GRDC Regional Cropping Solutions Network
Report Structure for Final Reports

2015 Canola early sowing management systems: Grazing canola to modify maturity and water use

Geoff Fosbery & Brad Joyce

Introduction

Since 2000 there has been a reduction in May/June double figure rainfall events, with larger events now coming during March/April in the eastern wheat belt. This has resulted in a need for eastern wheat belt farmers to adapt to these changes, ensuring they can germinate and establish a crop earlier than is normal practice. The moisture from these earlier rainfall events can be lost rapidly; therefore a quick decision to sow canola early is needed.

Early sowing canola has proven to be most beneficial if it is sown onto a ten month fallow in low rainfall areas. This reduces the risk associated as the stored moisture allows the crop to hang on given there is often a dry spell experienced in April and May. There is also a benefit associated with achieving two years weed control that allows wheat or barley to be grown with confidence in the following years.

When sowing early the question of frost will be raised. To overcome this issue grazing was investigated to alter the flowering window and reduce the risk associated with frost. Another benefit discovered was the ability of early sown canola to grow vigorously and reduce the feed gap in early winter, allowing pastures to establish and flourish.

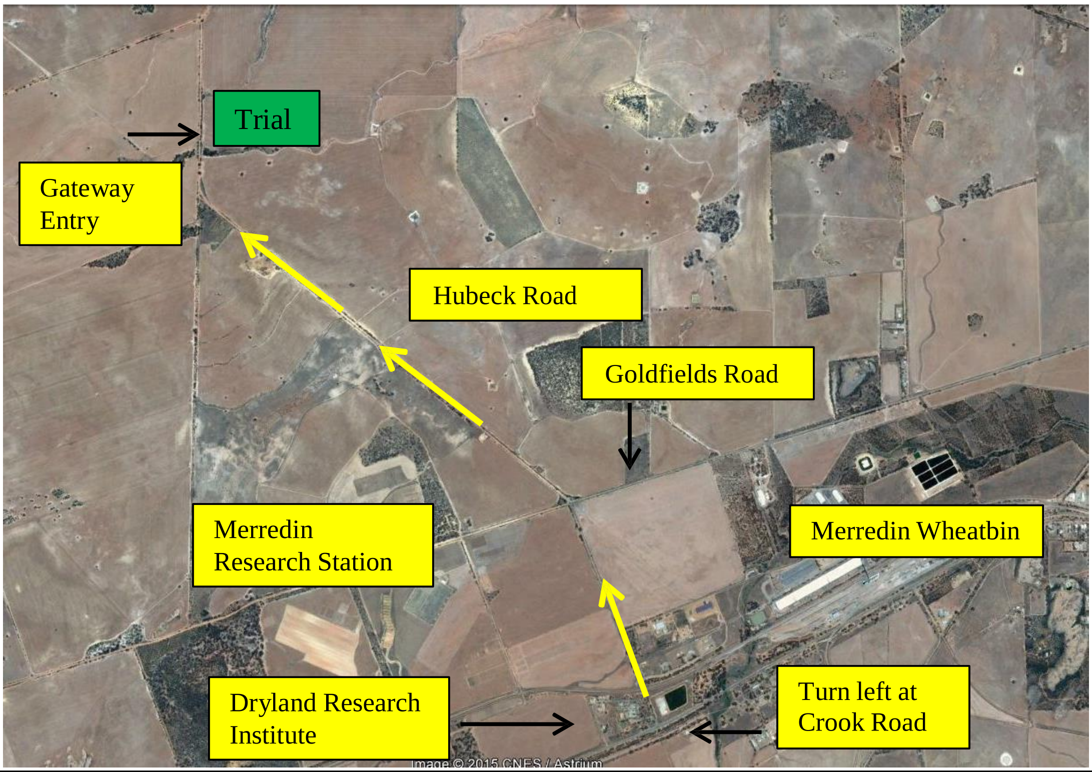
The aim of this trial was to investigate how early canola can be sown in the eastern wheat belt, given there is enough soil moisture to germinate and allow the crop to survive. It was also investigating the effect of grazing the crop with sheep. This was to alter the flowering window, reducing the possibility of a frost event causing damage during flowering and grain fill, without compromising yield.

Objectives

1. To determine the ability of canola to grow and produce grain on a very early sowing (April 2nd) opportunity versus a normally early sowing (April 20th).
2. To determine canola's ability to cope with higher frost risk from very early sowing.
3. To determine if it is possible to adequately modify canola flowering time at 1 to 2 times normal eastern wheat belt stocking rates.
4. To determine how canopy modification (though grazing) could modify plant available water use to increase grain yield.
5. Determine if young canola can provide at least maintenance levels of feed when grazed at eastern Wheat belt stocking rates (2-4 DSE/ha).
6. Does grazing canola provide adequate flowering modification to decrease frost susceptibility?
7. Increase low rainfall farmer confidence in growing canola in their farm system.
8. Demonstrate how low rainfall farmers can grow canola reliably and profitability in their farm systems.

9. Demonstrate to low rainfall farmers how diversity in rotation can decrease weed problems, increase profitability, decrease risk and make growing cereals easier.

Trial location



Lat - 31. 459272° South

Long – 118.206706° East

Methodology

The trial was established with Snapper canola sown and germinated on two dates, April 2nd and April 20th. Farmer equipment was used which resulted in each of the 24 plots being 18.3m x 200m. To investigate the most effective grazing regime six different treatments were established and replicated four times. These were -:

- Canola Germinated April 2nd Ungrazed
- Canola Germinated April 2nd Grazed Early
- Canola Germinated April 2nd Grazed Late
- Canola Germinated April 2nd Grazed Early and Late
- Canola Germinated April 20th Ungrazed
- Canola Germinated April 20th Grazed Early

The grazing dates are shown below (Tab 1).

Table 1 Grazing period for each treatment

	Grazing Dates	Grazing Days
Canola Germinated April 2nd Grazed Early	29th April – 22nd May	24
Canola Germinated April 2nd Grazed Late	15th June – 6th July	21
Canola Germinated April 2nd Grazed Early and Late	29th April – 22nd May and 15th June – 6th July	45
Canola Germinated April 20th Grazed Early	15th June – 6th July	21

Weaner ewes were used for grazing at a stocking rate of 4.2 DSE. The stocking rate was decided upon as it is considered achievable given the number of livestock eastern wheat belt farmers have on hand. The stocking rate is between 1.5 and 2 times the average eastern wheat belt stocking rate.
Biomass cuts were taken pre and post grazing to assess the level of grazing achieved in each treatment. Sheep weights were recorded pre and post grazing to allow an economic analysis to be conducted on the live weight gain achieved. Yield data was collected using the farmer's header and a weigh trailer. Temperature data was collected with the use of TinyTag data loggers to record any variation in canopy temperature due to grazing. This data was used to investigate whether grazing reduced the risk associated with frost and heat shock.

