

Kapunda

The Kapunda farm was a total of 2650 ha arable area. Of that 650 ha was cropped (180 ha milling wheat, 125 ha durum wheat, 270 ha barley, 75 ha canola). The remaining 1850 ha was native pasture (1650ha) and medic (200 ha) with a first cross operation run on it. The first cross flock contained 2484 breeding ewes (Merino), with half of them used to breed replacement Merino ewes and the other half cross with a Suffolk sire for first cross lambs.

The soil was a sandy clay loam with a plant available water capacity of 122 mm.

Crops were generally sown late April – mid May as per district practice to set a baseline. This was compared with three scenarios.

- I. Grazing normally sown crops
- II. Earlier sowing and earlier grazing
- III. Earlier sowing and earlier grazing with more stock to match the increase in area grazed over the year.

See appendix for more details on varieties and dates.

1. Grazing crops in the existing systems

1.1. Net farm profit

Grazing crops and stubbles at Kapunda in a standard system (ie. normal sowing dates, no management changes to accommodate grazing) resulted in 5.5% increase in average whole farm profit (\$28,271).

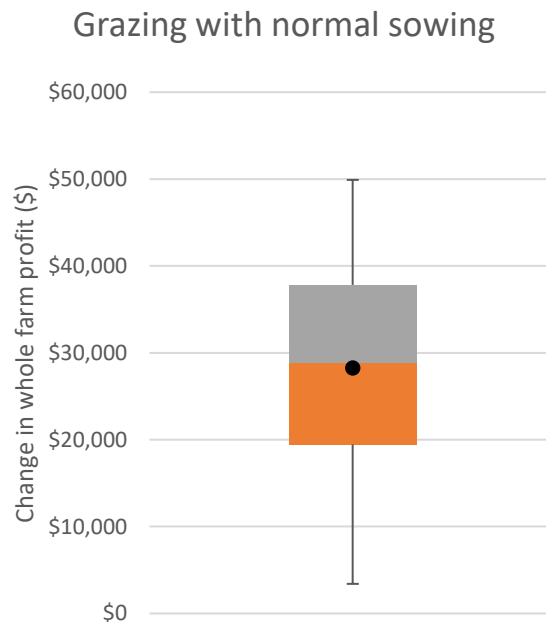


Figure 1. Change in whole farm profit with grazing crops compared to a baseline of not grazing

1.2. Crop gross margins

Grazing crops that were sown on a standard date resulted in decline in crop gross margin (GM) 99% of the time. On average the change in crop GM with grazing was $-\$11.10/\text{ha}$ due to yield decline with grazing (figure 2).

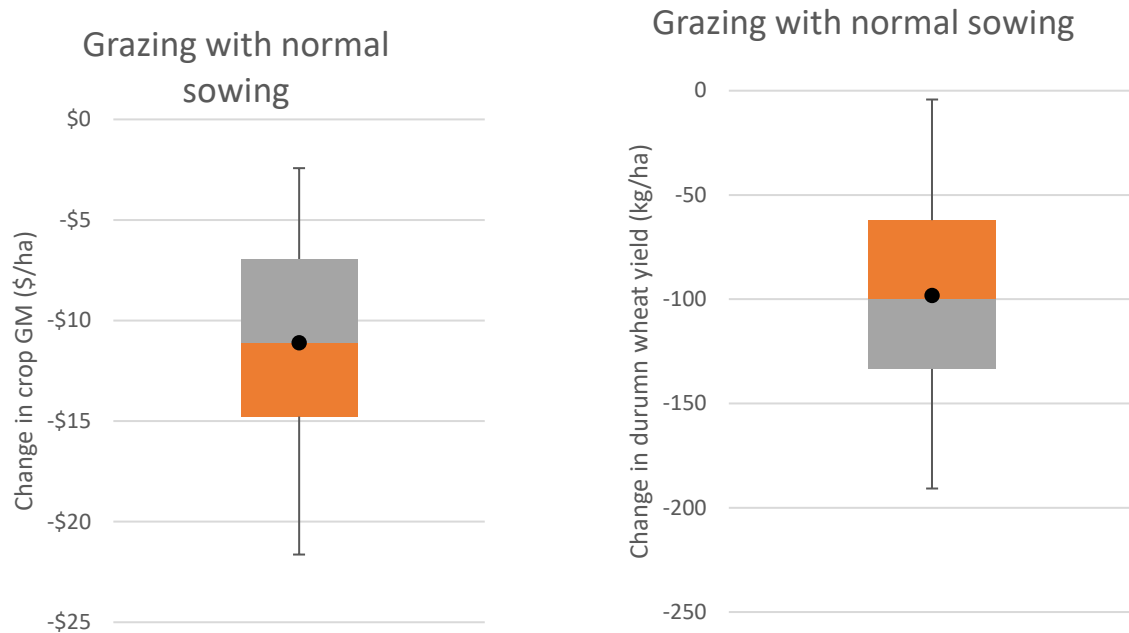


Figure 2. Change in crop GM (left) and wheat yield (kg/ha) with grazing compared to the baseline of not grazing.

