing winter crops can be the key to mixed farming profitability and has started to gain traction through past programs.

Winter type wheats (long season) are easier to graze than spring wheats because they remain in a vegetative state for much longer. This means they can be grazed for longer periods of time compared to spring type wheats, with less risk of yield loss. Having early sown established wheat crops, could help address the autumn feed gap that growers face every year.

Eighty (80%) of Southern DIRT Members are mixed farming enterprises. Average flock size for these enterprises is 2000- 5500 breeding ewes, with a few larger enterprises with approximately 7,000 breeding ewes. Prior to the commencement of this project, these producers have requested research that can provide them localised information and data on the outcomes of grazing crops. The view was that this information could increase their production capabilities and whole farm profitability.

2. Objectives

The objectives of the project are that by February 2024, the project aims to:

1. Demonstrate and quantify the benefits of integrating dual-purpose crops into mixed farming systems to address the autumn feed gap with three new demonstration sites each year (9 in total). One in 2020, three in 2021, three in 2022, two in 2023.

2. 80% of core producers will have adopted dual-purpose crops as a part of their whole farm management system.
3. 10% of Southern Dirt members will have adopted dual-purpose crops as part of a whole farm management (currently there is less than 5% of members using dual-purpose crops in their mixed farming enterprises).
4. Demonstrate the impact of grazing crops on harvest yield (kg/ha) and live weight gain (expected less than 10% yield penalty and 10% increase in liveweight gain (kg/hd/day) on dual-purpose crops compared to grazing pasture paddocks).
5. Conduct an economic analysis on grazing the dual-purpose crops, which will include crop yield and weight gain of sheep (considering factors such as reducing supplementary feed costs, crop yield penalties and weight gain).
6. Undertake communication activities (6 field walks and 2 events/workshops) to extend the results to encourage adoption of the practice by Southern Dirt members (target to increase knowledge and confidence in implementing grazing crops into farming management practices by a minimum of 80 farmers by 15%).

At the completion of the project:

- Objective one has been achieved successfully, with all nine demonstration sites established. The benefits of integrating dual-purpose crops have been demonstrated and quantified effectively.
- Objective two has been achieved successfully, with over 80% adoption rate of dual-purpose crops among core producers as all host producers adopted dual-purpose crops as part of their farming practice.
- Objective three has been achieved successfully, with the adoption rate of dual-purpose crops among Southern Dirt members increasing from less than 5% to at least 10%.
- Objective four has been achieved successfully, with the impact of grazing crops demonstrated, resulting in less than a 10% yield penalty and a 10% increase in liveweight gain compared to grazing pasture paddocks.
- Objective five has been achieved successfully, with a comprehensive economic analysis conducted, demonstrating the economic benefits of grazing dual-purpose crops if carefully managed.
- Objective six has been achieved successfully, with the planned communication activities completed, resulting in increased knowledge and confidence among more than 80 farmers in implementing grazing crops into their farming management practices.

3. Demonstration Site Design

3.1 Methodology

Nine paired paddock trial sites were set up in total in the Southern Dirt region over a four-year period. The PDS core producer members successfully set up the sites.

The paired paddock demonstration usually consisted of one paddock in pasture and the other two were sown to a dual-purpose crop. The paddocks were a minimum of 5 to 10ha in size. These trials were set up in Kojonup, Broomehill, Katanning, Darkan and Boyup Brook. One dual-purpose variety was sown into each of the trial crop paddocks. Grazing varieties such as Accroc wheat, Bannister and

Williams oats, Moby barley and serradella, clover and ryegrass were the species included as feed options for the trial.

To compare crop grazing versus ungrazed crop and to quantify the impact of grazing, two grazing control options were available: 1: Fencing off half the paddock or 2: Pasture cages (1m²) 1- 2 per hectare to be spread throughout the cropped paddock (up to 8 in total). The control implemented was a pasture paddock with pasture cages used to monitor FOO and NDVI. The sheep may be supplementary fed depending on seasonal conditions (e.g. lack of rainfall).

The sheep were taken off the dual-purpose crops before the GS30 stage to avoid/minimise yield losses. In most cases the stock were weighed, and condition scored or just condition scored when entering and being removed from both the crop and pasture paddocks and the results compared. The trials were repeated at different locations in years two and three to compare the stocking rate, seasonal conditions, weight gained and impact on yield. Grazing time was monitored and recorded, and the economics of grazing crops have been determined.

At the time of harvest, crop yields were established by one of two methods; either machine harvest with yield determined by harvester yield monitor, or crop head counts and the hand harvesting of the heads. The heads were threshed, and grain weighed to establish the yield. 50% of heads in each pasture cage were harvested and the equivalent from the grazed crop area.

At the conclusion of the trials an economic analysis was conducted to quantify the data and demonstrate the benefits of integrating dual-purpose crops into mixed farming systems.

Year 1 - 2020

Site one: Kojonup District High School – Kojonup

- 195 – total Ha managed
- 1,300 – total number of sheep
- Williams Oats - Dual-purpose crop variety

The data recorded at site 1 included:

- Agronomic inputs
- Lamb entry/exit weights
- Kg/head live weight gain
- Days grazing
- DSE equivalent stocking rates
- Food on Offer assessments and square cuts
- NDVI recordings
- Grazed crop yield

In 2020, two other producer demonstration sites in Katanning and Boyup Brook were established, both seeded to the dual-purpose crop but they were deferred due to poor seasonal conditions. This is why the project went for four years, instead of three.

Year 2 - 2021

Site two: Ben Webb - Qualeup

- 2,150 – total Ha managed
- 6,700 – total number of sheep
- Winter wheat – dual-purpose crop variety

Site three: Rodney Hester – Bridgetown

- 900 – total Ha managed
- 3,750 – total number of sheep
- Bannister oats - dual-purpose crop variety

Site four: Jeremy Kowald – Katanning

- 2,117 – total Ha managed
- 3,000 – total number of sheep
- Moby barley seeded with serradella – dual-purpose crop variety

The data recorded at sites 2-4 included:

- Agronomic inputs
- Some entry/exit weights
- Some Kg/head live weight gain
- Days grazing
- DSE equivalent stocking rates
- Food on Offer assessments and square cuts (pasture and crops)
- NDVI recordings (pasture and crops)
- Grazed and un-grazed crop yield

Year 3 - 2022

Site five: Ben Webb - Qualeup

- 2,150 – total Ha managed
- 6,700 – total number of sheep
- Accroc winter wheat – dual-purpose crop variety

Site six: Rodney Hester – Bridgetown

- 900 – total Ha managed
- 3,750 – total number of sheep
- Bannister oats – dual-purpose crop variety

Site seven: Kent Stone – Muradup

- 2,450 - total Ha managed

- 1,450 - total number of sheep
- Accroc winter wheat – dual-purpose crop variety

The data recorded at sites 5-7, included:

- Agronomic inputs
- Some entry/exit weights
- Some Kg/head live weight gain
- Days grazing
- DSE equivalent stocking rates
- Grazed and un-grazed crop yield

Year 4 – 2023

Site eight: Ben Webb – Qualeup

- 2,150 - total Ha managed
- 6,700 – total number of sheep
- Accroc winter wheat – dual-purpose crop variety

Site nine: Nathan Leitch - Muradup

- Barley, clover and ryegrass – dual-purpose varieties

The data recorded at sites 8-9 included:

- Agronomic inputs
- Days grazing
- DSE equivalent stocking rates
- Condition scores
- Grazed and un-grazed crop yield

3.2 Economic analysis

Dual-purpose cropping was evaluated for a “typical” farming system in the Great Southern region of WA using averaged data from the trial sites in the project. A typical farm was analysed to enhance relevance for a broad audience of observer growers. Average crop grazing production data is utilised to account for seasonal variation, providing prospective growers with accurate medium-term costs and benefits of crop grazing.

A sensitivity analysis has been conducted to further enhance the applicability of these results to various circumstances. This analysis demonstrates how the value of crop grazing changes with fluctuations in livestock and grain prices, grazing intensity, and crop area.

Finally, the results presented in the economic analysis illustrate how farmers can effectively integrate crop grazing into their systems. Farms are highly interconnected systems, where altering the management of one aspect often impacts the optimal management of others. For example, the

inclusion of crop grazing is likely to influence optimal stocking rates, pasture/crop areas, and supplementary feeding.

Overall, the analysis demonstrated the expected average return farmers in the Great Southern region of WA can anticipate from crop grazing and provides guidance on how best to incorporate crop grazing into their current systems.

3.3 Extension and communication

A communication plan was developed for the project (see appendix 6.1). The following extension and communication vehicles were planned to engage and upskill participating producers and to extend the project progress and outcomes to the broader industry:

- Nine on farm producer demonstrations sites established to assess the use of dual-purpose crops for grazing to bridge the autumn feed gap, and the economic impacts
- Three on farm events - field walks/workshop
- Four case studies
- Three in-depth articles
- Pre and Post project surveys
- Numerous social media posts
- One economic analysis

3.4 Monitoring and evaluation

A monitoring, evaluation and reporting (MER) plan was developed for the project (see appendix 6.3).

The plan included:

- 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
- Entrance surveys of producers to benchmark current knowledge and skills in relation to the subject
- Benchmark current practices in relation to the subject
- Exit surveys of producers to enable assessment of changes in:
 - Reactions (perceptions, enthusiasm etc.) because of the project
 - Knowledge, Attitudes, Skills and Aspirations
 - Practices
- Extent of and impact from communication / extension activities outside of the PDS project participants

Engagement metrics measured:

- Pre and post project knowledge, skills and confidence
- Number producers directly and indirectly engaged
- Practice change – intended and actual

Productivity metrics measured or modelled:

- Production efficiency (Kg red meat / area unit)

- Production efficiency (kg red meat /dse)
- Pasture productivity (kg DM/ area unit)
- Stocking rate (DSE/ha)
- Labour efficiency (DSE / AE per labour unit or ha/AE per labour unit)

Profitability – Enterprise Indicators Cost of:

- Production (\$/ kg red meat)
- Gross Margin / Ha
- Gross Margin / dse or AE

Environmental metrics measured:

- Ground cover (%)

4. Results

4.1 Demonstration site results

4.1.1 Site 1 – Kojonup District High School, Kojonup - Year 2020

The Kojonup District Hight School (KDHS) Farm, made up of 195 Ha and manages approximately 600 merino ewes, along with a smaller number of crossbreds. Two (2) paddocks were selected for the project. The cropping paddock, “Red Dam”, was 25 hectares and the pasture paddock, “Orchard”, was 12 hectares. The sheep went from a condition score of 1-2 to a condition score of 2-3, with no significant difference seen between the two mobs (Table 1).

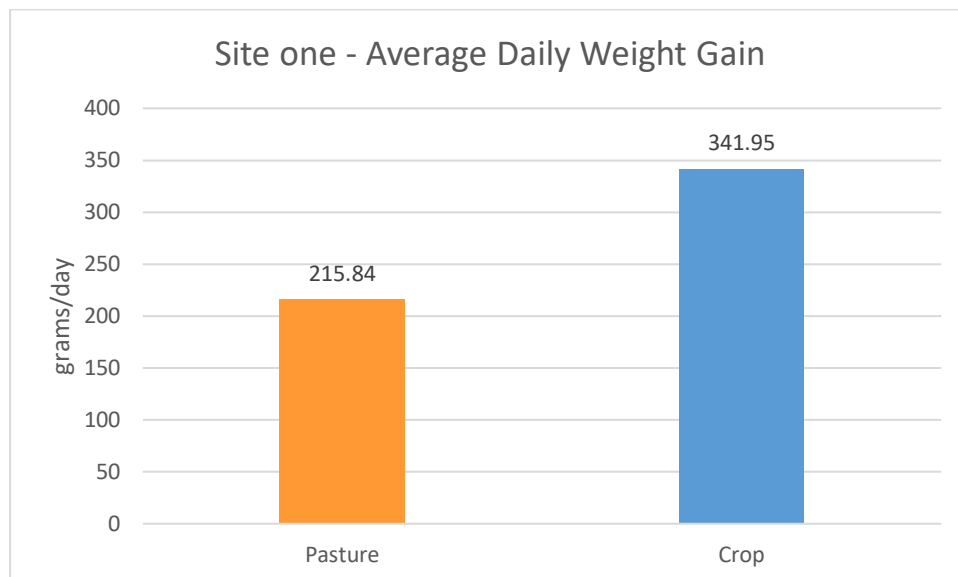
Table 1- Site one overall results

	Pasture	Crop
Hectares (ha)	12	25
Sheep In	75	144
Sheep Out	75	144
Stocking Rate (DSE/ha)	5.21	4.77
Average Initial Weight (kg)	40.25	39.03
Average Final Weight (kg)	43.06	43.82
Days Grazed	13	14
Total Weight Gain (kg)	2.81	4.79
Daily Weight Gain (g/day)	215.84	341.95
Daily Weight Gain (% of body weight)	.52%	.83%
Estimated Av Carcass Weight (@42%)	18.09	18.40
Condition Score In	1-2	1-2
Condition score Out	2-3	2-3

The sheep on the Williams oats crop paddock gained on average 341.95g/hd/day and the sheep on the pasture averaged a weight gain of 215.84g/hd/day (Fig. 1).

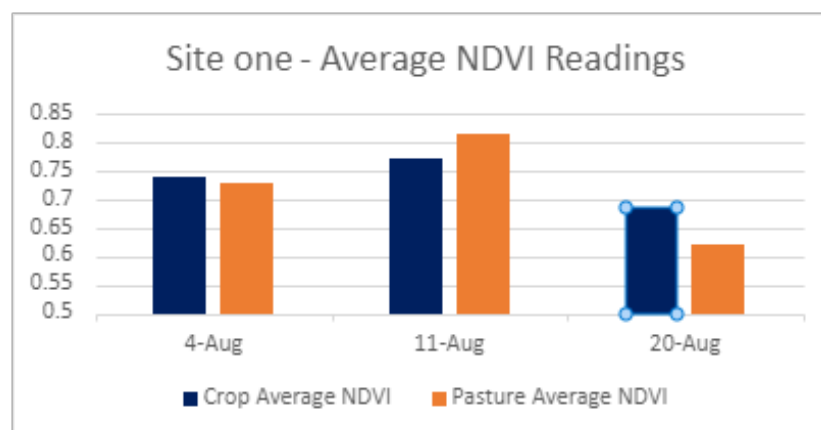
The final weights were very similar, but it was noted that the Williams oats crop mob had a slightly lower average initial weight. NDVI readings were taken weekly during the grazing phase of this project.