Additional Information

1. Seeding Equipment – Morris Contour 2 drill. Primary sales 12mm knifepoint with 45mm Y splitter boot.
2. Row Spacing – 300mm
3. Bar Width – 18.3m (60ft)
4. Header width – 12.2m (40ft)
5. Seeding Depth – 5 to 10mm
6. Variety – Snapper @ 2.3kg/ha
7. Sowing/Germination Dates – TOS 1 = April 2nd/ TOS 2 = April 20th
8. Sowing Direction – East/West
9. Fertiliser - Agras @ 80kg/ha and Urea @ 40kg/ha Deep Banded – Urea @ 40kg/ha Topdressed. Urea was applied at 30th July.

Results

Final Yield

The table below shows that yield was only significantly reduced when the plots were grazed early and late, resulting in a total of 45 grazing days. All other grazing treatments did not influence yield.

Table 2 Final Yields recorded

	t/ha
Canola Germinated April 2nd Ungrazed	1.29
Canola Germinated April 2nd Grazed Early	1.23
Canola Germinated April 2nd Grazed Late	1.18
Canola Germinated April 2nd Grazed Early and Late	1.07
Canola Germinated April 20th Ungrazed	1.40
Canola Germinated April 20th Grazed Early	1.29

P-Value – 0.346, LSD – 0.307

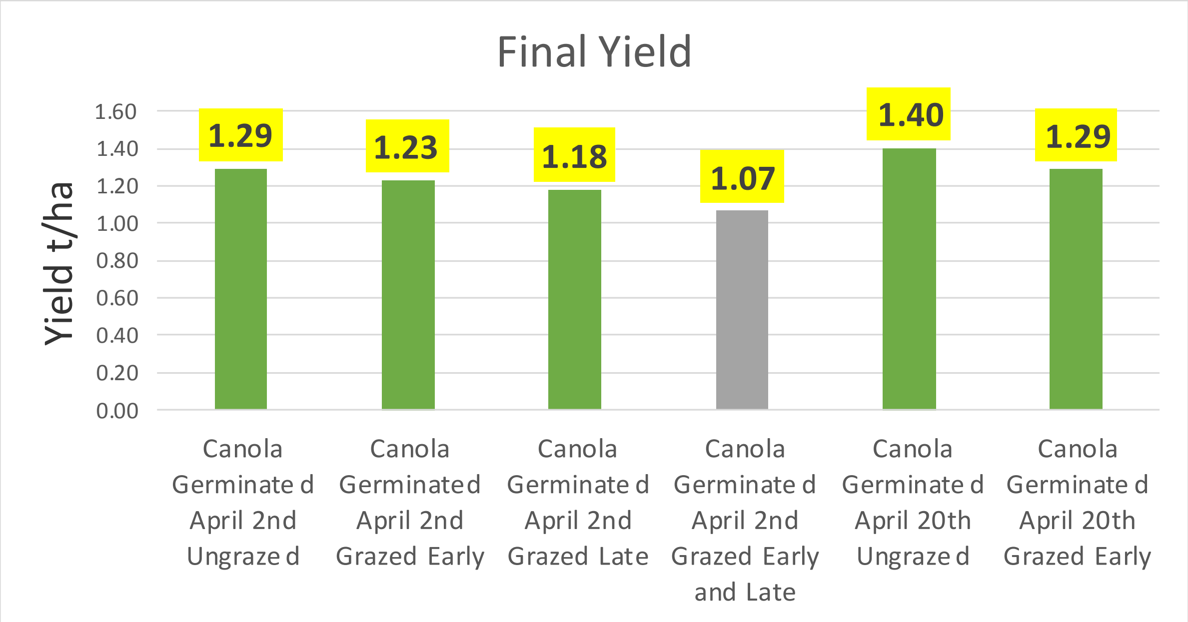


Figure 1 Final Yields recorded

Moisture Readings

Volumetric moisture readings were taken on the 22nd of May, which was the end of Grazing Time 1. It shows that grazing did not influence moisture loss, however time of germination produced significant differences (Fig 2). Canola germinated on April 2nd recorded significantly less moisture than canola germinated on April 20th no matter if it was grazed or not.

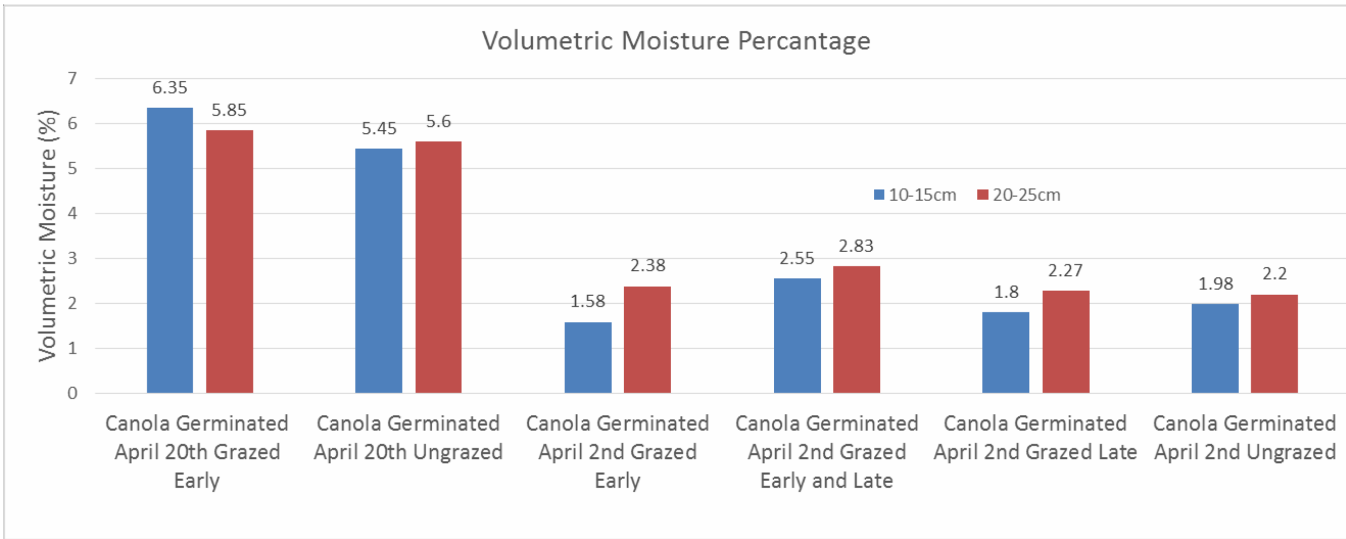
Figure 2 Biomass difference on the 22nd of May