1.1. Livestock gross margins

Gross margin increased with grazing crops 99.9% of the time. On average the GM increased by $\$18.80/\text{ha}$ (figure 3).

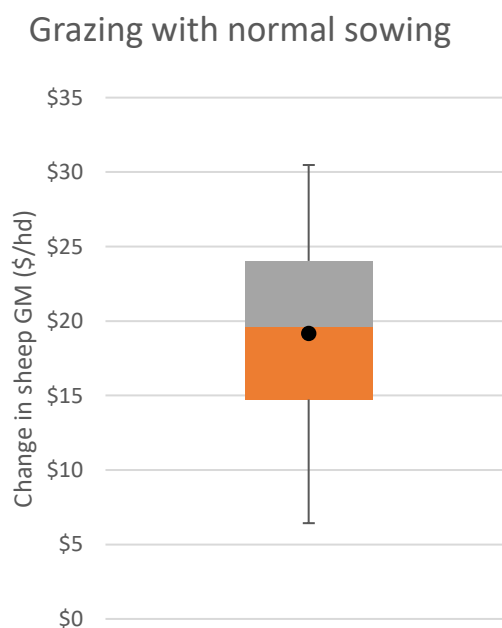


Figure 3. Change in livestock GM with grazing crops compared to a baseline of not grazing crops.

1.2. What is changing the crop GM?

Cereal crops were grazed, with resulting yield reductions in all three crop types (milling wheat, durum wheat and feed barley). Barley yields changed the same proportions from grazing as wheat¹.

Canola was not grazed as adequate early season biomass was not reliable enough for grazing.

1.3. What is changing the livestock GM?

Lambing percentage

Timing of crop grazing has a large effect on lambing percentage. Ewes used to produce replacements came off crop 18 days before lambing and had reliable increase in lambing percentage of 5.7% on average. Ewes used to produce first cross lambs had an average increase in lambing percentage of 11.3%, but with much more variation, seen in the length of the box and whiskers in figure 4. These ewes came off crop the day before lambing.

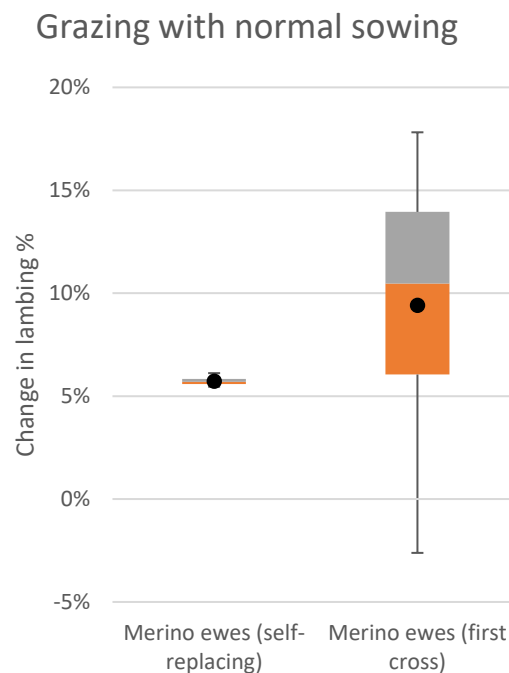


Figure 4. Change in lambing percentage with grazing crops compared to a baseline of not grazing crops.

- Merino ewes (self-replacing) grazed crop July 18-July 1 and lambed July 18. By lambing, they were only 0.05CS heavier than if they had not grazed crop.
- Merino ewes (first-cross) grazed crop July 2-18 and lambed July 18. By lambing, they were only 0.04CS heavier than if they had not grazed crop.

¹ APSIM does not allow defoliation (grazing) of barley so grazed barley was modelled by using the same proportional decline in wheat yields from grazing.