Figure 1- Site One average daily weight gain - Pasture vs Crop



2Stocking rates for crop grazing can be highly variable depending on the management targets of different operations. In this demonstration a light stocking rate of circa 5 DSE/Ha (4.77 and 5.21 DSE) was implemented (Table 1). From the FOO recordings, this stocking rate only had a limited impact on the crop. The crop was able to continue growing on average while under the grazing pressure for the 2-week period. It is therefore expected, under this strategy, the short-term light grazing would have little impact on the eventual crop yield. Although the NDVI improved one week after the lambs were put into the paddocks (Fig. 2) and then declined after the second week, suggesting the lambs were starting to reduce the FOO of both paddocks and that they were removed at the correct time.

Figure 2- Site One - Average NDVI readings - Pasture vs Crop



Food On Offer (FOO) assessments were taken during the grazing phase of this project (Table 2, Table 3)

Table 2 - Site one - Food on Offer results - Crop

Crop			
	Square Cut (DM kg/ha)	FOO Ruler (DM kg/ha)	Pastures From Space (DM kg/ha)
4-Aug	1500	900	500-750
5-Aug	1700	1100	500-750
11-Aug	1920	1600	750-1500
18-Aug	1850	1600	1000-1500

Table 3 - Site one - Food on Offer results - Pasture

Pasture		
	Visual (DM kg/ha)	Pastures From Space (DM kg/ha)
4-Aug	1000	750-1000
11-Aug	1000	750-1000
18-Aug	1000	750-1000

The daily benefit from grazing an oat crop with lambs during winter compared to a pasture is \$0.27/head/day (Table 4).

Table 4 - Site one - Weight gain benefit (500c/kg carcass weight)

	Pasture	Crop
Total live weight gain (kg)	2.81kg	4.79kg
Total carcass weight gain @ 42% yield	1.18kg	2.01kg
Daily Weight Gain (\$/head/day)	\$.45/head/day	\$0.72/head/day

The final yield of the grazed crop was 4.00 MT/Ha however the non-grazed crop yield was not recorded at the end of the season and therefore the cost benefit from the grazing is unable to be determined after year 1. From the actual yield, NDVI and FOO data it is predicted there would have been a minimal impact as the 4.00 MT/Ha yield is at the higher end of the expected range of an oat crop in Kojonup on a below average rainfall season.

Short term grazing of crops could give a boost to the growth rates of lambs compared to grazing pastures. Additional benefits from this management system include allowing the short-term resting of pastures enabling them to 'get away' during the slow growth period of winter. The strategy also allows increased carrying capacity as the total grazing capacity of the property increases through encompassing the crop paddocks. An additional benefit, looking at weight gain benefits (Table 4) is that the lambs will reach a sale weight earlier reducing the grazing pressure on the property.

4.1.2 Site 2 – Ben Webb, Qualeup – Year 2021

The Webbs planted 80 hectares of accroc wheat into one paddock. Pasture cages were introduced to allow an ungrazed component. Sheep were introduced at 20 DSE/ Ha for 32 days (Table 5).

Table 5 - Site two overall results

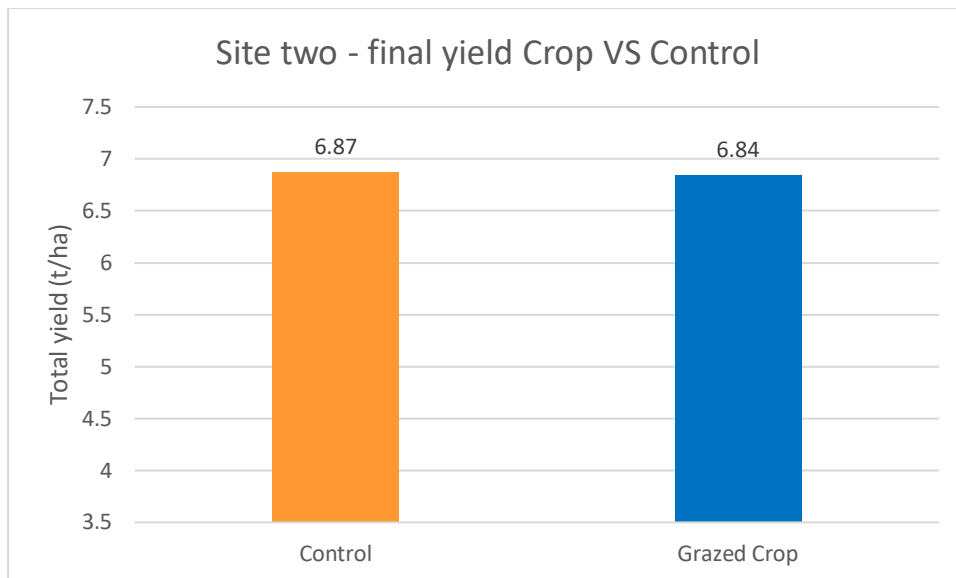
	Grazed Crop – Accroc Wheat	Control: Pasture Cages implemented into grazed crop
Hectares (ha)	80	
Sheep In	1600	
Sheep Out		
Date in	14 th June 2021	
Date out	16 th July 2021	
Stocking Rate (DSE/ha)	20	
Days Grazed	32	
Final yield (t/ha)	6.84 t/ha	6.87 t/ha

Control

- Grazing cages erected in crop to measure ungrazed yield

3Site two key findings:

- The grazing period was in line with best practice for this demonstration; June/July.
- The stocking rate of 20 DSE was below normal practice however this allowed for a longer grazing period of 32 days (Table 5).
- The grazed wheat yielded 0.40% lower than the ungrazed wheat. Grazed wheat at 6.84 T/Ha vs ungrazed wheat at 6.87 T/Ha (Fig. 3).
- The grazing of the hoggets allowed pasture to establish and increase FOO during the tight winter period of late June into July
- Early sowing is important to allow crops to establish itself to allow grazing in late June or early to mid-July.

Figure 4 - Site two - Final yield crop vs control

4.1.3 Site 3 – Rodney Hester, Bridgetown – Year 2021

The Hesters planted 4.5 hectares of Bannister oats. Pasture cages were introduced to allow an ungrazed component. Sheep were introduced at 40 DSE/ Ha for 11 days (Table 6). NDVI readings were taken pre and post grazing.

Table 6 - Site three - overall results

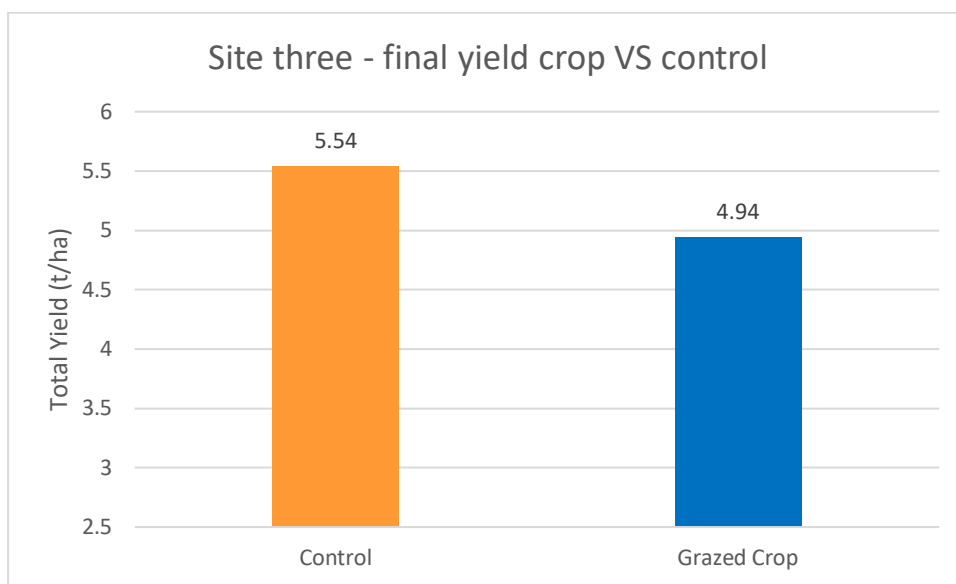
	Grazed Crop - Bannister Oats	Control: Pasture Cages implemented into grazed crop
Hectares (ha)	4.5	
Sheep In	136	
Date in	12th August 2021	
Date out	21st August 2021	
Stocking Rate (DSE/ha)	40	
Days Grazed	11	
Final yield (t/ha)	4.94 t/ha	5.54 t/ha

Controls

- Grazing cages erected in crop to measure ungrazed yield
- Pasture control paddock in place

Site three key Findings:

- Yield reduction due to grazing of 10.85% or 4.94T/Ha vs 5.54T/Ha (Fig. 4 and Fig. 5)
- Grazing period was later than preferred which impacted the final yield difference.
- By bringing the grazing period forward into July it is expected the impact on yield would be reduced to below 5%.
- Sheep grazing were ewes and lambs and therefore no weight gain data was recorded
- NDVI readings of crop vs control vs pasture are shown in Table 7. The impact of grazing can be seen
- Through crop grazing an increased area of crop can be planted within the total mixed farming operation while still maintaining the same livestock numbers.

Figure 5 - Site three - final yield crop vs control**Table 7 - Site three NDVI readings of crop vs control vs pasture**

	Oats - grazed	Oats - ungrazed	Pasture
Pre-grazing - 12 August	0.564	0.564	0.728
Post Grazing - 21 August	0.540	0.677	0.748

Figure 5 - site three immediately post grazing with grazing cage removed

4.1.4 Site 4 – Jeremy Kowald, Katanning – Year 2021

The Kowalds planted 1.61 Ha of a Moby barley and Serradella mix. Sheep were introduced at 42 DSE/Ha and grazed for 7 days (Table 8). Weights were taken pre and post-grazing.

Table 8 - Site four overall results

	Grazed Crop - Moby Barley & Serradella Mix	Control: half paddock fenced off
Hectares (ha)	1.61	
Sheep In	68	
Date in	13th August 2021	
Date out	20th August 2021	
Stocking Rate (DSE/ha)	42 DSE/ha	
Days Grazed	7	
Average Initial Weight (kg)	48.9kg	
Average Final Weight (kg)	50.0kg	
Average Daily Weight Gain (g/day)	0.157kg/day	
Final yield (t/ha)	1.5t/ha	1.7t/ha

Controls

- Paddock divided into 2 with one half grazed and the other ungrazed
- Pasture control paddock in place

Site four key findings:

- Yield reduction due to grazing of 11.77% or 1.5T/Ha vs 1.7T/Ha (Fig. 6).
- Grazing period was later than preferred which impacted the final yield difference .
- By bringing the grazing period forward into July it is expected the impact on yield would be reduced to below 5%.
- Ewe hogget achieved good weight gain of 157 grams/day while grazing the barley crop.
- There was no comparative pasture grazing result.
- Later sown crops can result in later grazing period which will increase impact on final yield.

Figure 6 - Site four final yield t/ha crop vs control

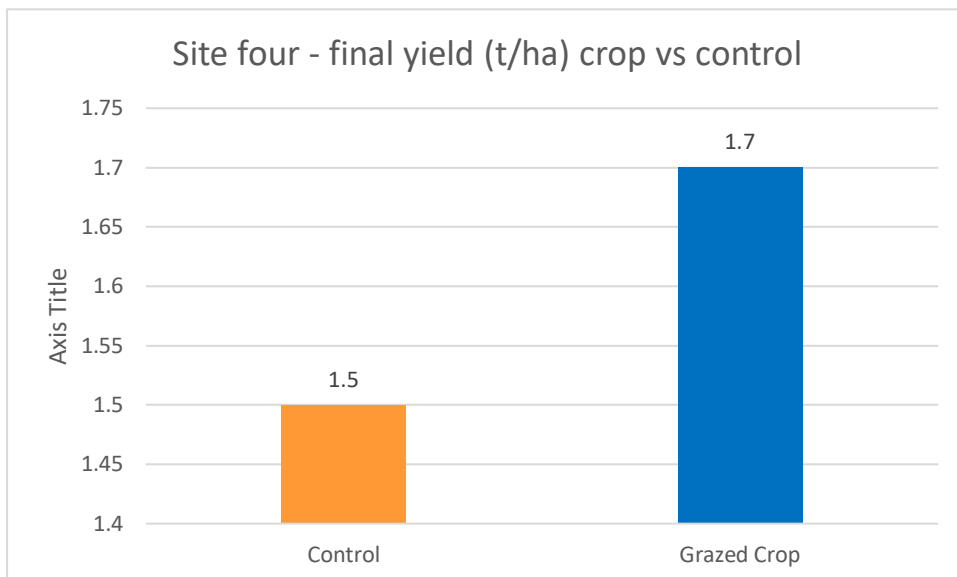


Figure 7 - Site four ewe hoggets pre grazing ready to weigh



4.1.5 Site 5 – Ben Webb, Qualeup - Year 2022

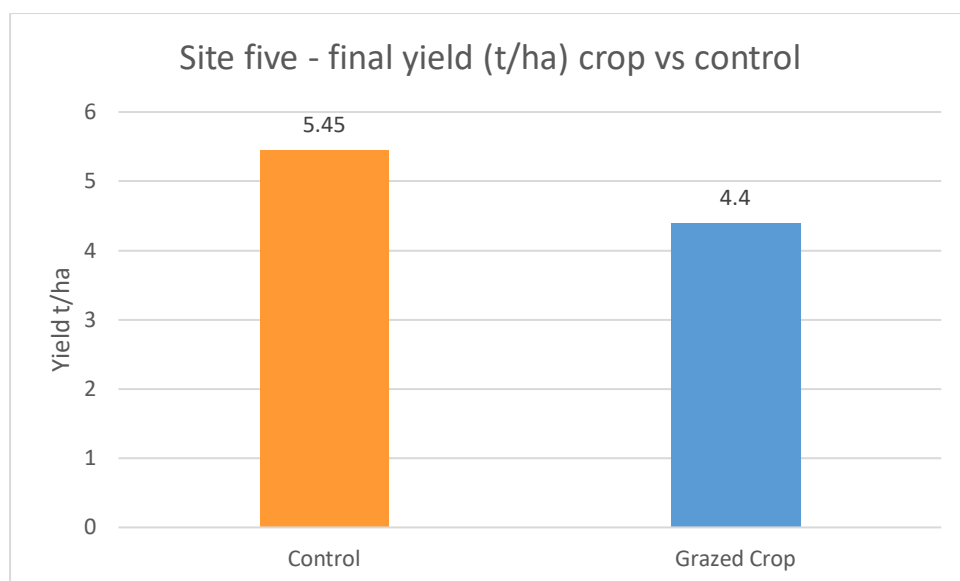
The Webbs planted 11 ha of accroc wheat. Ewes and lambs were introduced at a stocking rate of 8.3 DSE / Ha and grazed for 57 days (Table 9).