Table 3 Moisture Readings as at 22nd May - End of GT 1

	10-15cm	20-25cm
Canola Germinated April 20th Grazed Early	6.35	5.85
Canola Germinated April 20th Ungrazed	5.45	5.6
Canola Germinated April 2nd Grazed Early	1.58	2.38
Canola Germinated April 2nd Grazed Early and Late	2.55	2.83
Canola Germinated April 2nd Grazed Late	1.8	2.27
Canola Germinated April 2nd Ungrazed	1.98	2.2

10-15cm - P-Value - <0.001 LSD – 2.35

20-25cm - P Value – 0.004 – LSD 2.22



Change in Canola Phenology

Canola phenology was altered by grazing. When grazed early, at the three to five leaf stage, it was found that for every day of grazing the maturity of Snapper canola was altered by half a day. When grazed later, at 50 percent flower, every one day of grazing altered maturity by nearly a day as shown in Figure 3. Appendix 1 describes the corresponding growth stage to the numbers below.

Table 4 Canola Phenology through time

	15-Jun	7-Jul	11-Aug
Canola Germinated April 2nd Ungrazed	4.54	5.36	6
Canola Germinated April 2nd Grazed Early	4.25	5.29	5.89
Canola Germinated April 2nd Grazed Late	4.7	4.99	5.52
Canola Germinated April 2nd Grazed Early and Late	4.61	4.8	5.57
Canola Germinated April 20th Ungrazed	2.49	4.13	5.35
Canola Germinated April 20th Grazed Early	2.46	3.7	5.12