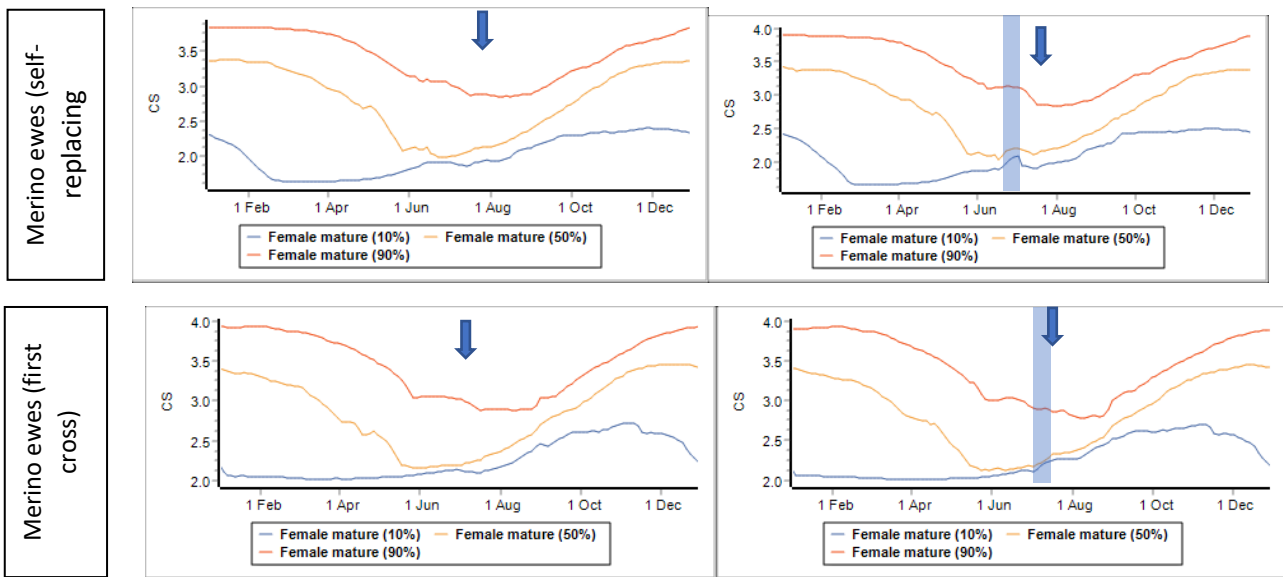


Figure 5. Ewe condition score² where crops are not grazed (left) and where they were grazed (right). Blue arrow shows lambing, shaded crop is crop grazing window.

Sale weights

The only animal class to significantly change sale weight were the CFA ewes and first cross lambs (figure 6).

² Graph is generated from percentiles of the whole data set. Each line does not represent a singular year or ewe in the mob, but the (eg.) 50th percentile ewe CS for that day from across the 35 years of the model.

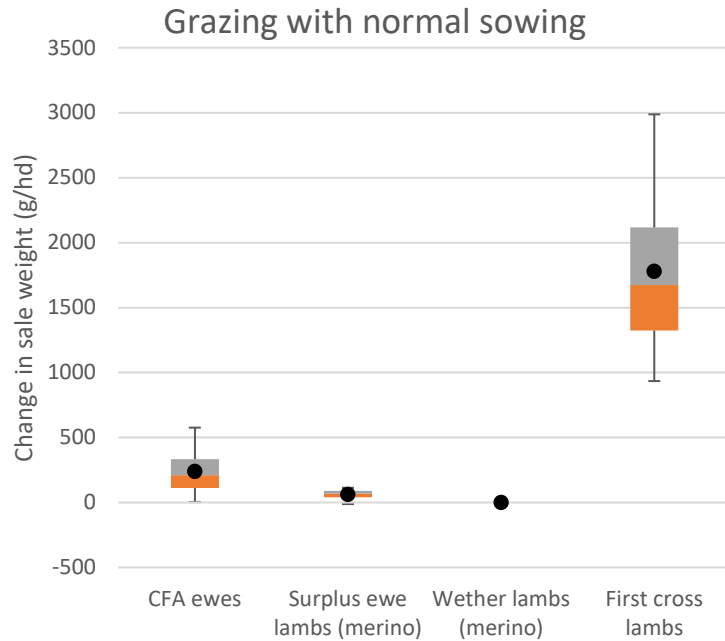


Figure 6. Change in sale weights of first cross lambs and CFA ewes from the prime lamb mob with grazing crops.

The first cross lambs grazed stubbles whilst the merino lambs did not, hence the big difference in the changes to their sale weights. First cross lambs sold on average 1.78 kg/hd heavier (+\$3.61/hd). CFA ewes sold on average 239 g heavier (+\$0.28/hd). Surplus merino ewes sold 62 g/hd heavier (+\$0.08). Wether lambs were the same weight.

Wool cut

Wool cut increased marginally with grazing crops (figure 7). Ewes in the self-replacing flock had the largest change in wool cut in response to grazing crops, with an average increase of 70 g CFW/hd. At a price of \$13.19/kg cln for 19 μ m wool that is an average increase of \$0.92/ewe.

Ewes in the first cross flock had a slight decline in wool cut, decreasing on average 49 g CFW/hd (-\$0.65/hd)

Merino hoggets increased wool cut on average 29 CFW/hd (+\$0.42). At a price of \$14.45/kg cln for 18 μ m wool that is an average increase of \$0.55/hd.

First cross lambs increased wool cut on average 48g/hd. At a price of \$10.43/kg cln for 23 μ m wool that is an average increase of \$0.50/hd.