Table 9 - Site five - overall results

	Grazed Crop - Accroc wheat	Control: Pasture Cages implemented into grazed crop
Hectares (ha)	11ha	
Sheep In	54 ewes + 66 lambs	
Date in	1st July 2022	
Date out	26th August 2022	
Stocking Rate (DSE/ha)	8.3	
Days Grazed	57	
Final yield (t/ha)	4.4 t/ha	5.45 t/ha

Site five key findings:

- Yield reduction due to grazing of 23.8% or 4.40t/Ha vs 5.45t/Ha (Fig. 8)
- Grazing period was later than ideal due to poor winter seasonal conditions and the grazing needed to be extended
- Ideally the grazing period would have finished by the end of July.
- This demonstration show's producers the cost of extending crop grazing into late August
- Sheep grazing were ewes and lambs and therefore no weight gain data was recorded
- The good seasonal spring conditions allowed the grazed wheat to recover well and still deliver a good yield.
- Late sowing with the intention for grazing could have a better result with a higher seeding rate than 60 kg/Ha.

Figure 8 - Site five, final yield t/ha crop vs control

4.1.6 Site 6 - Rodney Hester, Bridgetown – Year 2022

The Hester's planted 7 Ha of Bannister oats. Cattle were introduced at a stocking rate of 40 DSE / Ha and grazed for 10 days. The paddock was divided into two to allow for a control (Table 10). No livestock weights were recorded.

Table 10 - Site six overall results

	Grazed Crop - Bannister Oats	Control: Half paddock fenced off from livestock
Hectares (ha)	7	
Cows In	20	
Date in	18th July 2022	
Date out	28th July 2022	
Stocking Rate (DSE/ha)	40	
Days Grazed	10	
Final yield (t/ha)	3.96t/ha	4.23t/ha

Controls

- Paddock divided into 2 with one half grazed and the other ungrazed

Site six key findings:

- Yield reduction due to grazing of 6.38% or 3.96t/Ha vs 4.23t/Ha (Fig. 9)
- The grazing period was just in the the preferred time window.
- Ideally the grazing period would have commenced earlier, mid-June, but crop development didn't allow for an earlier entry.
- Due to the short gazing period the grazing was uneven. The yield was taken from the grazed area
- Cattle grazing were cows and calves and therefore no weight gain data was recorded
- Through crop grazing an increased area of crop can be planted within the total mixed farming operation while still maintaining the same livestock numbers.

Figure 9 - Site six final yield t/ha crop vs control

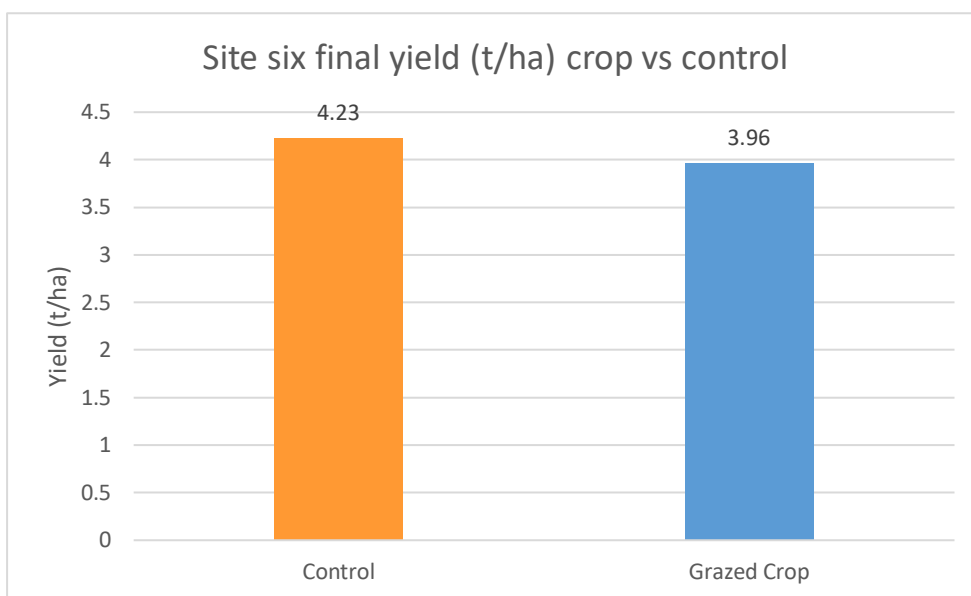


Figure 10 - Site six immediately post grazing with removal of cow and calf units



4.1.7 Site 7 – Kent Stone, Muradup - Year 2022

The Stone's planted 35 Ha of accroc wheat. Sheep were introduced at 12.8 DSE / Ha and grazed for 85 days (Table 11). No livestock weight gain data was recorded.

Table 11 - Site seven overall results

	Grazed Crop - Accroc Wheat	Control: Half paddock fenced off from livestock
Hectares (ha)	35	
Sheep in	300	
Date in	15th May 2022	
Date out	8th August 2022	
Stocking Rate (DSE/ha)	12.8	
Days Grazed	85	
Final yield (t/ha)	7.37	7.62

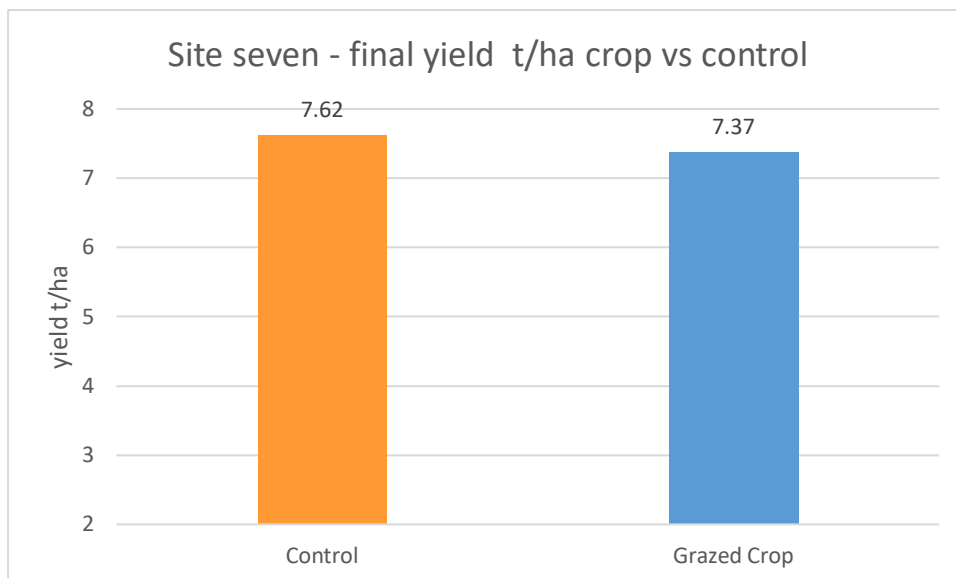
Controls

- Paddock divided into 2 with one half grazed and the other ungrazed

Site seven key findings:

- Yield reduction due to grazing of 3.4% or 7.37t/Ha vs 7.62t/Ha (Fig. 11).
- The grazing period was slightly later than preferred window (end of July) due to poor winter seasonal conditions and the grazing needed to be extended.
- The early sowing and good seasonal spring conditions allowed the grazed wheat to recover to nearly match the ungrazed wheat in terms of yield.
- The demonstration highlights to producers the benefit of early sowing and how this delivers flexibility through the season.
- Sheep grazing were ewes and lambs and therefore no weight gain data was recorded

Figure 11 – Site seven – final yield



4.1.8 Site 8 - Ben & Emily Webb - 2023

The Webb's planted four paddocks of accroc wheat totalling 70 Ha. One paddock of 30 Ha was ungrazed and acted as the control. Sheep were introduced at different stocking rates ranging from 11 to 25 DSE / Ha. Grazing was for 60 days. Sheep were condition scored in and out of grazing (Table 12).

Table 12 - Site eight overall results

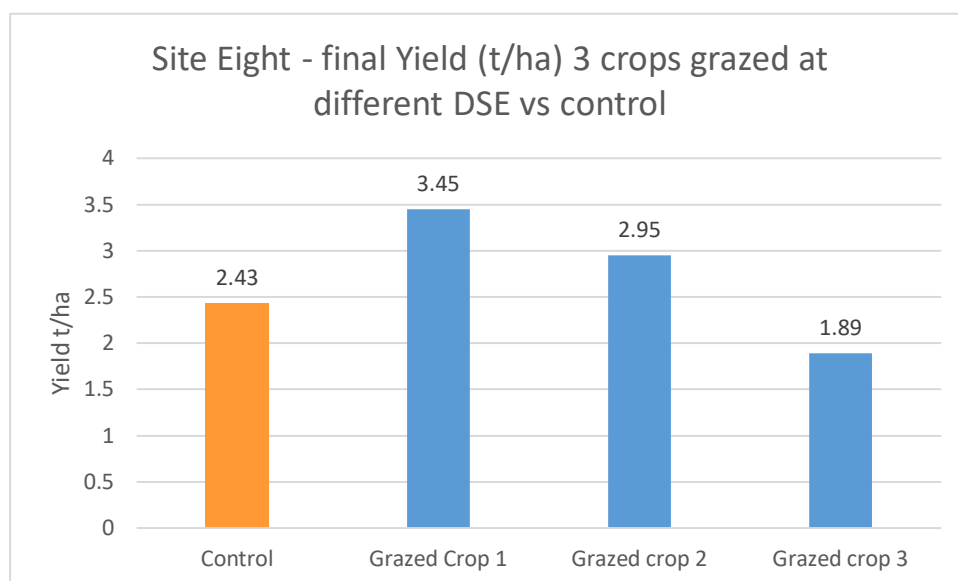
	Grazed Crop - Accroc Wheat	Grazed Crop - Accroc Wheat	Grazed Crop - Accroc Wheat	Control - ungrazed crop
Hectares (ha)	11	10.5	18.5	30
Sheep in	88	115	333	
Date in	15th June 2023	15th June 2023	15th June 2023	
Date out	14th August 2023	14th August 2023	14th August 2023	
Stocking Rate (DSE/ha)	11.2	15.3	25.2	
Days Grazed	60	60	60	
Condition score in	3	3	3	
Condition score out	3.3	3.2	3.1	
Final yield (t/ha)	3.45	2.95	1.89	2.43

Control:

Separate paddock left ungrazed

Site eight key findings:

- The ungrazed paddock did not perform as well with final yield due to paddock conditions being non wetting and very heavy gravel soils (Fig. 12).
- Sheep grazing were pregnant ewes, therefore no weight gain data was recorded.
- The good seasonal spring conditions allowed the grazed wheat to recover well and still deliver a quality yield on the lower DSE grazed paddocks.
- There was a clear impact of DSE / Ha and final yield – the higher the DSE the lower the yield.
- Late sowing with the intention for grazing could have a better result with a higher seeding rate than 70 kg/Ha.
- There was an increase in the Ewe's condition scores for all grazing paddocks and DSE.

Figure 12 - Site eight, final yield crops vs control

4.1.9 Site 9 - Nathan & Didi Leitch

The Leitch's planted 10 hectares of barley, clover and ryegrass. Stocking rate of the sheep that grazed the crop for 41 days was 15 DSE / Ha. Sheep were condition-scored pre and post-grazing (Table 13). No final yield was taken for the crop.

Table 13- Site nine overall results

	Grazed Crop - Barley, clover and ryegrass
Hectares (ha)	10
Sheep in	150
Date in	1st August 2023
Date out	10th September 2023
Stocking Rate (DSE/ha)	15
Days Grazed	41
Condition score in	2-3
Condition score out	3-4
Final yield (t/ha)	-

Site nine key findings:

- Sheep condition scores increased from an average of 2-3 on entry to 3-4 on exit over 41 days of grazing.
- Compared to other sites, there appears to be a positive correlation between the gain in condition score and the number of days grazed, indicating that extended grazing periods contributed to better condition of the sheep.

4.1.10 Summary of all sites

Table 14 - ALL sites overall results comparison table

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 8	Site 8	Site 9	Overall Average
Year	2020	2021	2021	2021	2022	2022	2022	2023	2023	2023	2023	
Additional costs (\$/ha)	-	0	0	0	0	0	0	0	0	0	0	0
Additional labour (hr/ha)	-	0	0	0	0	0	0	0	0	0	0	0
Yield penalty (kg/ha)	-	30	600	200	1050	270	250	-	-	-	-	400
Yield penalty (%)	-	0.40%	10.85%	11.77%	23.80%	6.38%	3.40%	-	-	-	-	9%
Estimated FOO (kg DM/ha)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Estimated DMD (%)	75%-80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
Stocking rate (DSE/ha)	4.77	20	40	42	8.3	40	12.8	15.3	25.2	11.2	15	22
Length of grazing period (days)	14	32	9	7	57	10	85	29	29	29	39	30.1
Weight gain (g/d)¹	341	100	100	157	100	100	100	110.667	55.3333	166	125	133
Estimated grazing (kg/ha)²	100	709	399	400	524	443	1206	513	665	455	713	542
Notes	No control crop				Crop grazed late into August			Control crop not accounted for	Control crop not accounted for	Control crop not accounted for	Didn't harvest	

¹ Where weight data was not collected it was assumed that average weight gain was 100g/hd/d based on information from LifeTime Wool trial findings.

² Estimated crop consumed was calculated as a function of stocking rate, grazing period and daily intake (based on maintenance energy requirement and energy for weight gain).

4.2 Economic analysis

The economic analysis can be found in the Appendix, (Appendix 8.3) and has also been attached on submission with this project.

In the economic analysis, dual-purpose cropping is evaluated for a “typical” farming system in the Great Southern region of WA using averaged data from the trial sites in the project. A typical farm is analysed to enhance relevance for a broad audience of observer growers. Average crop grazing production data is utilised to account for seasonal variation, providing prospective growers with accurate medium-term costs and benefits of crop grazing.

To further enhance the applicability of these results to various circumstances, a sensitivity analysis was also conducted. This analysis demonstrates how the value of crop grazing changes with fluctuations in livestock and grain prices, grazing intensity, and crop area. Finally, the results presented in this section illustrate how farmers can effectively integrate crop grazing into their systems. Farms are highly interconnected systems, where altering the management of one aspect often impacts the optimal management of others. For example, the inclusion of crop grazing is likely to influence optimal stocking rates, pasture/crop areas, and supplementary feeding needs.

Overall, this analysis demonstrates the expected average return farmers in the Great Southern region of WA can anticipate from crop grazing and provides guidance on how best to incorporate crop grazing into their current systems.

Key findings from the analysis include

- Grazing crops has the potential to increase profit between \$19/ha and \$30/ha depending on the yield penalty incurred by grazing.
- To maximise the benefits of crop grazing, other key management changes must be made. The level of adjustment to make depends on the grazing intensity. At a grazing intensity of 250 kg/ha the key management changes include increasing stocking rate by 0.5 DSE/ha, increasing pasture area by 8% and reducing supplementary feeding by 25 kg/DSE.
- The value of crop grazing significantly decreases for low livestock prices.
- At high grain prices light crop grazing is still profitable however profit drops significantly for higher grazing intensities.
- Farmers can be confident that crop grazing will be profitable regardless of the size of their cropping enterprise.