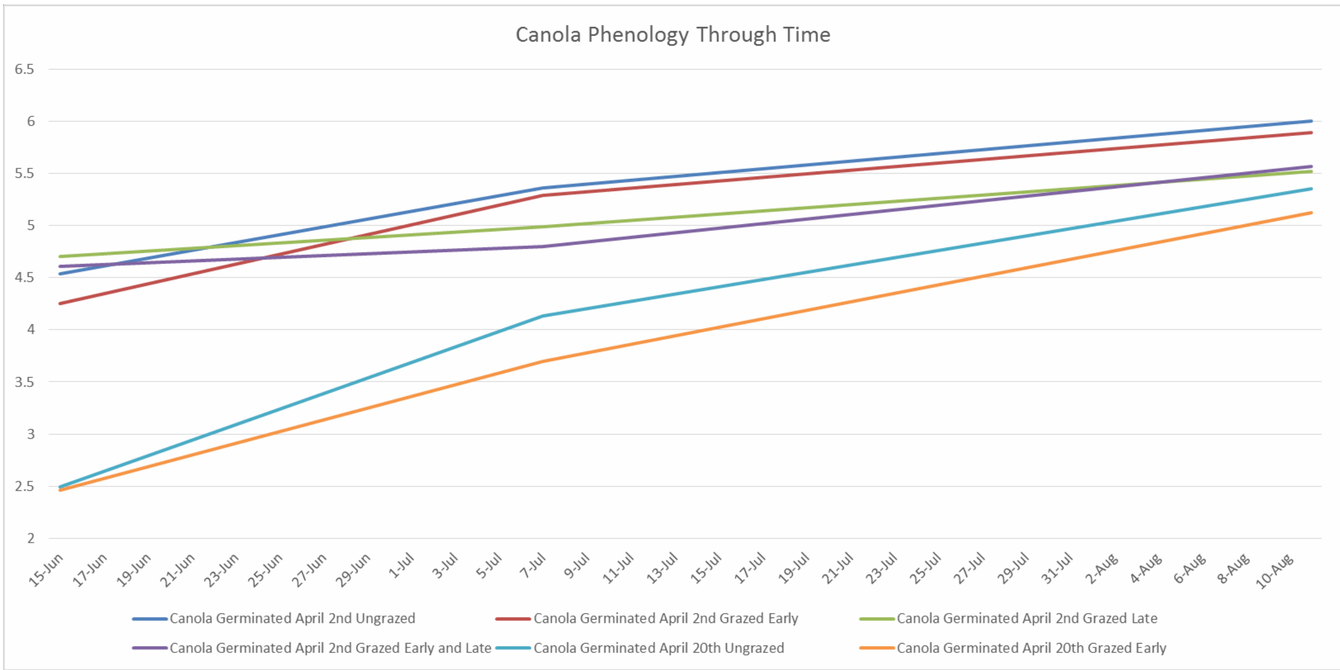


Figure 3 Change in canola phenology through time

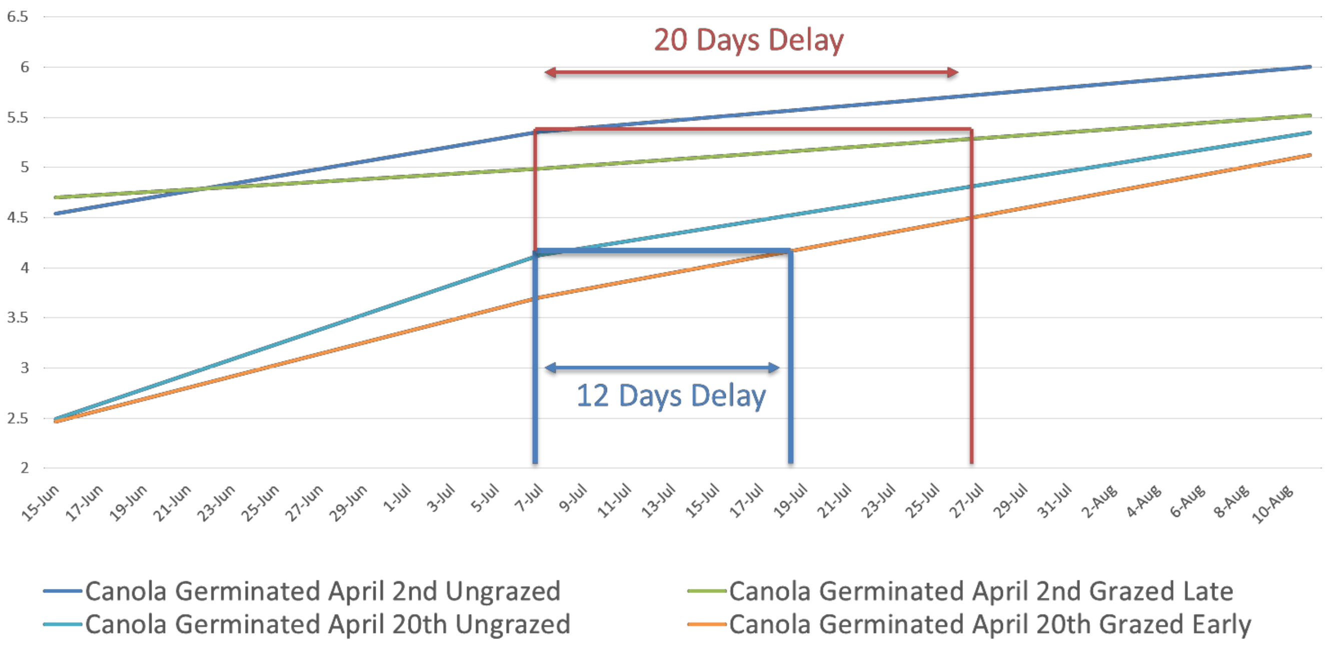


Figure 4 The ability of grazing to alter canola phenology

Sheep Weights

Sheep weights were recorded before and after each grazing period. As shown below (Table 5) grazing time one allowed an average of 850gm/head live weight gain during the 24 day grazing period. Grazing time two recorded an average live weight gain of 3.96kg/head during the 21 day grazing period.

Table 5 Sheep Weights before and after each grazing period

Grazing Time 1		
	In 29/04/2015	Out 22/05/2015
Avg Liveweight (kg/head)	41.25	42.11
Weight Increase (kg/head)	0.85	
% Increase	2.07	
Grazing Time 2		
	In 15/06/2015	Out 6/07/2015
Avg Liveweight (kg/head)	48.39	52.35
Weight Increase (kg/head)	3.96	
% Increase	8.19	

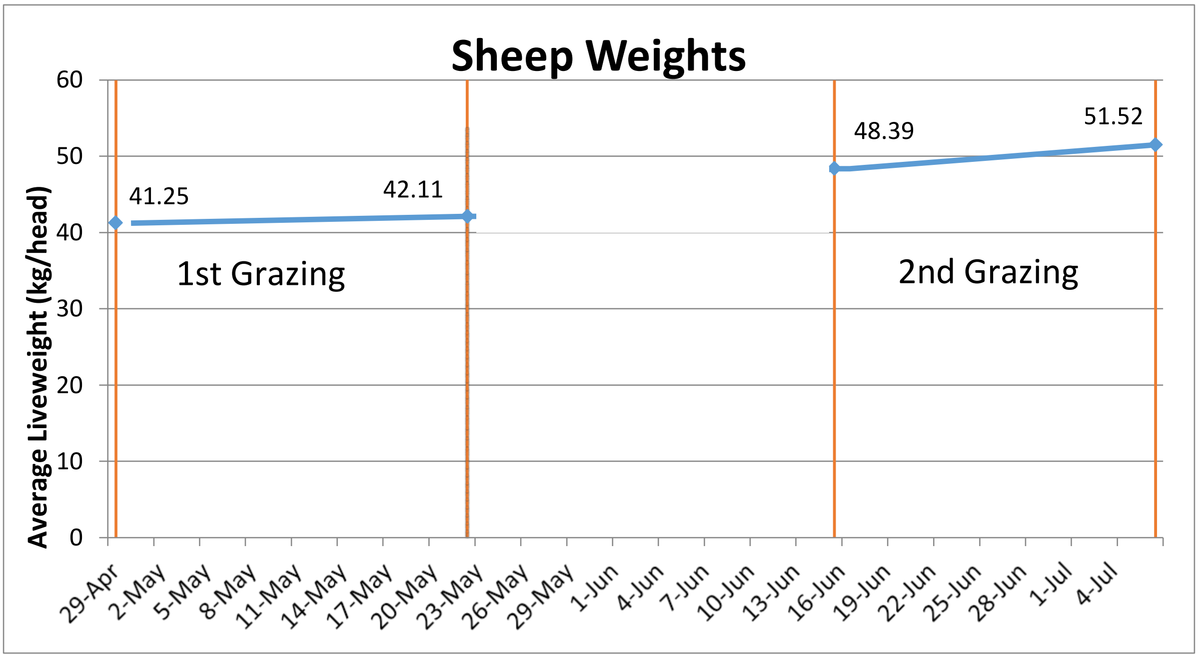


Figure 5 Sheep weights before and after each grazing period

Feed on Offer

After the first grazing of the April 2nd germinated canola biomass was significantly reduced by an average of 52%. However the early grazed plots recovered their biomass, in the 23 days to the beginning of the second grazing period, to be not significantly different in biomass from the ungrazed plots. The similarity in biomass of the April 2nd grazed early versus ungrazed was maintained till July 7th when the crop was flowering and filling pods. The final measurements (Table 6) showed the Germinated April 2nd Grazed Late treatment as having the most feed on offer. The treatment Germinated April 20th Ungrazed recorded the lowest final feed on offer reading with 1180kg/ha of dry matter.

Table 6 Feed on Offer measured through time. Measured as kg/ha Dry Matter. Included is the dry matter changes between measurements (kg/ha).