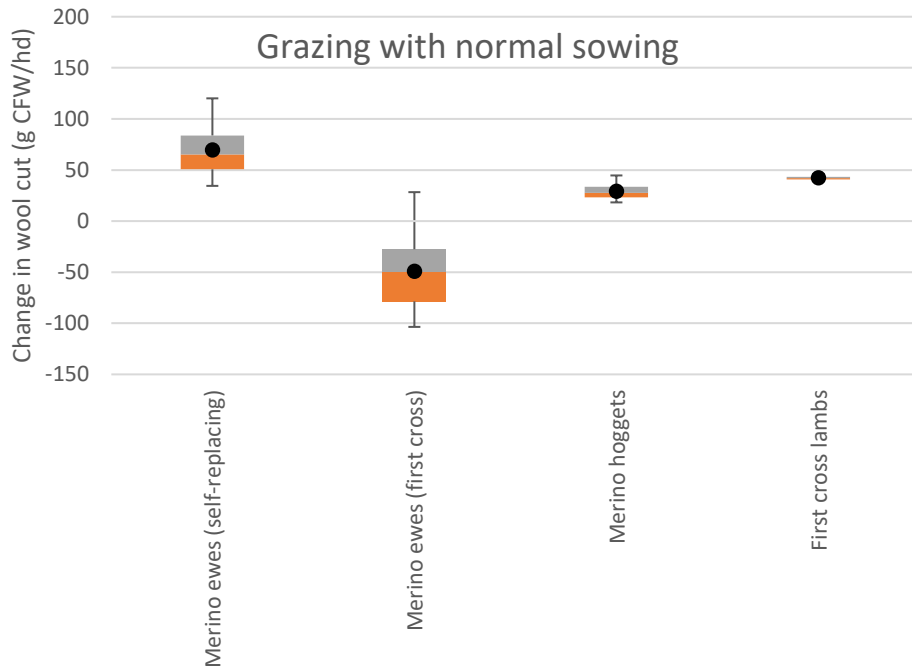


Figure 7. Change in wool cut with grazing crops

Supplementary feeding

Supplementary feeding was kept to a minimum, so although feeding out decreased with grazing crops, it was not all that substantial (figure 8).

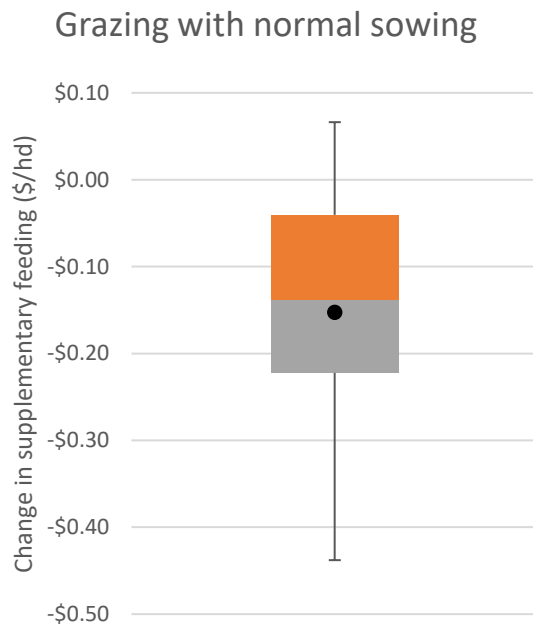


Figure 8. Change in supplementary feeding costs for the whole flock divided by the number of ewes.

The whole first cross operation, including self-replacing flock, saved on average 1.63 t feed (barley) which equated to \$379 across the mob on average.

Very occasionally feeding out increased with grazing crops, seen in the upper whisker in figure 8 reaching \$0.07/hd. This was mainly driven by increased feeding out to lambs in a late autumn break because more there were more lambs born than when crops were not grazed.

1.4. How often are crops grazed?

Crops were only grazed when the extra fodder was needed. When green pasture FOO was <800 kg DM/ha animals were put on crop. First cross lambs grazed stubble every year.

	Merino ewes (self-replacing)		Merino ewes (first cross)	
	Frequency of years	Crops grazed	Frequency of years	Crops grazed
Grazing with normal sowing	65%	Barley (2 – 16 July) Milling wheat (16 – 19 July)	73%	Durum wheat (18 June – 2 July)

2. Grazing early sown crops

2.1. Net farm profit

Grazing crops and stubbles at Kapunda when longer season varieties were sown resulted in 2.75% increase in whole farm profit (\$14,031).

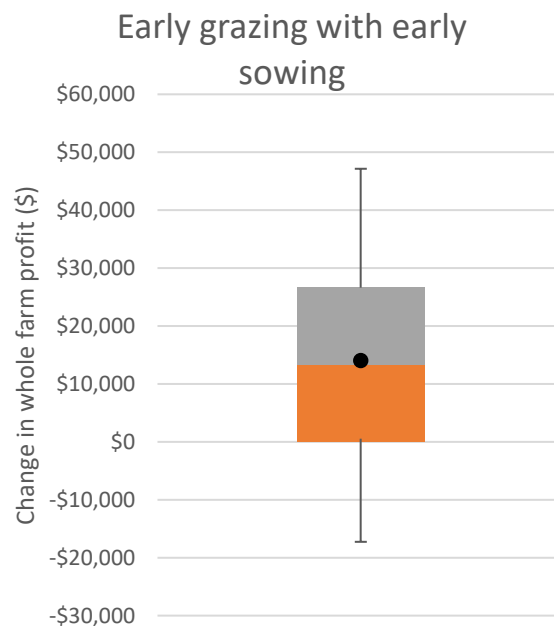


Figure 9. Change in whole farm profit with grazing crops compared to a baseline of not grazing.