4.3 Extension and communication

2020:

The project was extended through numerous social media posts and two field walks which were held in 2020.

- The first on farm event was held in conjunction with DPIRD plus training days with students and growers covering field assessments and measurements

- A second event was held through a visit as part of the Southern Dirt Spring Field Day on the 10 October in which the information surrounding the project was presented to all attendee's to the day. There were 71 attendees to the Southern Dirt Spring Field Day made up of growers and industry representatives - <https://southerndirt.com.au/spring-field-day/>
- Copy of Facebook posts can be found in the Appendix, Appendix 8.1
- Copy of Twitter posts can be found in the Appendix, Appendix 8.1
<https://x.com/DirtSouthern/status/1319465534782640130><https://x.com/DirtSouthern/status/1319465534782640130> - Hyperlink Twitter article 23 October 2020 @DirtSouthern spring field day
- Trials review virtual field day YouTube link:
<https://www.youtube.com/watch?v=feWApXQoSAU&t=2s>
- Newsletter Article with project update: [Increasing Profits with Dual Purpose Crops PDS1.docx](#)

2021:

Field walk plus social media posts conducted through the spring field day season.

- Results delivered in annual trials booklet - [2022-Research Annual.pdf](#)
- Copy of Twitter posts can be found in the Appendix, Appendix 8.1
<https://x.com/DirtSouthern/status/1447789767861493764> - Hyperlink Twitter article 12 October 2021 Crop lunch- and chat around dual-purpose @meatlivestock and long season wheat @DirtSouthern spring field day.
- Newsletter article with project update: [The Dirt Vol7 Membership.pdf](#)

2022

Field walks and social media posts were conducted through the spring field day season.

- In depth article and communication update submitted to MLA
- One in-depth article produced and released via Southern Dirt web site.
- The project extended through numerous social media posts

2023

- In depth article and communication update submitted to MLA
- Data results from 2023 collated and analysed for PDS site 1,
- PDS site 2 results will be included in the Final technical report

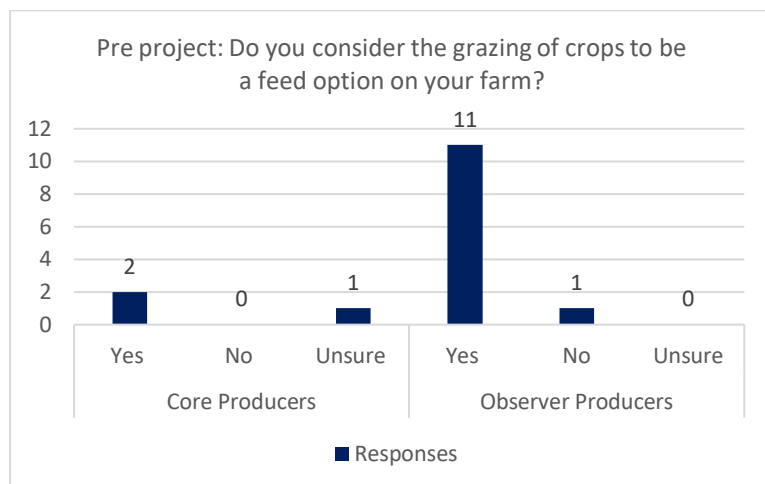
All corresponding documents have been attached separately with submission of this report.

4.4 Monitoring and evaluation

Pre and post-project surveys were conducted to determine changes in knowledge, skills, etc, as well as practice change. Summarised results are provided below.

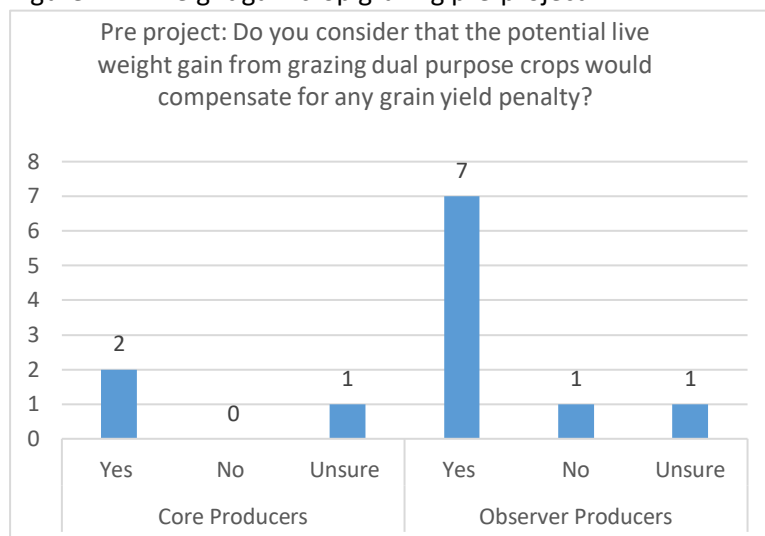
Eighty seven percent of producers surveyed pre project stated they consider grazing of crops to be a feed option on their farm, with 100% of core producers surveyed post project stating they consider Dual-Purpose crops to be an alternative management tool to replace the supplementary feeding of stock in autumn/winter (Fig. 13).

Figure 13 – Crop grazing feed option pre-project



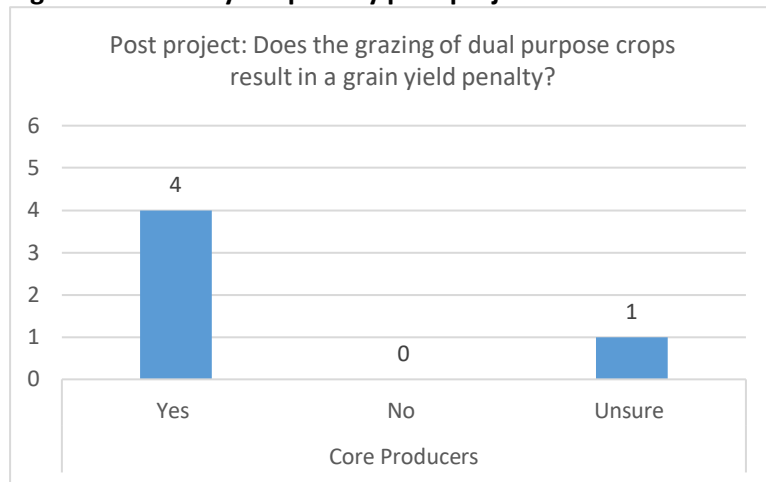
Seventy five percent of producers thought that the potential liveweight gain from crop grazing would compensate for any yield losses (Fig. 14).

Figure 14 – Weight gain crop grazing pre-project



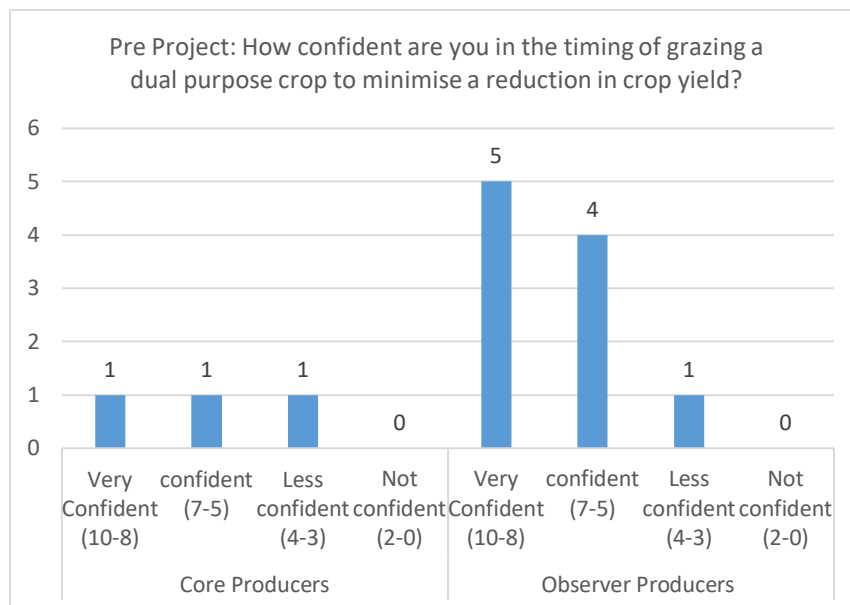
Eighty percent of core producers surveyed post-project state that grazing of dual-purpose crops results in a grain yield penalty (Fig. 15). This is also supported by the overall key findings of the project.

Figure 15 – Grain yield penalty post-project



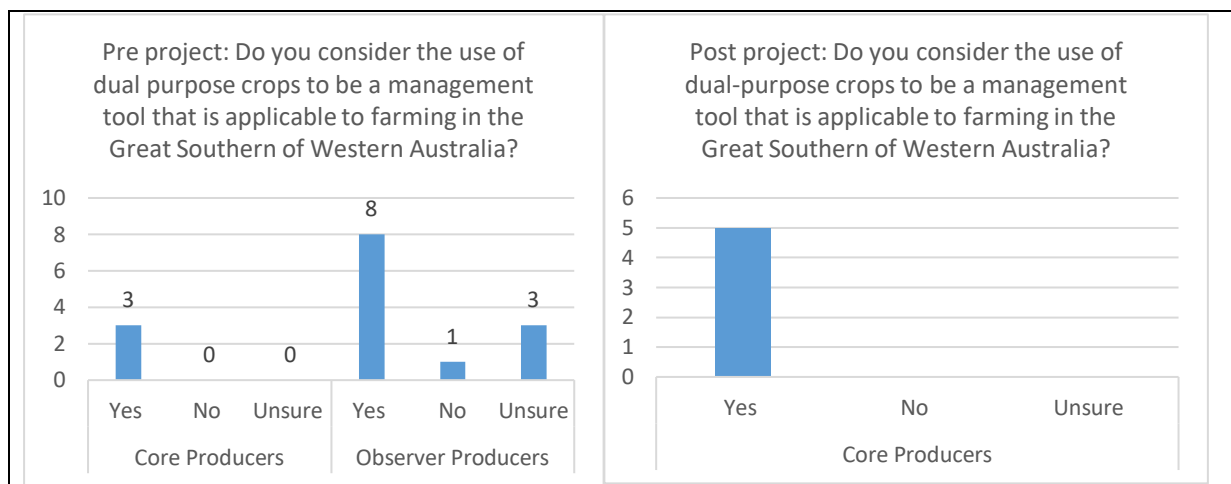
Eighty-two percent of producers were very confident or confident in the timing of grazing to minimise the impact of grazing on crop yields (Fig. 16)

Figure 16 – Confidence in time of grazing dual-purpose crop



Pre-project surveys show that 73% of producers consider the use of dual-purpose crops to be a management tool that is applicable to farming in the Great Southern of Western Australia. Post-project, this lifted to 100% (Fig. 17).

Figure 17 – Crop grazing as a management toll – pre and post-project



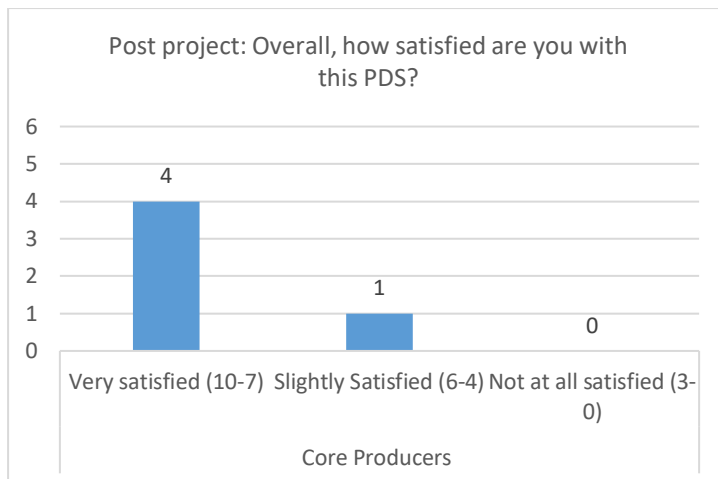
Supporting comments from these producers included:

- *That dual-purpose crops make more options available such as utilising weedy paddocks*
- *Enabling the ability to eliminate supplementary feeding programs*
- *With early sowing and the right management, it will increase profits by reducing supplementary feed costs*
- *It's applicable when seasons break early*
- *When it is managed correctly*

One hundred percent of core producers surveyed post-project agreed that the use of dual-purpose crops to be a management tool that is applicable to farming in the Great Southern of Western Australia. Supporting comments from core producers being:

- *Increase production in frost prone areas that would not normally be cropped/seeded.*
- *The rainfall in our area allows for dual-purpose cropping to be implemented, it has benefits for mixed enterprises in high rainfall regions*
- *Dual-purpose cropping is suited to multiple mix enterprise productions within the high rainfall region depending on the seasonal conditions and market needs.*
- *With the correct seasonal weather conditions and market needs dual-purpose cropping is applicable.*
- *Dual Purpose cropping is an economical method of feeding stock during autumn.*

All core producers post-project rated this PDS to be satisfied in assisting producers to manage their livestock enterprise (Fig. 18). Eighty percent of producers were very satisfied, rating either a 7 or above out of 10, with 20% of producers slightly satisfied with the PDS rating of 6/10. All core producers post-project said they would recommend MLA's PDS program to others. Sixty percent (60%) of core producers post-project also stated they have made or intend to make other changes to their business as result of participating in this PDS.

Figure 18: Satisfaction with PDS project

All core producers post-project surveyed stated that participating in this PDS project has increased their knowledge of Dual-Purpose Crops. Eighty percent (80%) of core producers post-project surveyed also said that it has increased their skills significantly. Twenty percent (20%) stating their skills were increased slightly.

Post-project surveys show that 60% of core producers intend to make changes to their business as a result of participating in this PDS, with comments being:

- *Yes, I am implementing grazing barley for 2024 season as a dual-purpose crop for ewes & lambs*
- *Look at variety differences in the future, including oats*
- *Dual-purpose crops have given another tool to include in my management of mixed enterprises*

Post project, 40% of core producers stated they will not make any changes with comments being:

- *Dual-purpose crops do not currently fit into our production as the production utilises confinement feeding currently.*
- *No, we use dual-purpose crops for our system already but will not make further changes*

Producer feedback/comments:

Feedback gained while taking surveys of the producers that hosted the PDS was that for the producer to implement /adopt dual purpose grazing crops into a mixed enterprise:

- The decision to sow dual-purpose crops had to be made relatively early/ same time as the broadacre production plan developed so the selected paddocks were able to be prepared appropriately to maximise the return on investment (fertiliser/ pre-emergent herbicides etc.), and time of sowing to reduce the yield penalty though maximise the grazing capacity.
- Post harvest land management – soil testing – nitrogen application etc. for the next growing season. (similar to any cereal crop management).
- One producer confirmed that they are very satisfied with the improvement in weights for his ewes and plans to use dual-purpose crop and grazing techniques again in the future. They found that they would include calcium in the ewe's diets before and during grazing, since red wheat is low in calcium, which could be problematic for pregnant and lactating ewes. They

are considering also including sub-clovers and/ or vetch to give the livestock in confinement a better and more balanced diet.