Treatment	Start of 1st Grazing	Dry Matter Change	End of 1st Grazing	Dry Matter Change	Start of 2nd Grazing	Dry Matter Change	End of 2nd Grazing
Canola Germinated April 2nd Ungrazed	87	286	373	515	888	517	1405
Canola Germinated April 2nd Grazed Early	87	75	162	625	787	526	1313
Canola Germinated April 2nd Grazed Late					1242	563	1805
Canola Germinated April 2nd Grazed Early and Late	87	104	191	649	840	662	1502
Canola Germinated April 20th Ungrazed					662	518	1180
Canola Germinated April 20th Grazed Early					662	706	1368

	P-values	LSD
Treatment	0.003	139.7
Change through time	<.001	174.2

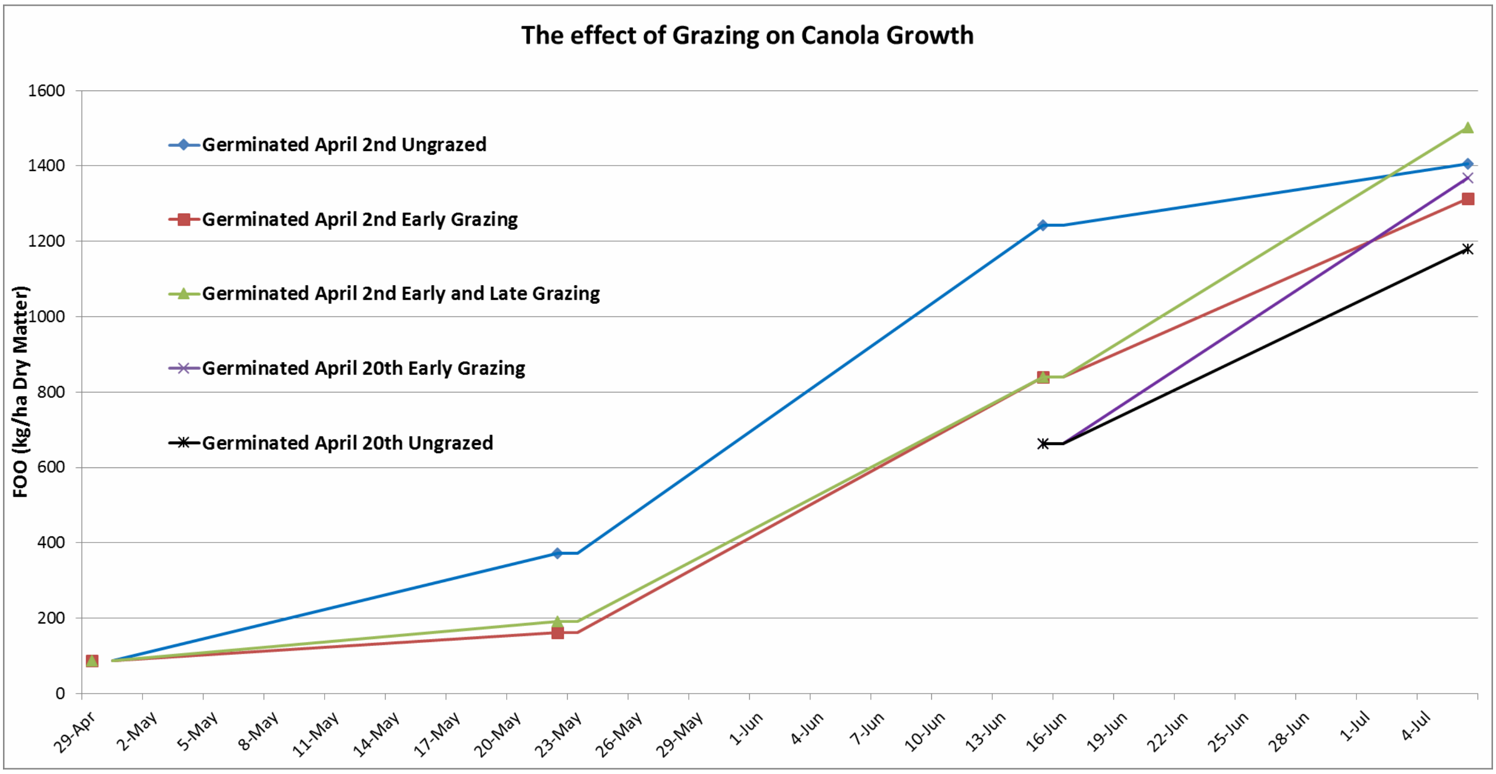


Figure 6 Feed on Offer measured through time. Measured as kg/ha Dry Matter.

Plant Counts

The results indicate that grazing did not reduce the plants per m^2. There was only one significant difference recorded at the end of the second grazing, with the plots germinated April 2nd grazed early and late recording an average final plant count of 35.8 plants/m^2.

Table 7 Average plant counts

Treatment	Start of 1st Grazing	End of 1st Grazing	Start of 2nd Grazing	End of 2nd Grazing
Canola Germinated April 2nd Ungrazed	28.8	25	24.3	25
Canola Germinated April 2nd Grazed Early	28.8	21.7	24.3	23.2
Canola Germinated April 2nd Grazed Late			24.6	32.8
Canola Germinated April 2nd Grazed Early and Late	28.8	24.2	24.8	35.8
Canola Germinated April 20th Ungrazed			24.6	25.2
Canola Germinated April 20th Grazed Early			24.6	25.8
	P-values	LSD		
Treatment	0.089	10		