2.2. Crop gross margins

Early sowing had a significant impact on yields (figure 10). The yield increase from early sowing outweighed the slight yield decline from grazing.

Grazing long season crop varieties that were sown earlier saw a decrease in crop gross margin (GM) 78% of the time (figure 11). On average the change in crop GM with grazing was -\$22/ha (figure 10). See appendix for sowing dates and varieties.

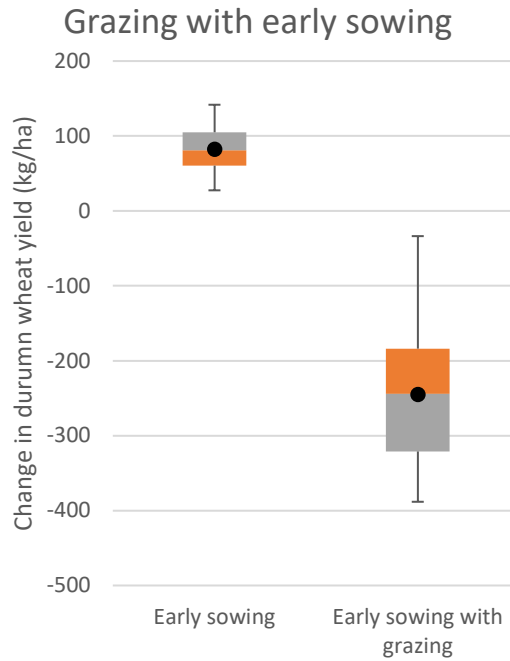


Figure 10. Change in durum wheat yield with earlier sowing compared with normal sowing (left bar), and grazing of early sown wheat compared with normally sown ungrazed (right bar)

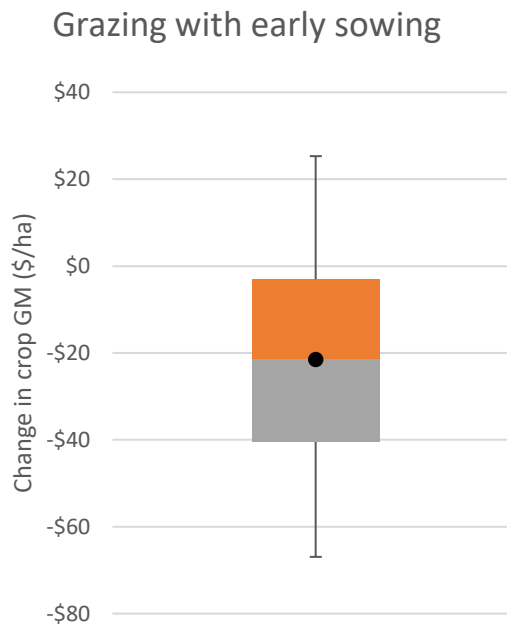


Figure 11. Change in crop GM (left) with early grazing of early sown crops compared to the baseline of not grazing normally sown crops.

2.3. Livestock gross margins

Gross margin increased with early grazing of crops 100% of the time. On average the GM increased by \$13.4/ha (figure 12).

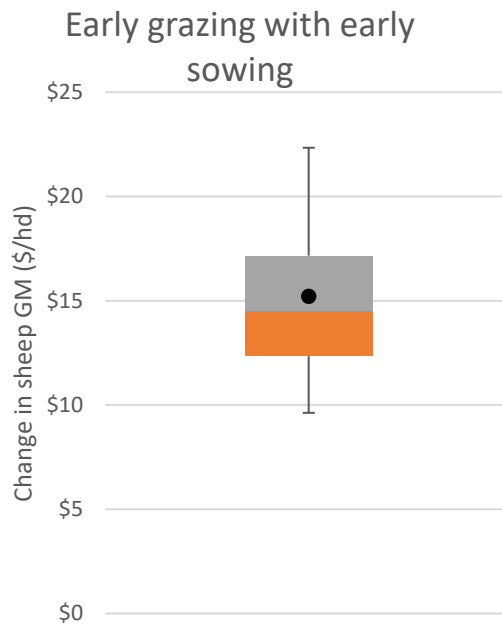


Figure 12. Change in livestock GM with early sowing and early grazing of crops compared to a baseline of not grazing crops.