- Greater assistance and support with a prior plan for getting the PDS sorted to assist the host better, including more help with organising seed, fertilizer, spreading, and paddock preparation.
- Some producers haven't replicated this PDS on large scale due to seasonal reasons.
- Some producers have never used dual-purpose crops before but believe it is worth trying when the price of sheep is high.

5. Conclusion

5.1 Key Findings

5.1.1 Key findings of nine dual-purpose crop producer demonstration sites

- Grazing crops can potentially increase profit by between \$19/ha and \$30/ha as a result of increasing live weight gain of stock. Potential profit depends on the yield penalty incurred by grazing.
- However, to maximise the benefits of crop grazing, other key management changes must be made. The level of adjustment to make depends on the grazing intensity.
- At a grazing intensity of 250 kg/ha the key management changes include increasing the stocking rate by 0.5 DSE/ha, increasing pasture area by 8% and reducing supplementary feeding by 25 kg/DSE.
- Grazing intensity (DSE / Ha), grazing duration, and time of removal of livestock all have an impact on yield quantity
- Yield impact negatively increases if grazing is carried over to August and September in WA
- There are other benefits of crop grazing including resting of pastures to increase FOO, better establishment of new pastures and better management of twin-bearing ewes.
- Modelling indicates that the benefit of crop grazing increases as livestock prices increase, and grain prices decrease.

5.1.2 Summary of Key Individual Site Findings Sites 1-9.

Site 1:

Lambs grazing William's oats gained 341.95 g/head/day, outperforming those on pasture at 215.84 g/head/day. This growth exceeded DPIRD's expectations, showcasing the benefits of short-term crop grazing for lamb growth and pasture resting, with minimal crop impact at 5 DSE/Ha stocking rate.

Site 2:

- Grazing in June-July at 20 DSE for 32 days resulted in a minimal 0.40% yield penalty, with wheat yields nearly identical for grazed and ungrazed plots.
- Early sowing facilitated effective grazing and improved pasture FOO, enhancing farm efficiency and sustainability.

Site 3:

- Grazing wheat later than preferred reduced yields by 10.85%, though shifting grazing to July could lower this to below 5%.
- Despite yield reduction, pasture FOO improved by 500 kg DM/Ha, supporting increased crop area while maintaining livestock numbers.

Site 4:

- Grazing barley later than preferred led to an 11.77% yield reduction.
- Adjusting grazing to earlier in the season could minimise yield penalties to below 5%.
- Ewe hoggets gained 157 g/day, highlighting crop grazing's benefits for livestock growth and farm productivity.

Site 5:

- Late grazing due to poor winter conditions caused a 23.8% yield reduction, with grazed wheat yielding 4.40 MT/Ha versus 5.45 MT/Ha for ungrazed.
- The trial suggests late sowing with higher seeding rates could improve outcomes, despite respectable yields after spring recovery.

Site 6:

- Grazing within the preferred window led to a 6.38% yield reduction, with grazed wheat yielding 3.96 MT/Ha compared to 4.23 MT/Ha for ungrazed.
- Despite uneven grazing, the trial highlighted crop grazing's potential to increase crop area while maintaining livestock numbers.

Site 7:

- Slightly late grazing into August resulted in a 3.4% yield reduction, with grazed wheat yielding 7.37 MT/Ha versus 7.62 MT/Ha for ungrazed.
- Early sowing and favourable spring conditions helped grazed wheat recover, demonstrating the benefits of early sowing for yield flexibility.

Site 8:

- Grazed wheat on good soils performed better than ungrazed paddocks on poorer soils.
- Despite challenges, crops yielded well, and ewe condition scores improved.
- However, there was a considerable impact on crop yield from increasing grazing pressure (DSE / Ha)
- The farmer planned to continue using dual-purpose crops with dietary adjustments for balance.

Site 9:

- Sheep condition scores improved significantly from 2-3 on entry to 3-4 on exit over 41 days of grazing.
- No measurement of impact of grazing on crop yield was taken.

5.2 Conclusion

The project has demonstrated that dual-purpose crops have the potential to assist producers to manage seasonal feed gaps more effectively, which may in turn help contribute to farm profit. With the correct management, grazing crops has resulted in minimal yield penalties, allowing for optimal livestock and crop production. Enhancing overall productivity, providing a greater return on often underutilized land, can contribute to economic stability within the sector.

The successful implementation and demonstration of dual-purpose crops has encouraged knowledge sharing and innovation, promoting a collaborative approach to farming challenges and sustainable practices, leading to a greater return on investment for producer's and industry.

Grazing small quantities of crop for short periods in mid-winter may substantially improve farm profitability. This conclusion is largely unchanged for a range of scenarios of grazing quantity and the loss in yield that could result from grazing.

Only small changes to the whole farm strategy are likely to be needed, with the most significant being an increase in the stocking rate of the model farm, a decrease in the level of supplementary feeding and increasing pasture area.

The project has delivered strong practical applications to producers in the Great Southern Region of Western Australia and beyond as it has produced a diverse range of strategies for dual-purpose crops and the best practice results that can be expected when grazing these crops.

5.3 Benefits to industry

Integrating dual-purpose crops into mixed farming systems can enhance farm productivity and sustainability. By prioritising early sowing and effective grazing management, producers can establish resilient crops and optimise livestock performance, gaining a greater profit on property. This approach not only stabilises feed supply during critical periods but also reduces reliance on external inputs, thereby lowering production costs and enhancing economic resilience.

Key challenges identified included the need to refine grazing timing to minimise yield penalties and variability in crop and livestock performance across different sites and seasons in the Great Southern region. These challenges highlight the importance of targeted research and extension services to optimise grazing timelines and improve system adaptability. The project's successes in enhancing pasture health through resting periods using dual-purpose crops and demonstrating the economic benefits of dual-purpose cropping systems highlight its potential to benefit the wider red meat industry.

6. Appendix

6.1 Communication plan

Communications Plan: Producer Demonstration Sites

Project name L.PDS. 1904 Increasing Profits with Dual Purpose Crops

Date: 31-05-2019

Project overview

MLA Program Manager	Alana McEwan Brown (Russell Pattinson – PDS national coordinator)
Project objectives	By January 2022, the project aims to: 1. Demonstrate and quantify the benefits of integrating dual purpose crops into mixed farming systems to address the autumn feed gap with three new demonstration sites each year (9 in total). 2. 80% of core producers will have adopted dual purpose crops as a part of whole farm management 3. 10% of Southern Dirt members will have adopted dual-purpose crops as part of a whole farm management (currently there is less than 5% of members using dual purpose crops in their mixed farming enterprises) 4. Demonstrate the impact of grazing crops on harvest yield (kg/ha) and live weight gain (expected less than 10% yield penalty and 10% increase in liveweight gain (kg/hd/day) on dual purpose crops compared to grazing pasture paddocks). 5. Conduct an economic analysis on grazing the dual-purpose crops which will include crop yield and weight gain of sheep (considering factors such as reducing supplementary feed costs, crop yield penalties and weight gain) 6. Undertake communication activities (6 field walks and 2 events / workshops) to extend the results to encourage adoption of the practice by Southern Dirt members (target to increase knowledge and confidence in implementing grazing crops into farming management practices by a minimum of 80 farmers by 15%)

What are the 'outcomes' for producers?	1. Increase knowledge and confidence in implementing grazing crops into farming management practices 2. Increased adoption of dual-purpose crops for grazing
Measure of success of communication plan and / or activities (KPIs and how measured)	Refer to MER plan but will include: • Pre and post surveys of core and observer participants before and after project • Recording and analysis of trial data to measure economic and productivity performance metrics • Field days held • Media events/outputs • Case studies written
Primary audience (include regions/species)	Core producers and observers: Southern Dirt Members
Secondary audience (include regions/species)	Non members in the Great Southern Region of WA

Communications Plan / Activities

Activity	Responsibility	Target Audience	Key messages and must-have elements	Timing	Estimated reach
Field walks 2 per year	Southern dirt personnel	Core producers and observers	On-site field walk and discussion of results to date	June/July October/November	80 – 100 producers per year
Workshop: year 2 and 3	Southern dirt personnel	Core producers and observers Non-member audience	Discuss findings of demonstration sites Consultant/ agronomist involvement	July 2020, 2021	80-100 producer members plus wider audience
In-depth article-1 per year	Southern dirt personnel	Core producers and observers Non-member audience	Dual purpose crop varieties discussion. Current best practice for grazing of dual-purpose crops. Will have linkage to other PDS in the area – such as Agpro management	October/November	80-100 producer members plus wider audience
Case study-1 per year	Southern dirt personnel	Southern dirt members	Interview of producer who grazes dual purpose crops- benefits and negatives	October	500 Southern Dirt members

Social media	Southern dirt personnel	Producers	Photos and updates of trial sites	Ongoing	Wider community
Producer guides/fact sheets	Southern dirt personnel	Core producers and observers	Summary of benefits of crop grazing from demonstration sites and providing a 'how to' guide for crop grazing	At the end of the project	500 Southern Dirt members plus wider audience
Other – media releases and trial booklet	Southern dirt personnel		Regular media updates will be given throughout the project. Results will be published in Southern Dirt's annual trials booklet	Ongoing	500 Southern Dirt members plus wider audience

6.2 Communication outputs

6.2.1 Newsletter & in-depth articles

- [Article – Increasing profits with dual-purpose crops - 2021](#)
- [Article – Winter wheats the ideal dual-purpose crop –2022](#)
- [Article – Implementing dual-purpose cropping and grazing in the high rainfall zone of southern Western Australia - 2024](#)
- [Newsletter Article: The Dirt Newsletter Vol 6](#)
- [Newsletter Article: The Dirt Newsletter Vol 7](#)

6.2.2 Case studies

- [Case Study: Increasing crop area while maintaining breeders with dual-purpose crops – January 2022](#)
- [Case Study: PDS host, Ben Webb 2024](#)

6.2.3 Southern Dirt Annual Research report

- [2022 Southern Dirt annual research report](#)

6.2.4 Social media

12 October 2021 Crop lunch- and chat around dual-purpose @ meatlivestock and long season

Southern DIRT
4 Aug · 🌐

Today Project Officer Mel spent time at the Kojonup District High School farm for our Meat & Livestock Australia invested Dual Purpose Crops project. Today students practiced their data recording and livestock handling as we collected the baseline weights and condition score of the sheep. Next stages will be recording FOO and NDVI readings weekly whilst the sheep are on the trial. A huge thank you to Gary Mitchell and Troy Hornby for providing weigh scales and mentoring the students to weigh the mobs. Thank you to students Thyla and Emelia for recording sheep data and to students Brodie, Zaide and Flynn for their excellent sheep handling skills. And thank you to farm manager Brandon Holland for coordinating an excellent morning.



Southern DIRT
13 Aug · 🌐

Today project officers Mel & Sheridan were given the opportunity to present to the Kojonup District High School year 8 students their knowledge about grazing crops & pastures in regards to the Meat & Livestock Australia Dual Purpose Crops project which Kojonup District High School farm is kindly hosting for us.

Discussions were around how grazing crops can have benefits such as addressing the autumn-winter feed gap for sheep, how project officers are going to calculate the benefits of grazing crops and how it fits in with STEM. We also discussed growth stages, counting tillers, crop development, project management and shared scientific knowledge with the students.

The students learnt how to determine when the crops are ready to begin grazing and the different growth stages of cereal crops.

It was great to have involvement from so many keen future farmers, we look forward to working with KDHS for the remainder of the project and beyond!

#MLA #greatsouthern #futurefarmers #womeninag #agronomy #agriculture #southerndirt #sheep #livestock #grainandgraze #westernaustralia



Southern DIRT
18 Aug · 🌐

Another fantastic day working with students to collect weight data for our Meat & Livestock Australia invested Dual Purpose Crops project at the Kojonup District High School farm.

A huge thank you to teacher Mel Shepherd and students Oliver, Alex, Georgia and Ollie for spending time after school to finalise the weighing. Was a pleasure to work with such enthusiastic students!

#careersinag #MLA #greatsouthern #futurefarmers #womeninag #agronomy #agriculture #southerndirt #sheep #livestock #grainandgraze #westernaustralia #communitylove #teachersrock



Carla Green and 11 others · 5 Shares

Like Comment Share

724 people reached >

Boost Post

Southern DIRT
19 Aug · 🌐

This week is the second week the sheep have been on the Meat & Livestock Australia invested Dual Purpose Crops project at Kojonup District High School's farm site. We were fortunate enough to learn more about animal nutrition, crop grazing and withholding periods from Dr Danny Roberts from Department of Primary Industries and Regional Development - DPIRD. The sheep will be removed early next week and reweighed so we can crunch some numbers. Please let us know if you would like us to organise a pop up field walk for this site.