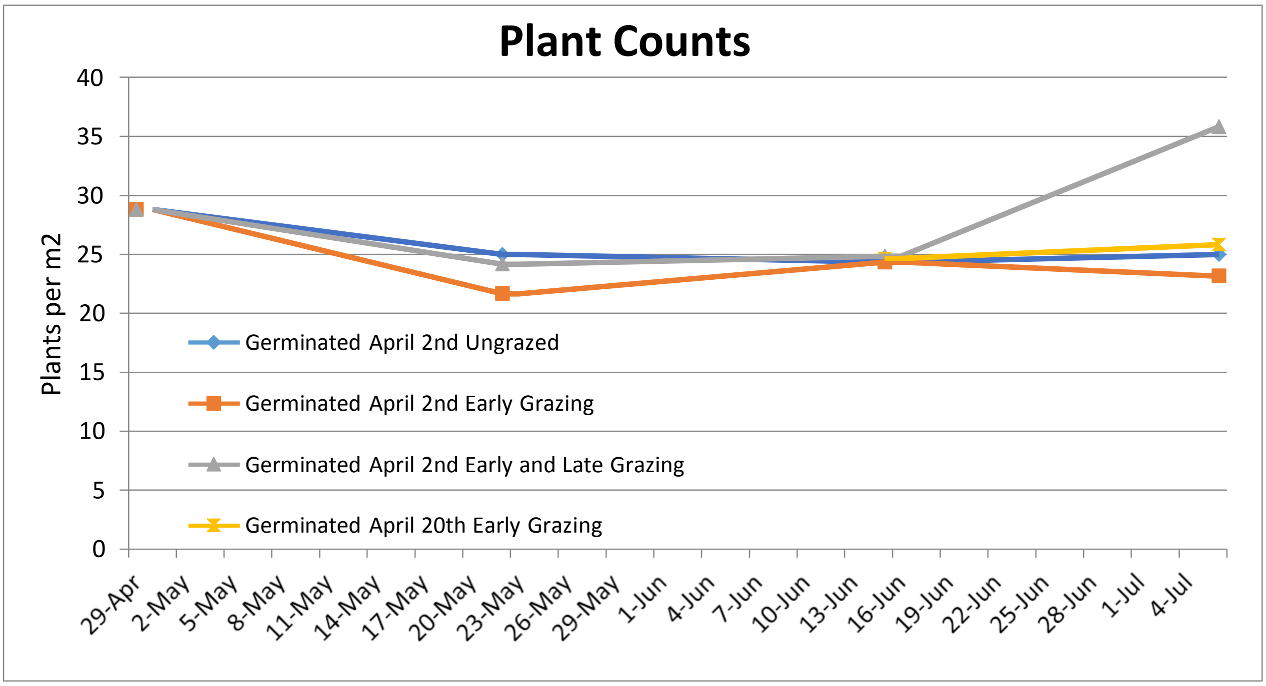


Figure 7 Average plant counts through time

Grain Quality

Sowing earlier produced significantly higher oil contents than later sowing when left ungrazed or grazed early. There was no significant effect on grain oil content if canola was grazed early relative to ungrazed at either time of sowing. Time of sowing and grazing had no influence on protein and admixture.

Table 8 Final Grain quality information

	Protein (%)	Oil (%)	Admix (gms)	Lge Admix (gms)
Canola Germinated April 2nd Ungrazed	20.0	47.2	13.2	3.1
Canola Germinated April 2nd Grazed Early	19.9	47.4	9.4	3.2
Canola Germinated April 2nd Grazed Late	20.3	46.2	12.1	2.8
Canola Germinated April 2nd Grazed Early and Late	20.1	46.5	9.1	3.0
Canola Germinated April 20th Ungrazed	20.5	45.5	8.6	3.6
Canola Germinated April 20th Grazed Early	20.6	44.9	7.9	3.5
P value	0.045	<0.001	0.024	0.569
LSD	0.53	0.99	2.95	1.02

Discussion of Results

When determining whether canola can be sown early on April 2nd compared to a more traditional sowing on April 20th, table 2 demonstrates that the yields achieved at both sowing times were not significantly different. The April 2nd sowing and germination date resulted in a final yield of 1.29t/ha compared to the April 20th sowing and germination which yielded 1.40t/ha. Grain quality parameters tested show there is a difference between the time of sowing and oil percentage. The germinated April 2nd treatments recorded significantly higher oil percentages when compared to the April 20th germination (Table 8). This demonstrates there was an advantage to the earlier sowing given price bonuses for having high oil percentages above 42%. Time of sowing had no influence on any other grain quality parameters tested.

Given the paddock was previously in a ten month fallow there was stored moisture that reduced the risk associated with early sowing. The trial area recorded 60mm for March, ensuring there was a full profile of soil moisture at sowing. Between April 2nd and June the 15th the trial received 32mm of rainfall, resulting in the crop suffering from moisture stress, with it being blue and wilted (Fig 8). Between June 15th and the 6th of July 42mm of rain fell resulting in a rapid recovery as shown below. Figure 8&9 were taken from the same location.

Figure 8 Photo taken 15th June

Figure 9 Photo taken 6th of July

The ability of canola to hang on through the dry periods experienced in 2015 should demonstrate to farmers in low rainfall areas that canola can be grown if correct rotations and agronomy are implemented. Growing canola on a paddock that was previously in a fallow ensures stored moisture can be carried between seasons, reducing the risk associated with moisture stress. This rotation also allows for two years weed control ensuring the weed seed bank is diminished, allowing multiple cereal crops to be grown in successive seasons. With many growers inspecting the trial and seeing the recovery of the canola after a rainfall event had occurred they should have an increased confidence to implement a strategy for growing canola on their farms.

Given April 2nd was such an early sowing there was an increased risk that a frost event would impact the final yield. To alter the flowering window grazing was used. A stocking rate of 4.2 DSE was chosen as it was decided this stocking rate although 1.5x the district average was achievable by growers in the eastern wheat belt. Within the two times of sowing six different times of grazing were investigated (Table 1).

Within these grazing treatments there was an early (3-5 Leaf) grazing and a late (50% Flower). A treatment of both times of grazing was included to determine how the canola would recover from over grazing. The results indicated that grazing at the 3-5 leaf stage resulted in the least yield loss (Fig 1). This early grazing allowed for the maximum amount of time for crop recovery which is imperative in the eastern wheat belt. Early grazing also allows for any early winter feed gaps to be bridged, reducing the need to supplementary feed and allowing pastures to establish and flourish.

The ability of grazing to alter the canola phenology was demonstrated. As shown in Figure 3 when grazed at the three to five leaf stage (Early) maturity was altered by roughly half a day for every one day of grazing. This rule of thumb was developed in previous grazing trial work with cereal crops. This rule of thumb demonstrated with canola allows growers the knowledge of how long to graze their crops for a desired change in maturity. Figure 3 also demonstrates how a later grazing (at 50% flower) altered maturity. It shows that when grazed late there was almost a one day delay in maturity for every one day of grazing. This delay in maturity was deemed too severe as you are increasing the level of risk associated with less time for crop recovery coupled with increasing the chances of a heat shock event influencing the final yield.

When grazing crops the desired effect is not to graze the plant right to the base but to leave some leaf matter to help in the plant recovery. It is important when grazing a paddock to monitor how hard the sheep are grazing to ensure overgrazing does not occur. A grazing time of 2-3 weeks given a stocking rate of 4-5 DSE will ensure adequate changes in canola maturity to reduce the risk of frost.