2.4. What is changing the crop gross margin?

The idea was to sow earlier and graze crops earlier to reduce yield loss. With the earlier sowing, canola could be grazed from May when it was not grazed at all in the later sowing. The change in sequence of crop grazing meant that durum wheat was grazed at the same time and milling wheat was not grazed at all. This defeated the purpose of sowing earlier, as it shortened the recovery window for the durum wheat, leading to greater yield declines, and canola yields were also decreased by grazing.

2.5. What is changing the livestock gross margin?

Lambing percentage

Proximity to grazing had a large impact on change in lambing percentage in both the grazing of early and normal sown crops (see section 1.3).

Merino ewes in the first cross operation came off crop 37 days before lambing, whilst those in the self-replacing flock came off only 16 days before lambing. The flocks increased lambing percentage 1.9% and 6.7% respectively.

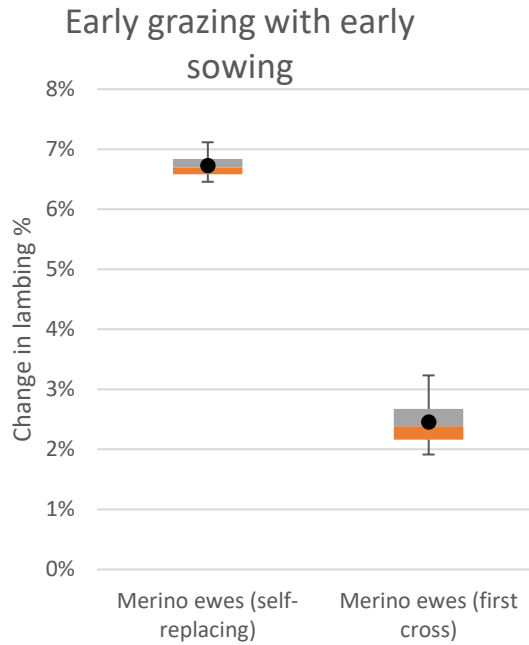


Figure 13. Change in lambing percentage with grazing of early sown crops compared to a baseline of not grazing crops.

- Merino ewes (self-replacing) grazed crop June 11-30 and lambed July 18. By lambing, they were 0.07CS heavier than if they had not grazed crop.
- Merino ewes (first-cross) grazed crop May 21- Jun 10 and lambed July 18. By lambing, they were 0.10CS heavier than if they had not grazed crop.

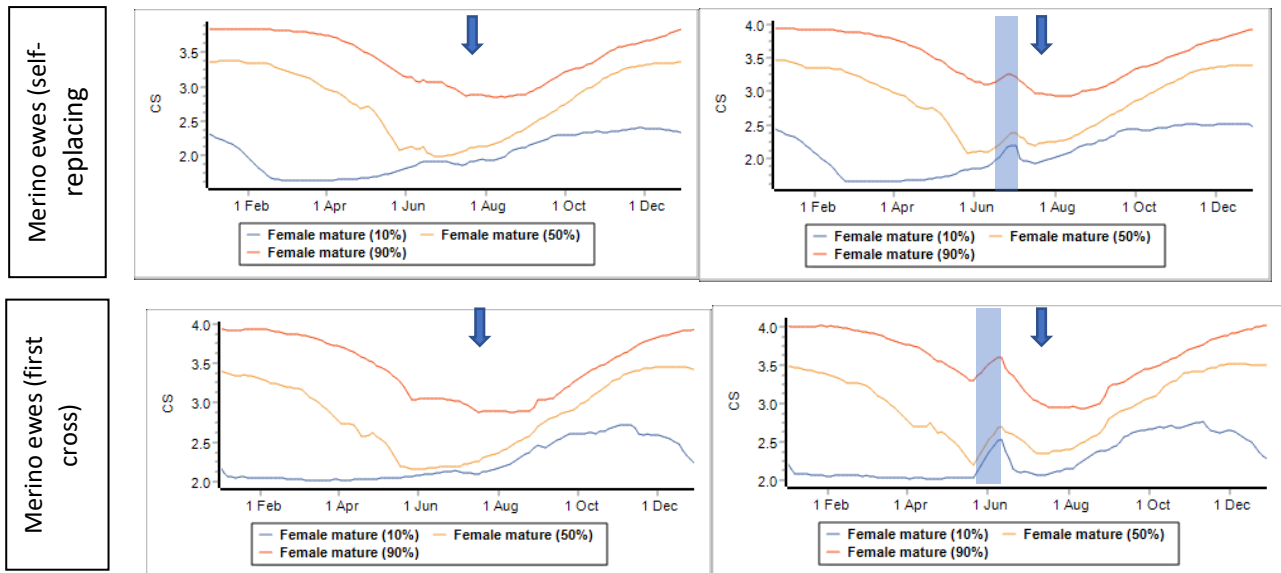


Figure 14. Ewe condition score³ where crops are not grazed (left) and where they were grazed early at a normal stocking rate (right). Blue arrow shows lambing, shaded crop is crop grazing window.