Early learning from this project include

- Grazing crops allows resting pastures
- Needing the right season i.e an early break
- Choosing longer season crops and seeding early
- Utilizing smaller paddocks to graze with higher stocking densities



Sheridan Kowald and 9 others · 4 Shares

Like Comment Share

639 people reached >

Boost Post

SouthernDIRT @DirtSouthern · Oct 12, 2021

Crop lunch- and chat around dual purpose @meatlivestock and long season wheat @DirtSouthern spring field day



wheat @DirtSouthern

12 October 2021 Crop lunch and chat around dual purpose @meatlivestock and long season wheat @DirtSouthern



October 23rd, 2020, Spring Field day

6.3 Monitoring, Evaluation and Reporting Plan

MER Plan: Producer Demonstration Sites

Project name: L.PDS. 1904_Increasing Profits with Dual Purpose Crops

Date: 31-5-2019

Evaluation level	Project Performance Measures	Evaluation Methods
Inputs – What did we do? <i>Describe the planned and expected inputs involved in your project, including funds, resources, development & projects structures</i>	• Number of core producers involved in demonstration sites & their demographics • Number of head of livestock involved • Area (ha) involved • Project steering committee decisions and notes • 9 on fam PDS over 3 years: to demonstrate the use of dual-purpose crops to bridge the autumn feed gap. • Sheep weighed and conditioned scored in and out of grazing pasture and crop • Pasture and crop monitoring during grazing • Crop yield measured: grazed and ungrazed • 2 on farm events held each year • Other extension activities: newsletter, case studies, social media	• 8 core producers involved • Steering committee meeting notes • 9 sites selected - details and locations • Record of events
Outputs - What did we do? <i>Describe the outputs planned/expected from your project, including engagement activities & products from demonstration sites</i>	• Practical demonstrations of the use of dual-purpose crops for grazing to bridge the autumn feed gap, and the economic impacts • Crop yield data: grazed and ungrazed • Live weight gain: comparison between grazing pasture and dual-purpose crops	• Trial evaluations and results recorded and reported such as ○ DSE ○ Kg/head live weight gain ○ NDVI and FOO recordings

	• Field walks- 2 per year • 3 Case studies • 3 in-depth articles • 2 workshops • 1 producer guide • Social media - numerous	○ Crop yield data- grazed and ungrazed • Project records / reports on dissemination of information to producers via site visits, field walks, case studies and other extension outlets
Changes in knowledge, attitudes and skills - How well did we do it? <i>Describe the changes in KASA that you are planning to achieve.</i>	• Pre and post surveys- core producers and observers • 100% of core producers will have good working knowledge and understanding of how dual-purpose crops can be utilised as a part of a whole farm management system. • 15% increase in knowledge and confidence by observer producers in implementing grazing crops	○ Core participant surveys- pre and post responses ○ Observer surveys- pre and post responses
Practice changes – Has it changed what people do? <i>Describe the practice changes that you are expecting to achieve by the end of your project</i>	• 80% of core producers will have adopted dual-purpose cropping • 10% of Southern Dirt members will have adopted dual-purpose crops as part of a whole farm management (currently there is less than 5% of members using dual-purpose crops in their mixed farming enterprises)	○ Core participant surveys- pre and post responses ○ Observer surveys- pre and post responses
Benefits – Is anyone better off? <i>Describe the benefits that you are expecting to achieve as a result of the project</i>	• Data collection to allow BCA – covering live weight gains, grazing measurements, grain yield data, reductions in supplementary feeding, costs etc.	Benefit-cost analysis completed covering factors such as ○ Pasture efficiency metrics ○ Weight gains of livestock ○ DSE improvements ○ Grain yield
General observations/outcomes – Is the industry better off?	• Capture of key learnings • Capture of unexpected consequences • Changes by the wider group of crop grazing over time	○ Survey of steering committee ○ Final report ○ MLA subsequent surveys

6.4 Knowledge, Skills, Practices & Adoption Surveys and Survey Results

6.4.1 Pre-Project Survey Template



MLA Producer Demonstration Sites

Core Participants Survey

PDS Name: Increasing Profits with Dual Purpose Crops

PDS Code: L.PDS.1904

The following questions are used to determine your current level of use and understanding of Grazing *Dual Purpose Crops*. The knowledge and skills audit is used at the start and completion of the program to allow individuals to track their 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

- a. Property name.....
- b. Business / trading name.....
- c. Property address.....
- d. Postal address.....
- e. Email address.....
- f. Phone
- g. Mobile

A2. What area do you manage? *(please write the number of hectares that you managed)*

- a. Hectares

A3. What numbers of livestock do you run? *(please write the number of head against each of the categories of livestock that you run)*

- a. Number of beef breeders.....
- b. Number of cattle turned off per year
- c. Total number of cattle
- d. Number of ewes
- e. Number of lambs turned off per year
- f. Total number of sheep
- g. Number of goats turned off per year.....
- h. Other

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

B1. Do you consider dual-purpose crops to be an alternative management tool to replace the supplementary feeding of stock in autumn/winter? *(Tick one of the options below)*

- a. No, they are not an alternative to supplementary feeding ☐
- b. Yes, they are an alternative to supplementary feeding..... ☐
- c. Depends on the season..... ☐
- d. Unsure..... ☐

B2. Do you consider dual-purpose crops a cost-effective means of bridging the autumn feed gap? *(Tick one of the options below)*

- a. Yes, it is a cost-effective strategy ☐
- b. No, it is not a cost-effective strategy ☐
- c. Depends on cost and availability of supplementary feed ☐
- d. Unsure..... ☐

B3. Does the grazing of dual-purpose crops result in a grain yield penalty? *(Tick one of the options below)*

- a. Yes, grazing results in a yield penalty ☐
- b. No, grazing does not result in a yield penalty ☐
- c. Yield penalties are dependent on good grazing management ☐
- d. Yield penalties are dependent on seasonal conditions ☐
- e. Unsure..... ☐

B4. What is the most important aspect in determining the grazing period of a dual-purpose crop to minimise impact on grain yield? *(Tick one of the options below)*

- a. Stock condition..... ☐
- b. Feed availability..... ☐
- c. Crop variety..... ☐
- d. Crop growth stage..... ☐
- e. Other (Please describe) ☐
- f. Unsure ☐

B5. Do you consider that the potential increase in live weight gain from grazing dual-purpose crops will compensate for any crop yield penalty? *(Tick one of the options below)*

- a. Yes, live weight gain will compensate for any yield penalty ☐
- b. No, live weight gain will not compensate for any yield penalty..... ☐
- c. Will be about equal ☐
- d. Unsure..... ☐

6.4.2 Post Project Survey Template



Post-Project Survey – {Core/Observer} Participants

PDS Project Code: L.PDS.1904 **PDS Project Name :** *Increasing Profits with Dual-Purpose Crops*

The following questions are used to determine your level of understanding of *[insert topic]* 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: _____

Mobile: _____

Address: _____

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)

A4. Overall, how **satisfied** are you with this PDS?
_____/10

A5. How **valuable** was this PDS in assisting you manage your livestock enterprise?
_____/10

A6. Would you **recommend** MLA's PDS program to others? ☐ Yes ☐ No ☐ Not Sure

A7. 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. Overall, how well has this PDS project increased your knowledge of Dual-Purpose Crops?***Please rate out of 10 by marking your choice below, 1 = No Increase, 10 = very large increase*

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

B2. Overall, how well has this PDS project increased your skills in Dual Purpose Crops?*Please rate out of 10 by marking your choice below, 1 = No Increase, 10 = very large increase*

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

B3. Do you consider dual purpose crops to be an alternative management tool to replace the supplementary feeding of stock in autumn/winter? *(circle one of the options below)*

- a. No, they are not an alternative to supplementary feeding
- b. Yes, they are an alternative to supplementary feeding
- c. Depends on the season
- d. Unsure

B4. Does the grazing of dual-purpose crops result in a grain yield penalty?*(Tick one of the options below)*

- a. Yes, grazing results in a yield penalty ☐
- b. No, grazing does not result in a yield penalty ☐
- c. Yield penalties are dependent on good grazing management ☐
- d. Yield penalties are dependent on seasonal conditions ☐
- e. Unsure..... ☐

B5. What is the most important aspect in determining the grazing period of a dual-purpose crop to minimise impact on grain yield? *(Tick one of the options below)*

- a. Stock condition..... ☐
- b. Feed availability..... ☐
- c. Crop variety..... ☐
- d. Crop growth stage..... ☐
- e. Other (Please describe) ☐
- f. Unsure ☐

B6. Do you consider that the potential increase in live weight gain from grazing dual-purpose crops will compensate for any crop yield penalty? *(Tick one of the options below)*

- a. Yes, live weight gain will compensate for any yield penalty ☐
- b. No, live weight gain will not compensate for any yield penalty..... ☐
- c. Will be about equal ☐

d. Unsure..... ☐

B7. Do you consider dual purpose crops a cost-effective means of bridging the autumn feed gap?

(Tick one of the options below)

a. Yes, it is a cost-effective strategy ☐

b. No, it is not a cost-effective strategy..... ☐

c. Depends on cost and availability of supplementary feed ☐

d. Unsure ☐

Section C – Confidence and Practices

C1. How confident are you in the timing of grazing a dual-purpose crop to minimise a reduction in crop yield?

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

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

C2. As result of participating in this PDS have you adopted any of the following practices relevant to Dual Purpose Crops:

Practices	Practice Implemented?	Indicate on what % of your enterprise this practice has been adopted (if not adopted leave blank)	Frequency of use? (if not adopted leave blank)
Plant dual-purpose crops for the purpose of short-term grazing and then harvesting as part of your farm management system	☐ Yes, practice implemented ☐ I intend to implement ☐ No, I have no intentions to ☐ Adopted prior to PDS ☐ Not applicable	☐ Less than 25% ☐ Between 25% - 50% ☐ 50% ☐ Between 50% - 75% ☐ Greater than 75% ☐ 100%	☐ Normal Practice ☐ Sometime ☐ Rarely ☐ Never
	What are the reasons you have not implemented this practice on your property? ☐ Not a significant issue on my property ☐ Limited funds ☐ Lack of confidence ☐ Limited time ☐ Lack of skills ☐ Other (please specify)		

C2.1 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*

C3. Do you consider the use of dual-purpose crops to be a management tool that is applicable to farming in the Great Southern of Western Australia? Why?

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 and will not be disclosed to anyone else except as notified here, in accordance with the privacy policies of these organisations or where your consent has been obtained. MLA's privacy policy can be obtained directly from MLA by calling 1800 675 717, or from their website at www.mla.com.au. By providing your personal information, you consent to MLA collecting, holding, using and disclosing that information in the manner specified in this form and as otherwise specified in the privacy policies of these organisations. 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.

6.5 Economic Analysis – Farm Optimisation Group

Dual-purpose cropping



Farm Optimisation Group

This project was funded by MLA and undertaken by Southern Dirt grower group.

Analysis by Michael Young from Farm Optimisation Group.

Michael Young

Background

In Mediterranean-type environments, livestock productivity in mixed livestock and cropping enterprises often is limited by a period of feed scarcity that extends from late autumn, when dry residues of crops and pastures from the previous growing season are being exhausted, through to early winter when green feed is just commencing. Dual-purpose crops have been developed as a source of winter green feed, while still being a source of grain at harvest.

Grazing crops provide high quality green feed for livestock and can typically be grazed between June to august. Green crops have a higher energy content than green pasture and grow more vertical allowing for easier grazing, meaning a lower crop FOO is required to meet the livestock needs. There is however a yield penalty associated with this activity. Trials have recorded varying yield penalties from 0.4% to 23% but the consensus is that the yield penalty is minimal if the crop is grazed early and lightly. Crop grazing can be used in several possible ways to boost profitability including to;

- vii) allow twin ewes to gain weight at the end of pregnancy leading to bigger lambs with higher chance of survival,
- viii) increase stocking rate,
- ix) reduce supplementary feeding cost or
- x) producing out-of-season finished lambs.

This report begins by analysing the data collected from each host farm over the four-year PDS project. Secondly, it offers a detailed farm systems economic analysis designed to help prospective producers determine if dual-purpose cropping is a suitable strategy for them and to identify the best methods for incorporating dual cropping into their systems.

Analysis of host farm data

Year 1:

Figure 1: Sheep Weight Data in Crop v Pasture

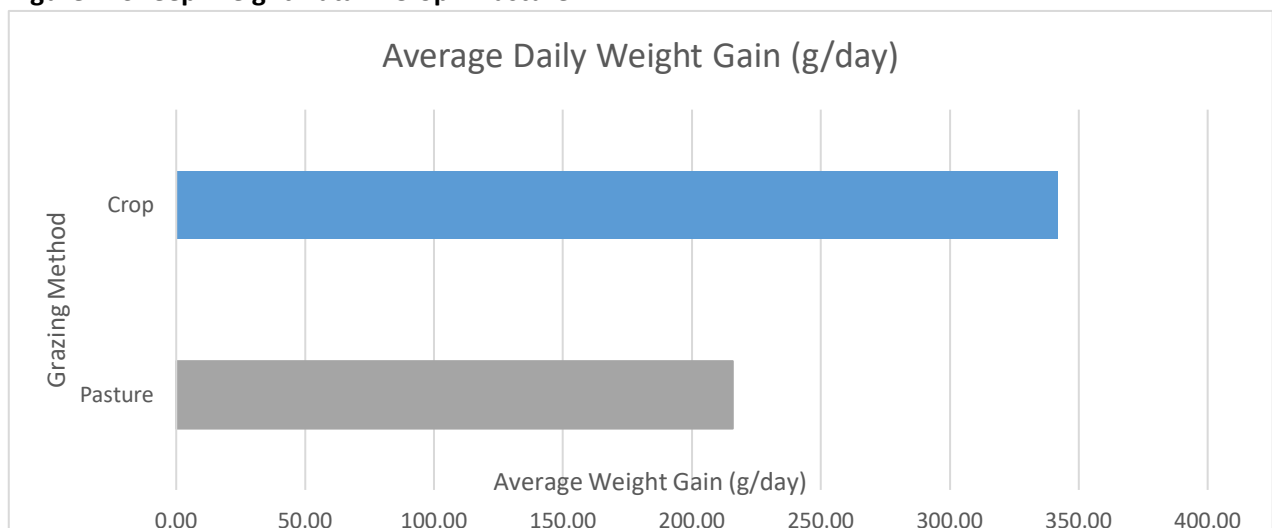


Table 15: Crop FOO Measurements

Crop	Square Cut (DM kg/ha)	FOO Ruler (DM kg/ha)	Pastures From Space (DM kg/ha)
4-Aug	1500	900	
5-Aug	1700	1100	500-750
11-Aug	1920	1600	750-1500
18-Aug	1850	1600	1000-1500

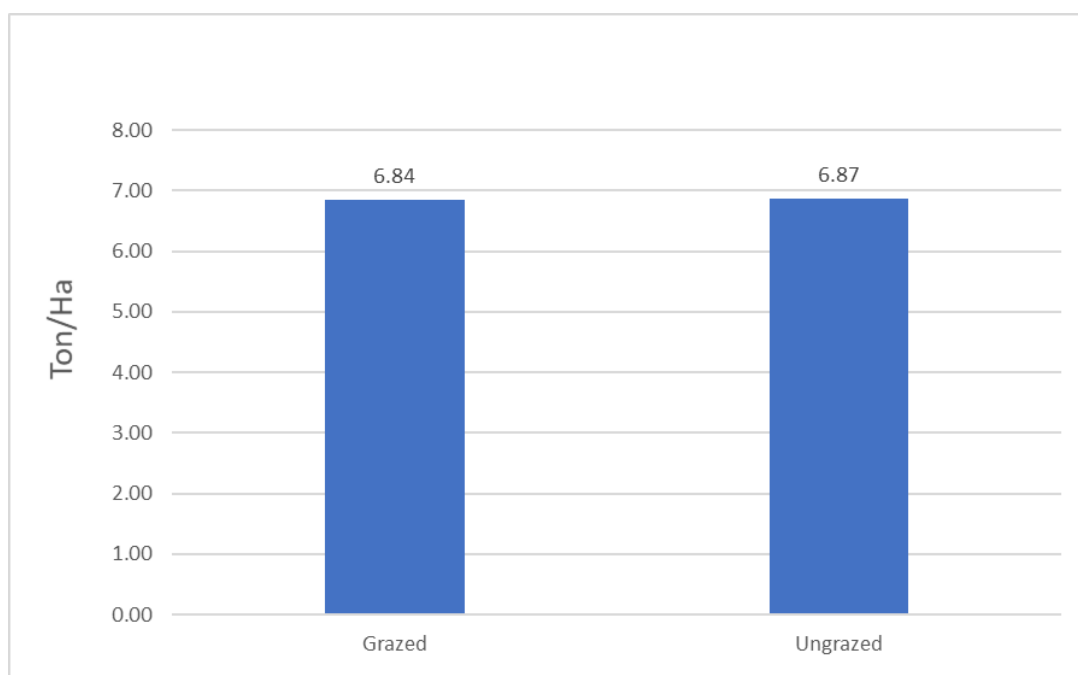
Year 2:**Figure 2: Final yields on wheat at Webb PDS site.**