As with any crop grazing strategy there was an uneven grazing throughout the trial area. This is what you would expect in any grazing regime, with the sheep preferentially grazing the eastern plots. This area of the trial was furtherest from the road and had a greater depth of soil above the clay layer. This variable subsoil constraint on the western plots may have hindered root growth and in turn made the plants more stressed, than plants on the eastern end of the trial having access to more water and nutrients, producing more soluble carbohydrates (sugar), making the plants sweeter. However when moisture measurements were taken there was no recorded differences in available moisture between the western and eastern plots (Table 3).

Another aim of grazing was to determine whether it would reduce plant transpiration by reducing the leaf area and in turn moisture loss. By reducing moisture loss through grazing it was hypothesised that there would be more plant available water at grain fill to improve yields. As shown in Table 3 grazing had no effect on reducing transpiration, with time of sowing having a significant impact on soil moisture levels. The picture alongside shows the increased leaf area and biomass the April 2nd germination had compared to the April 20th germination when the moisture measurements were taken on the 22nd May.
Plant counts were also taken before and after each grazing to determine whether grazing would reduce the plant numbers. As shown in Figure 6 grazing had no influence on reducing plant numbers throughout the trial.

For a whole farm economic analysis sheep weights were recorded before and after each grazing period (Table 5). The first grazing period of 24 days (29th April – 22nd May) resulted in an average live weight gain of 850gm/head (37gm/head/day). This weight gain required 8.1 MJ of metabolisable energy throughout the grazing period. If the sheep were to be supplementary fed through this time they would need 660gm/head/day of lupins or 700gm/head/day of oats to match the same weight gain that was achieved by grazing the canola. Given the stocking rate used (4.2 DSE) a saving of 68kg/ha of lupins or 70kg/ha of oats was achieved. In economic terms this resulted in $22/ha in feed savings (Lupins @ 330/tonne or Oats @ 300/tonne) and was able to offset a 40kg/ha yield loss incurred by grazing.

The second grazing period of 21 days (15th of June – 6th of July) resulted in an average live weight gain of 3.9kg/head (189gm/head/day). This weight gain required 15.8 MJ of metabolisable energy. To supplementary feed and achieve the same weight gain the sheep would require 1.3kg/head/day of lupins. Oats do not have enough protein to achieve the same live weight gain. By grazing canola we were able to save a total of 119kg/ha of lupins or $39/ha (Lupins @ 330/tonne). This grazing period was then able to offset a canola yield loss of 71kg/ha. Figure 9 demonstrates the adjusted yield with the feed savings added.

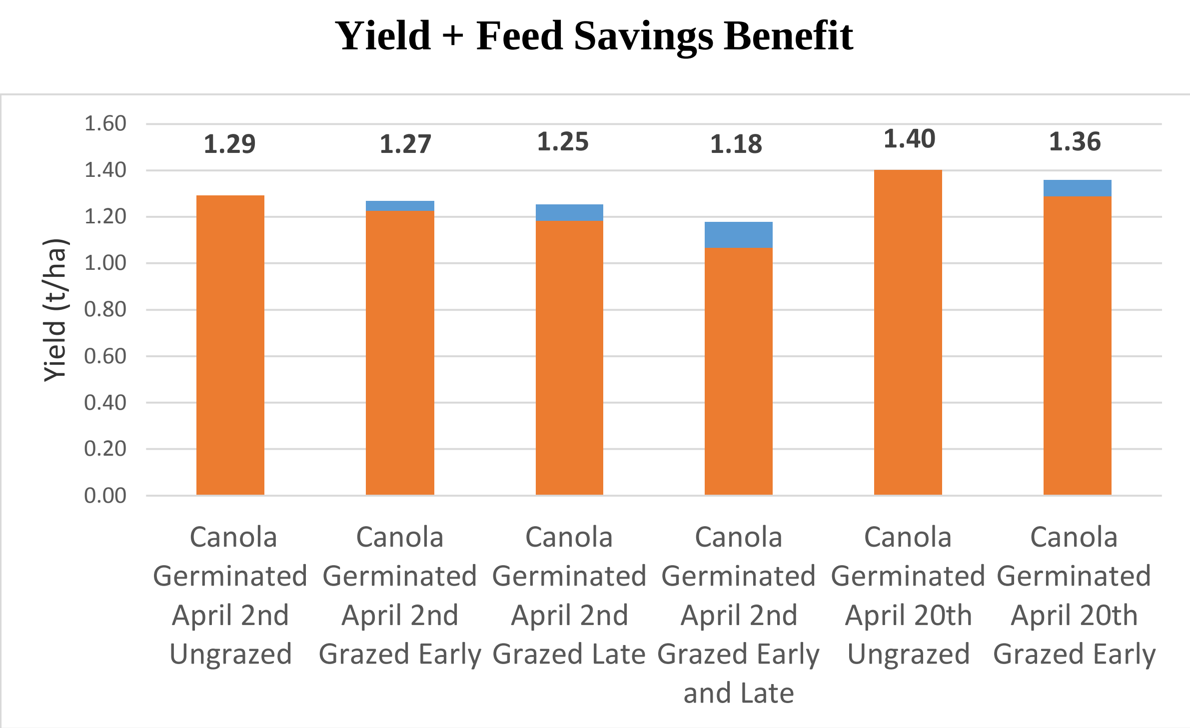


Figure 10 The final yield with the feed savings benefit added. Yield – Orange. Feed Savings Benefit - Blue

Implications

This trial has shown solid evidence that growers in the eastern wheat belt can produce high yielding profitable canola crop. When they can germinate canola in early April and have 50mm of plant available water (PAW) through a fallow or summer rain, then the canola will survive long dry periods, and yield well. To reduce the risk of having all the early sown canola flowering at a similar time it is possible to graze canola and delay flowering significantly thus spreading the frost and heat shock risks and not significantly reducing yield. This has positive implications on the carrying capacity of pasture paddocks as plant densities at emergence will be maintained while sheep are grazing the canola, allowing safer higher stocking rates which should produce greater profits.

To improve the level of PAW and improve the consistency of canola yields, canola should be sown onto a paddock which was previously in a ten month fallow. This tactic provides two years weed control, allowing multiple cereal crops to be grown in low weed burden paddocks reducing the pressure on selective herbicides allowing a good percentage of the cereal program to be able to be sown dry. By following these steps canola will become a more viable and profitable break crop in the eastern wheat belt. Given growers implement this strategy, the area sown consistently to canola will increase in lower rainfall areas with still increased areas sown on opportunistic significant summer/autumn rainfall.