³ Graph is generated from percentiles of the whole data set. Each line does not represent a singular year or ewe in the mob, but the (eg.) 50th percentile ewe CS for that day from the 35 years of the model.

Sale weights

CFA, first cross lambs and, to a lesser extent, surplus ewe lambs, changed weight with grazing crops.

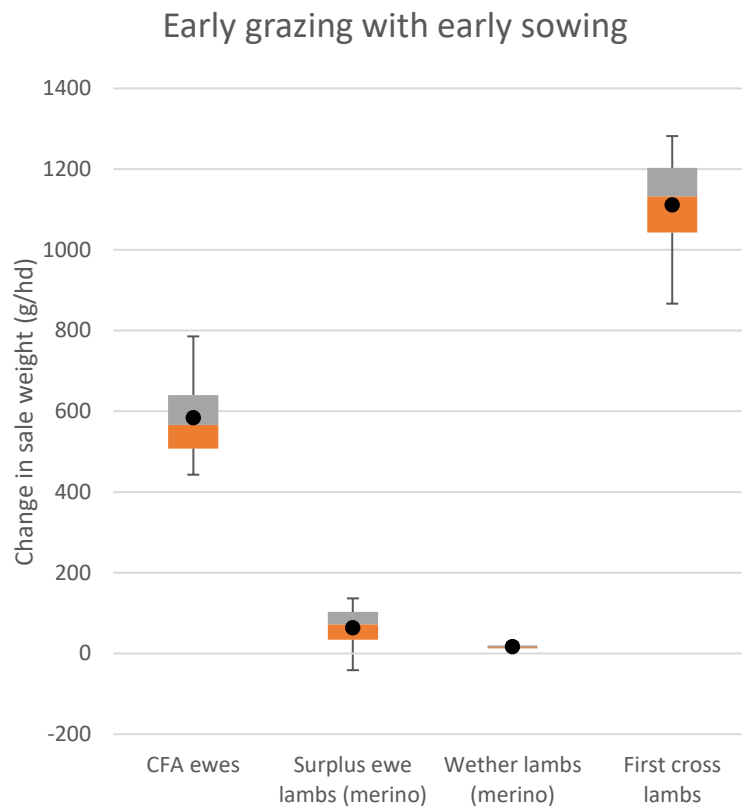


Figure 15. Change in sale weights with early grazing of early sown crops.

The first cross lambs grazed stubbles whilst the merino lambs did not, hence the big difference in the changes to their sale weights. First cross lambs sold on average 1.11 kg/hd heavier (+\$2.25/hd).

CFA ewes were significantly heavier with grazing crops, averaging an extra 584 g/hd (+\$0.63/hd). Surplus ewes sold on average 63 g/hd heavier (+\$0.09/hd). Merino wethers sold on average 17 g/hd heavier (+\$0.02/hd)

Wool cut

Wool cut generally increased with grazing crops (figure 16).

Merino ewes for the self-replacing flock came off crop 30 days before shearing, while ewes in the first cross operation came off 51 days prior to shearing. Both flocks had increased wool cut, although there was differences in the variability.

Merino ewe (self-replacing) wool cut increased on average 96 g CFW/hd. At a price of \$13.19/kg cln for 19 μ m wool that is an average increase of \$1.27/ewe. Merino ewes (first cross) increased on average 82 g CFW/hd (+\$1.08).

Merino hoggets increased wool cut on average 26 g CFW/hg. At a price of \$14.45/kg for 18 μ m wool that is an average increase of \$0.38/hd.

First cross lamb increased wool cut on average by 48 g CFW/hd. At a price of \$10.43/kg for 23 μ m wool that is an average increase of \$0.05/lamb.