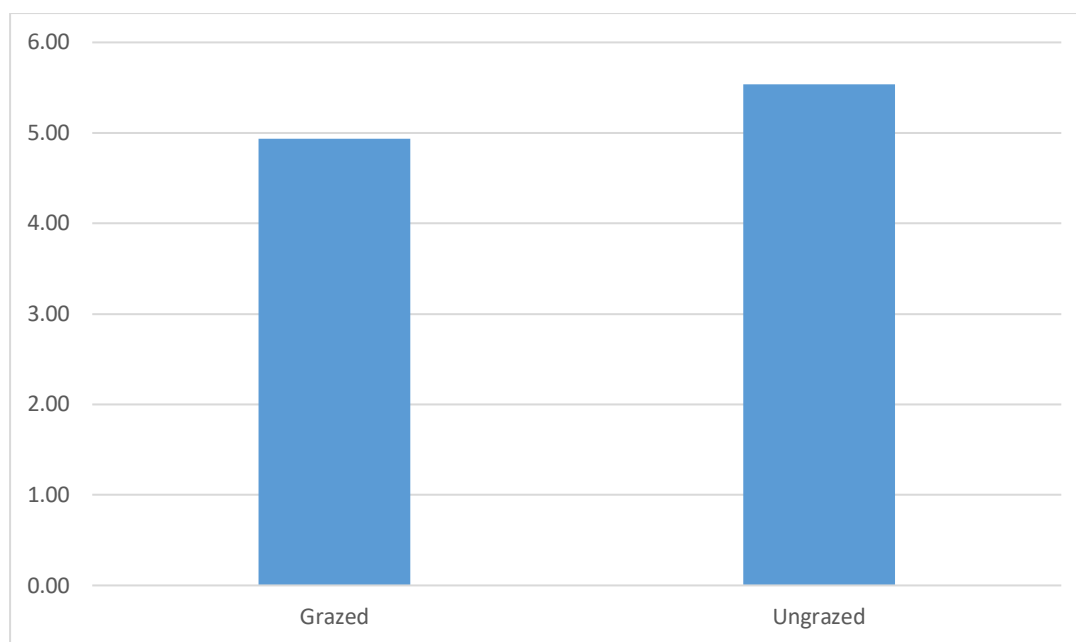
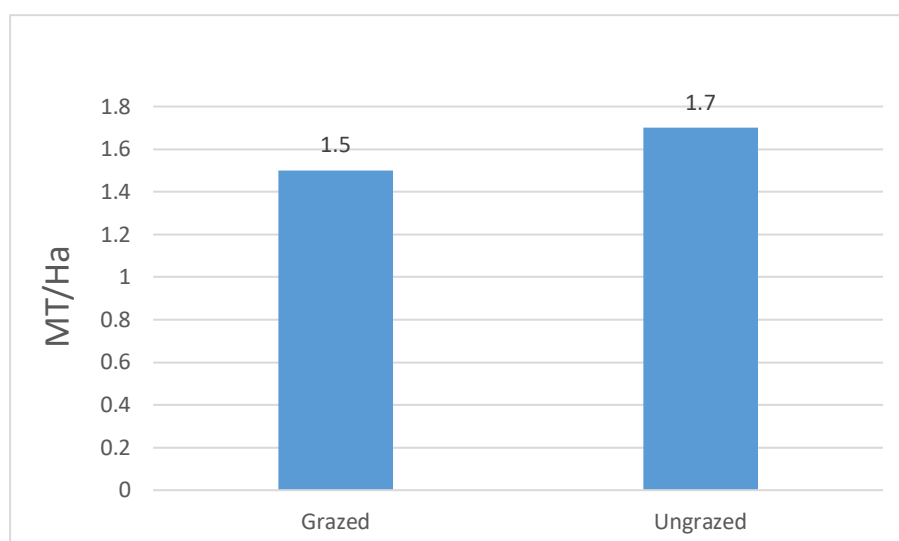
Figure 3: Final yields on Bannister oats at Hester PDS site.**Figure 4: Final yields on Moby Barley at Kowald PDS site.****Year 3:**

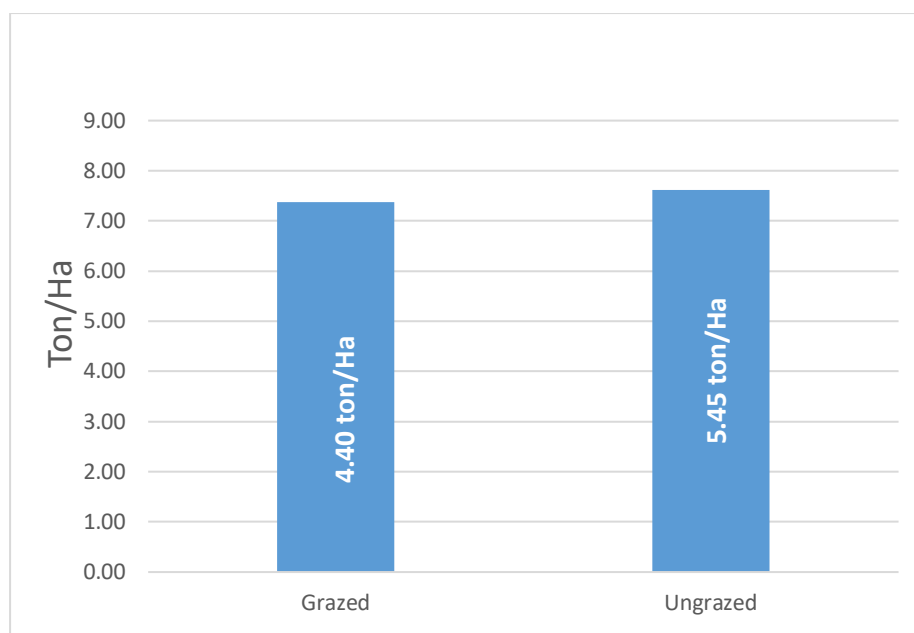
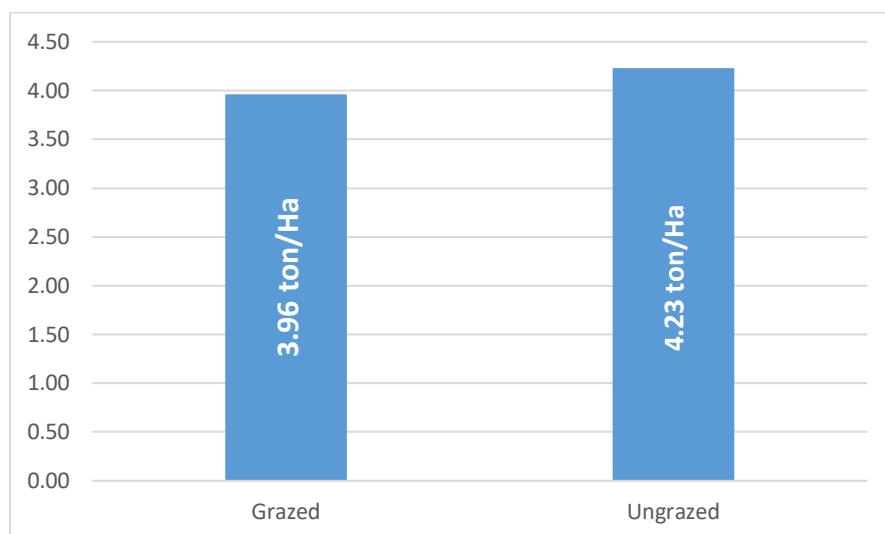
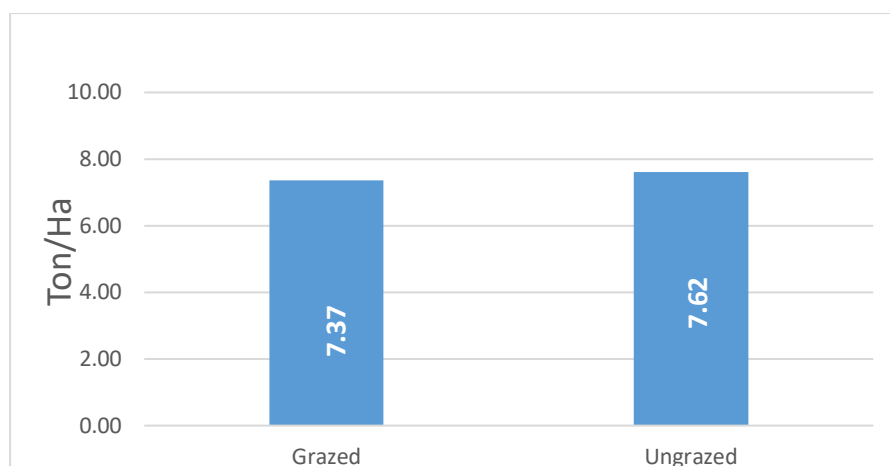
Figure 5: Final yields on Accroc Wheat at Webb PDS site**Figure 6: Final yields on Bannister oats at Hester PDS site**

Figure 7: Final yields on Accroc Wheat at Stone PDS site**Year 4:****Table 16: DSE grazed vs Harvest yield total (t/ha) at Webb PDS site**

Paddock	1 (ungrazed)	2	3	4
DSE	0	11.2	15.3	25.2
Harvest yield total t/ha	2.43t/ha	3.45t/ha	2.95t/ha	1.89t/ha

Table 17: Condition scores IN & OUT at Webb PDS site

Paddock	1 (ungrazed)	2	3	4
DSE	0	11.2	15.3	25.2
Condition scores IN 15 th June 2023	0	3	3	3

Table 18: Condition scores IN & OUT at Leitch PDS site

DSE	15
Condition scores IN 15 th June 2023	2.5
Condition scores OUT 14 th August 2023	3.5

Summary all years:

	KDSH	Webb	Hester	Kowald	Webb	Hester	Stone	Webb	Webb	Webb	Leitch	Average
	2020	2021	2021	2021	2022	2022	2022	2023	2023	2023	2023	
Additional costs (\$/ha)	-	0	0	0	0	0	0	0	0	0	0	0
Additional labour (hr/ha)	-	0	0	0	0	0	0	0	0	0	0	0
Yield penalty (kg/ha)	-	30	600	200	1050	270	250	-	-	-	-	400
Yield penalty (%)	-	0.40%	10.85%	11.77%	23.80%	6.38%	3.40%	-	-	-	-	9%
Estimated FOO (kg DM/ha)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Estimated DMD (%)	75%-80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
Stocking rate (DSE/ha)	4.77	20	40	42	8.3	40	12.8	15.3	25.2	11.2	15	22.0
Length of grazing period (days)	14	32	9	7	57	10	85	29	29	29	39	30.1
Weight gain (g/d) ¹	341	100	100	157	100	100	100	110.6667	55.33333	166	125	133
Estimated grazing (kg/ha) ²	100	709	399	400	524	443	1206	513	665	455	713	542
Notes	No control crop				Crop grazed late into August			No control crop	No control crop	No control crop	Didn't harvest	

¹ Where weight data was not collected it was assumed that average weight gain was 100g/hd/d based on information from Life Time Wool trial findings.

² Estimated crop consumed was calculated as a function of stocking rate, grazing period and daily intake (based on maintenance energy requirement and energy for weight gain).

Farm systems economic analysis

Introduction

In this section, dual-purpose cropping is evaluated for a “typical” farming system in the Great Southern region of WA using averaged data from the trial sites in the project. A typical farm is analysed to enhance relevance for a broad audience of observer growers. Average crop grazing production data is utilised to account for seasonal variation, providing prospective growers with accurate medium-term costs and benefits of crop grazing.

To further enhance the applicability of these results to various circumstances, a sensitivity analysis has been conducted. This analysis demonstrates how the value of crop grazing changes with fluctuations in livestock and grain prices, grazing intensity, and crop area.

Finally, the results presented in this section illustrate how farmers can effectively integrate crop grazing into their systems. Farms are highly interconnected systems, where altering the management of one aspect often impacts the optimal management of others. For example, the inclusion of crop grazing is likely to influence optimal stocking rates, pasture/crop areas, and supplementary feeding.

Overall, this analysis demonstrates the expected average return farmers in the Great Southern region of WA can anticipate from crop grazing and provides guidance on how best to incorporate crop grazing into their current systems.

Method

The economic valuation of crop grazing demands consideration of the flow on effects of the implementation of this strategy. For example, it is not sufficient to value of the benefits of an increased stocking rate over the period in which a crop is grazed, as the additional sheep require feed prior and subsequent grazing the crop. Provision of this feed comes at a cost so these must be weighed up against the potential gains. Similarly, valuing the grazing crop as a substitute for supplementary feed is inadequate because it discounts the possibility of increasing supplementary feeding to increase sheep production.

A thorough exploration of the economic benefits of grazing crops requires a whole-farm systems approach.

This analysis uses AFO to determine the systems level effects of introducing grazing crops to farming systems in the Great Southern region of WA. 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. Full details of the model can be found here: [AFO documentation](#).

Assumptions

Table 19: Values assumed for key parameters for grazing crops. These values are based on data provide by the host producers over the 4 year PDS project.

DM Available for grazing (kg/ha/d)	
May	1.5
June	4
July	8
Crop DMD	81%
Period of grazing	30 days after sowing - Aug
Base Yield Penalty	9%
Lamb price	\$6/kg
Wheat price	\$301/t

Note: There is only a yield penalty incurred in the current year. If you believe that crop grazing will increase weed seed set and therefore reduce yield in the following year this will reduce the profitability of crop grazing on productive paddocks that are continuously cropped. However, it may increase profit on paddocks that are going to be in pasture the following year.

Results and discussion

Grazing crops increases profit between \$19/ha and \$30/ha depending on the yield incurred by grazing (Figure 8). However, to maximise the benefits of crop grazing, other key management changes must be made. The level of adjustment to make depends on the grazing intensity. At a grazing intensity of 250 kg/ha the key management changes include increasing stocking rate by 0.5 DSE/ha (Figure 9), increasing pasture area by 8% (Figure 11) and reducing supplementary feeding by 25 kg/DSE (Figure 10).

The value of crop grazing significantly decreases for low livestock prices (Figure 12). At high grain prices light crop grazing is still profitable however profit drops significantly for higher grazing intensities (Figure 12).