The ability to carry moisture between seasons will also see yield improvements, increasing the total canola crop in WA. If growers are consistently getting yields above 1.2t/ha with their OP TT varieties, roundup ready hybrids may also become a more viable option. The ability to grow RR hybrids should further improve yields, whilst maximising weed control throughout the eastern wheat belt.

Recommendations

Further trial work could be conducted to assess the ability of other canola varieties to early sowing opportunities. Further research may be needed to investigate how other soil types through the eastern wheat belt are suited to the early sowing of canola. This will give growers the confidence to target paddocks given a certain soil type for early sowing opportunities.

Appendices

Canola Development Chart

Table ii. Stages of development in canola (*B. napus*).

STAGE	DECiMAL SCORE
Dry seed	0.0
Imbibed seed	0.2
Radicle emerged	0.4
Hypocotyl extended	0.6
Cotyledons emerged	0.8
LEAF PRODUCTiON (LOST LEAvES ARE COUNTED BY THEiR SCARS)	
Both cotyledons unfolded and green	1.00
1st true leaf exposed	1.01
2nd true leaf exposed	1.02
5th true leaf exposed	1.05
10th true leaf exposed	1.10
20th true leaf exposed	1.20
STEM EXTENSiON	
No internodes detectable (rosette)	2.00
One internode detectable	2.01
Two internodes detectable	2.02
Five internodes detectable	2.05
Ten internodes detectable	2.10
Twenty internodes detectable	2.20
FLOWER BUD DEvELOPMENT	
Only leaf buds present	3.0
Flower buds present but enclosed by leaves	3.1
Flower buds visible from above (green bud)	3.3
Flower buds raised above leaves	3.5
First flower stalks extending	3.6
First buds yellow (yellow bud)	3.7
More than half of flower buds on raceme yellow	3.9
FLOWERiNG	
1st flowers opened	4.1
20% of all buds on raceme flowering or flowered	4.2
50% of all buds on raceme flowering or flowered	4.5
80% of all buds on raceme flowering or flowered	4.8
All viable buds on raceme finished flowering	4.9
POD DEvELOPMENT	
Lowest pods more than 2 cm long	5.1
20% of potential pods on raceme more than 2 cm long	5.2
50% of potential pods on raceme more than 2 cm long	5.5
80% of potential pods on raceme more than 2 cm long	5.8
All potential pods on raceme more than 2 cm long	5.9
SEED DEvELOPMENT	
Seeds present	6.1
Most seeds translucent	6.2
Most seeds green	6.3
Most seeds green-brown mottled	6.4
Most seeds brown	6.5
Most seeds dark brown	6.6
Most seeds black but soft	6.7
Most seeds black and hard	6.8
All seeds black and hard	6.9

Source: Modified from Sylvester-Bradley and Makepeace (1984)

Extension Activities

- Members of MADFIG toured the site. Approx 15 attendees
- WANTFA board of directors toured. Approx 5-10 attendees
- Merredin DAFWA field walk. Approx 150 attendees
- Merredin Landmark toured the site twice. Approx 20 attendees
- Australian Canola Researchers visited. Approx 10 attendees

The trial was also presented at the Merredin Research Updates on the 9th of March 2016. There was 80-100 people in attendance for the research updates.
Further presentations have been given at the Merredin (14 Attendees), Quairading (24 Attendees), Narembeen (31 Attendees), Bruce Rock (37 Attendees), Kellerberrin (12 Attendees), Cunderdin (22 Attendees), Bulyee (18 Attendees), Coorow (15 Attendees), Goomalling (12 Attendees) and Carnamah (28 Attendees) farmer group meetings, attendees totalling 213 farmers. It was also presented and discussed at ConsultAg pre-seeding workshops which were attended by 135 ConsultAg clients.

The results from the trial were published in the 2016 Grain and Graze booklet and will be published in the early sowing of canola article being written for the Western Region in Ground Cover.

Plain English Summary

Project Title:	**2015 Canola early sowing management systems: Grazing canola to modify maturity and water use**
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Organisation:	ConsultAg Northam 57 Wellington St WA 6401
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Objectives	To determine how early canola can be sown in the eastern wheat belt, given there is enough moisture to germinate and allow the crop to survive in early April. To determine the best time to graze canola, reducing the frost risk by altering crop maturity.
Background	This trial was designed to give growers in the eastern wheat belt the confidence to sow canola in early April if there is enough moisture in the soil to germinate and allow the crop to survive. Since 2000 there has been a reduction in May/June germinating rains with more significant rainfall events occurring during March/April. Therefore, if the soil moisture level is enough to germinate a canola crop in early April farmers need to make a quick decision to sow canola early. This is imperative as soil moisture can be lost rapidly, reducing their ability to get an even germination. Given issues surrounding frost when crops are sown early, grazing has shown to be an option for altering the maturity in cereals. With research into canola grazing and its ability to alter maturity in the eastern wheat belt limited this trial was designed to determine the best time for canola grazing.
Research	The first part of this trial was to determine how early canola can be sown in the eastern wheat belt. The results indicate that given there is enough moisture to germinate and allow the crop to survive in early April there is no yield penalty associated with early sowing. The second aspect of the trial was investigating the best time to graze canola, to reduce any potential yield loss and to alter crop maturity. The trial work concluded that the best time to graze canola is early at the three to five leaf stage. This limited the yield loss, while also allowing a half day delay in maturity for every one day of grazing. Grazing also showed its ability to save the grower costs associated with the need to supplementary feed in early winter.
Outcomes	That extra area of canola may be grown in the eastern wheat belt of WA, given they implement sound agronomy and rotation practices. This will improve weed control in the area and improve the profitability of the break crop, resulting in canola being a more viable option for growers. Grazing canola will defer the grazing of pasture resulting in potential increases of livestock carrying capacity.
Implications	This trial has shown that canola can be grown in the eastern wheat belt of WA, given the paddock was in a previous 10 month fallow and/or there has been enough March/April rain to allow the crop to germinate and survive from an early April sowing. It has also shown the ability of grazing to alter the flowering window and that in a mixed farming operation grazing canola can save costs associated with supplementary feeding in early winter, with minimal yield loss to the canola.
Publications	Merredin Research Updates Booklet, Published March 2016 GRDC Western Region Early Sowing of Canola Article Grain and Graze Trial Results Booklet published in February 2016