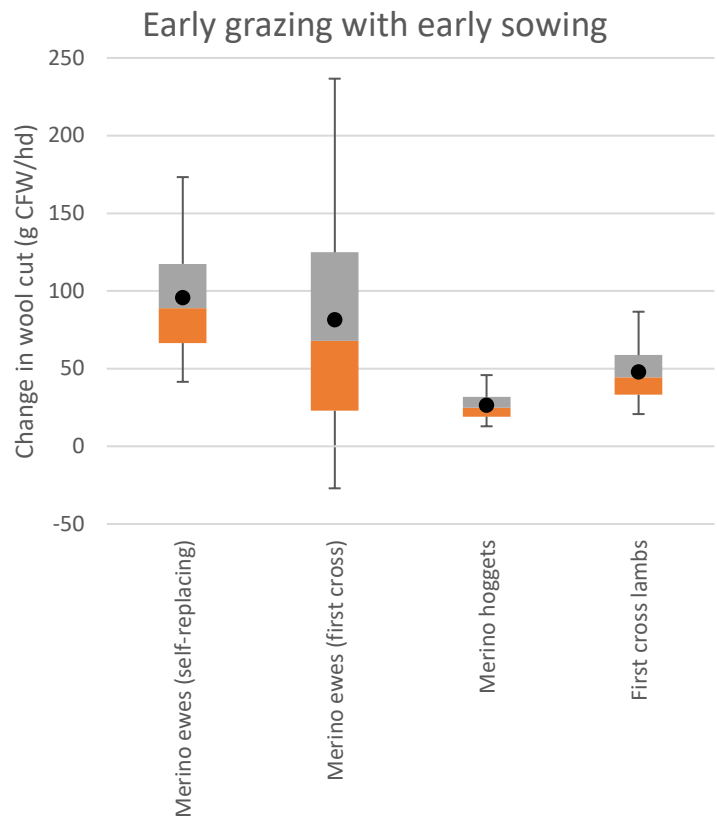


Figure 16. Change in wool cut from merino ewes and first cross lambs with grazing crops

Supplementary feeding

Supplementary feeding was kept to a minimum, so although feeding out decreased with grazing crops, it was not all that substantial (figure 8).

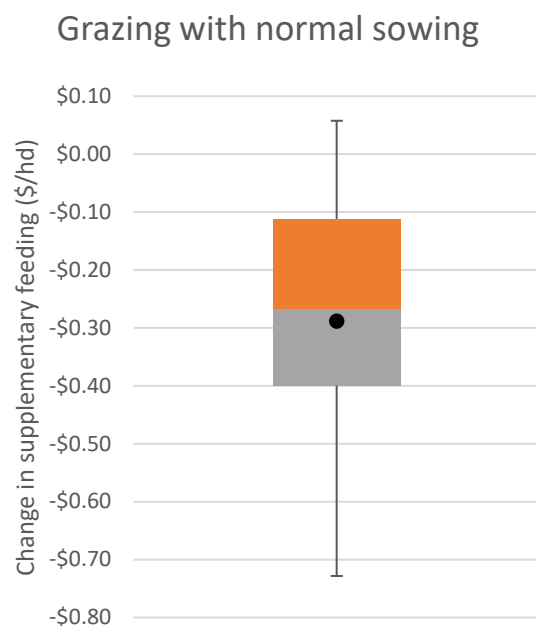


Figure 17. Change in supplementary feeding for the whole flock divided by the number of ewes in the flock where early sown crops were grazed.

The whole first cross operation, including self-replacing flock, saved on average 3.1 t feed (barley) which equated to \$716 across the flock on average.

Very occasionally feeding out increased with grazing crops, seen in the upper whisker in figure 8 reaching \$0.06/hd. This was mainly driven by increased feeding out to lambs in a late autumn break because more there were more lambs born than when crops were not grazed.

2.6. How often are crops grazed?

Crops were only grazed when the extra fodder was needed. When green pasture FOO was <800 kg DM/ha animals were put on crop. First cross lambs grazed stubble every year.

	Merino ewes (self-replacing)		Merino ewes (first cross)	
	Crops grazed	Frequency of years	Crops grazed	Frequency of years
Early grazing with early sowing	88%	Canola (21 May – 4 June) Barley (4 -11 June)	77%	Barley (11 – 18 June) Durum wheat (18 June – 2 July)

3. Grazing early sown crops with a higher stocking rate

The total grazing area across the year was calculated, and if cropped area grazed and time on crop were adequate, the number of stock was increased to maintain the same stocking rate (see Appendix 1 in the Executive Summary for a calculation example).

At Kapunda, there was insufficient grazing time and area for stock number to be increased across the year.

Appendix – Kapunda farm system

Soil type

Rubbly Fine Sandy Clay Loam over Clay (CI907)(Stockport No263); PAW 122mm

Grazed area

1850 ha with 1850 Merino ewes . Half joined with a Merino ram for self-replacing ewes, half joined with a Suffolk ram for first cross lambs.

Cropped area

180 ha milling wheat; 125 ha durum wheat; 270 ha barley; 75 ha canola

Varieties and sowing dates

Crop	Normal sowing date and variety		Early sowing date and variety	
Wheat (milling)	Mace	May 3-8	Trojan	April 15-5
Wheat (Durum)	Aurora	May 5-10	Aurora	May 1-5
Barley	LaTrobe	May 10-20	Compass	April 20 – May 5
Canola	Stingray	April 24-May 5	Hyola 650 TT	March 15-May 5

Crop grazing

	Merino ewes (self-replacing)		Merino ewes (first cross)	
	Frequency of years	Crops grazed	Frequency of years	Crops grazed
1. No grazing, normal sowing	Never	-	Never	-
2. No grazing, early sowing	Never	-	Never	-
3. Late grazing, normal sowing	65%	Barley (2 – 16 July) Milling wheat (16 – 19 July)	73%	Durum wheat (18 June – 2 July)
4. Early grazing (normal SR), normal sowing	88%	Canola (21 May – 4 June) Barley (4 -11 June)	77%	Barley (11 – 18 June) Durum wheat (18 June – 2 July)