Farmers can be confident that crop grazing will be profitable regardless of the size of their cropping enterprise (Figure 13).

Figure 8: Whole-farm profit at different crop grazing intensities for low, standard and high yield penalties.

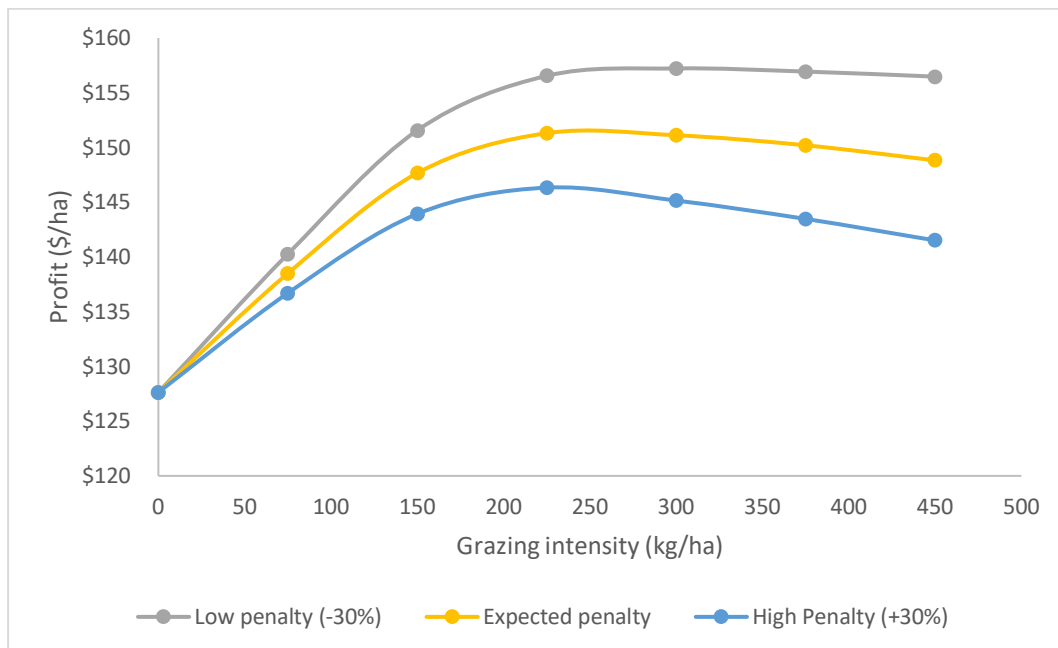


Figure 9: Optimal stocking rate at different crop grazing intensities.

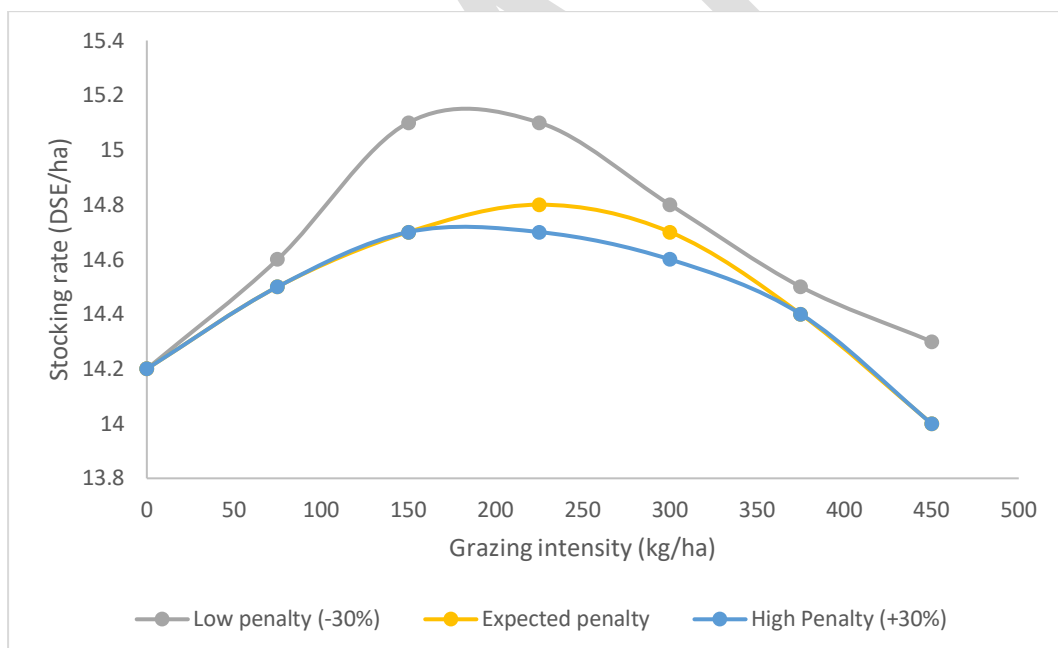


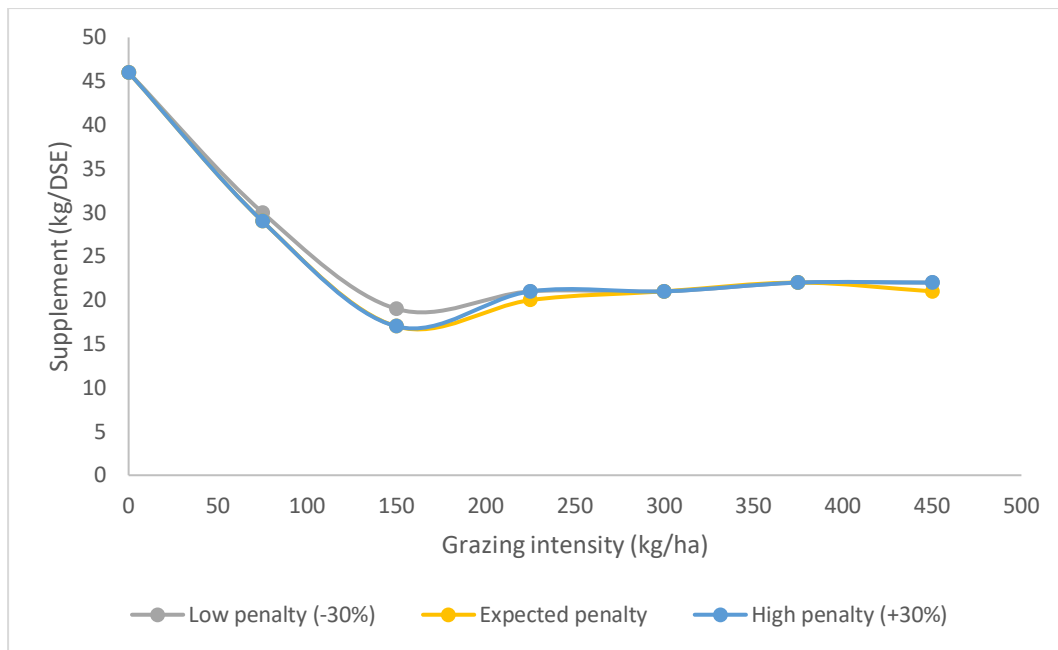
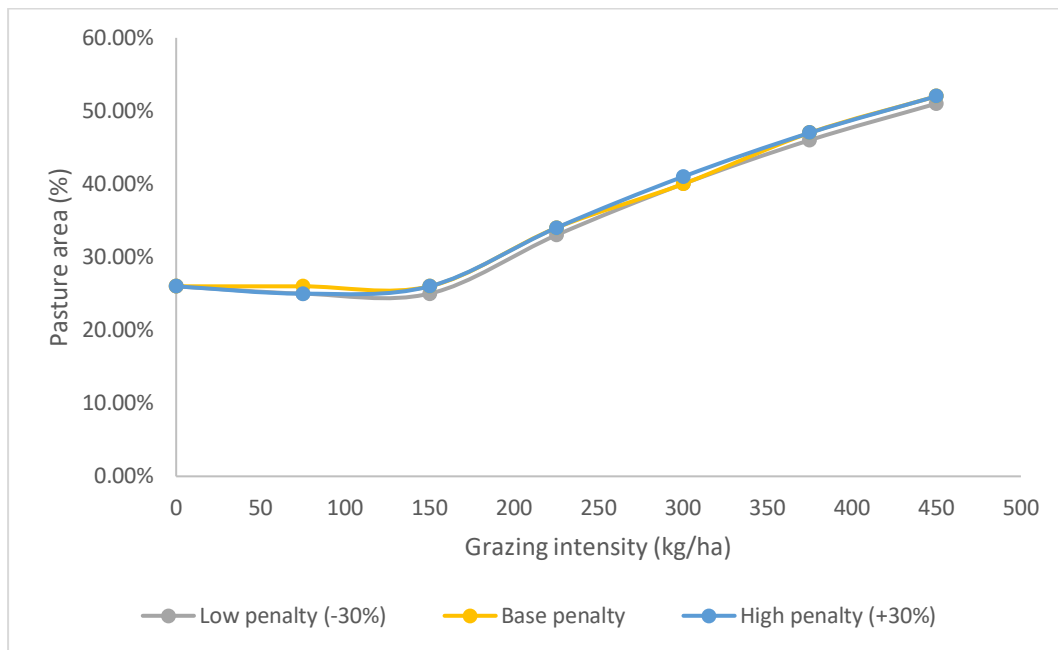
Figure 10: Supplementary feeding required at different crop grazing intensities.**Figure 11: Optimal pasture area at different crop grazing intensities.**

Figure 12: Change in profitability of different crop grazing intensities for different price scenarios.

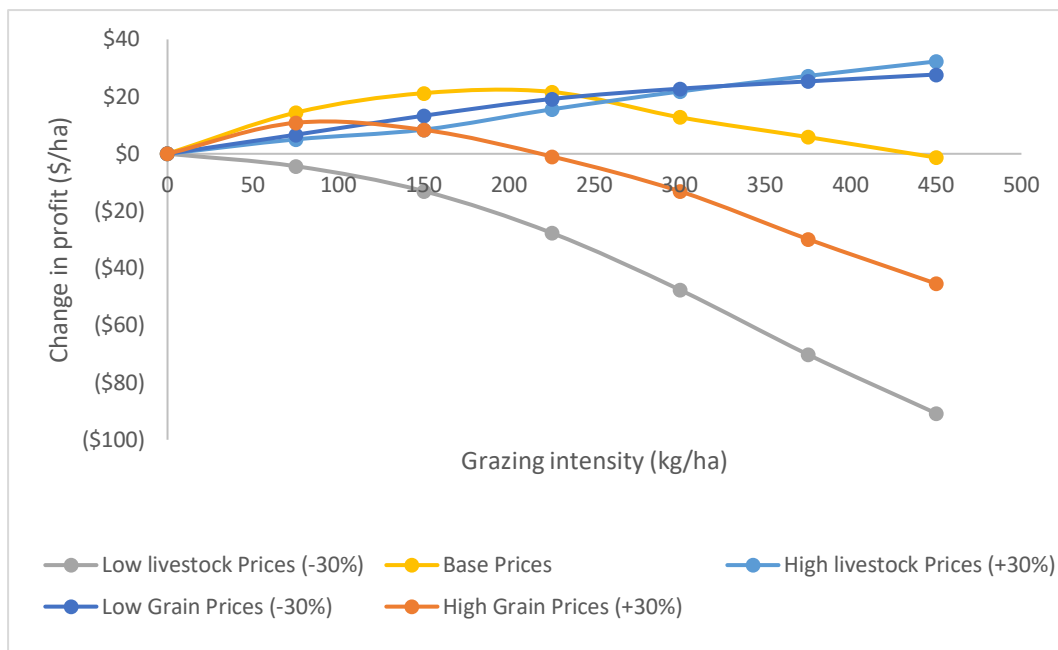
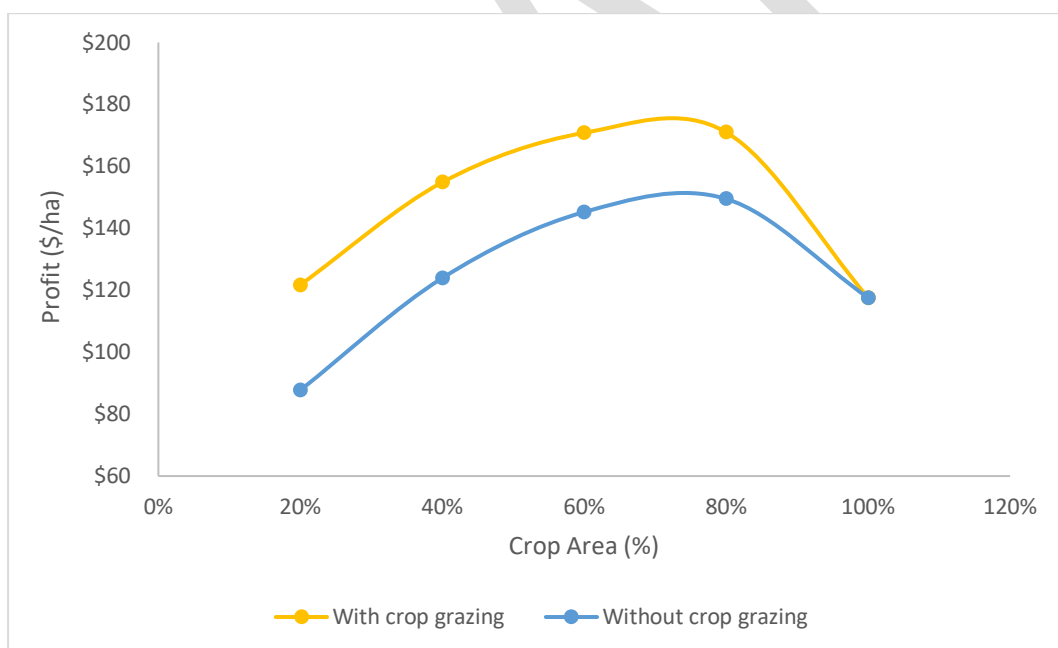


Figure 13: Farm profitability (\$/ha) with different cropping allocations with and without dual-purpose crops.



Conclusion

Grazing small quantities of crop for short periods in mid-winter may substantially improve farm profitability. This conclusion is largely unchanged for a range of scenarios of grazing quantity and the loss in yield that could result from grazing.

Only small changes to the whole farm strategy are likely to occur, with the most significant being an increase in the stocking rate of the model farm, a decrease in the level of supplementary feeding and increasing pasture area.

Further work

This report has shown that crop grazing can be highly profitable in certain circumstances. However, to improve crop grazing management guidance further work can still be undertaken. Some gaps in data include:

- How does yield penalty change for
 - different crops
 - grazing severity
 - grazing time
 - on different soil types
- Follow on impacts of crop grazing. Several producers displayed concerns that crop grazing can increase weed seed set and thus they avoid crop grazing in their continuous cropping paddocks.