Inverleigh

The Inverleigh farm was a total of 1140 ha arable area. Of that 240 ha cropped (100 ha wheat, 70 ha barley, 70 ha canola). The remaining 900 ha was improved pasture with prime lamb and first cross operations run. The prime lamb flock contained 2354 breeding ewes (Dorset). The first cross flock contained 1974 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 clayey sand with a plant available water capacity of 138 mm.

Crops were generally sown late April – late 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 Inverleigh in a standard system (ie. normal sowing dates, no management changes to accommodate grazing) resulted in 2.3% increase in average whole farm profit ($9,591).

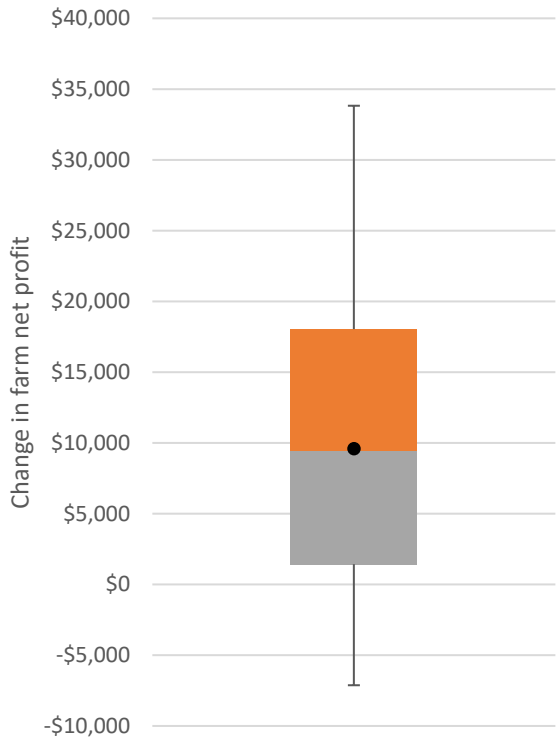


Figure 1. Change in whole farm profit with grazing crops compared to a baseline of not grazing

There was a greater increase in the poor years than the good years: while the top 25% of years only increased 1.2% with grazing crops, the bottom 25% of years increased 4.0%.

1.2. Crop gross margins

Grazing crops that were sown on a standard date resulted in decline in crop gross margin (GM) 86% of the time. On average the change in crop GM with grazing was -$21/ha due to yield decline with grazing (figure 2).

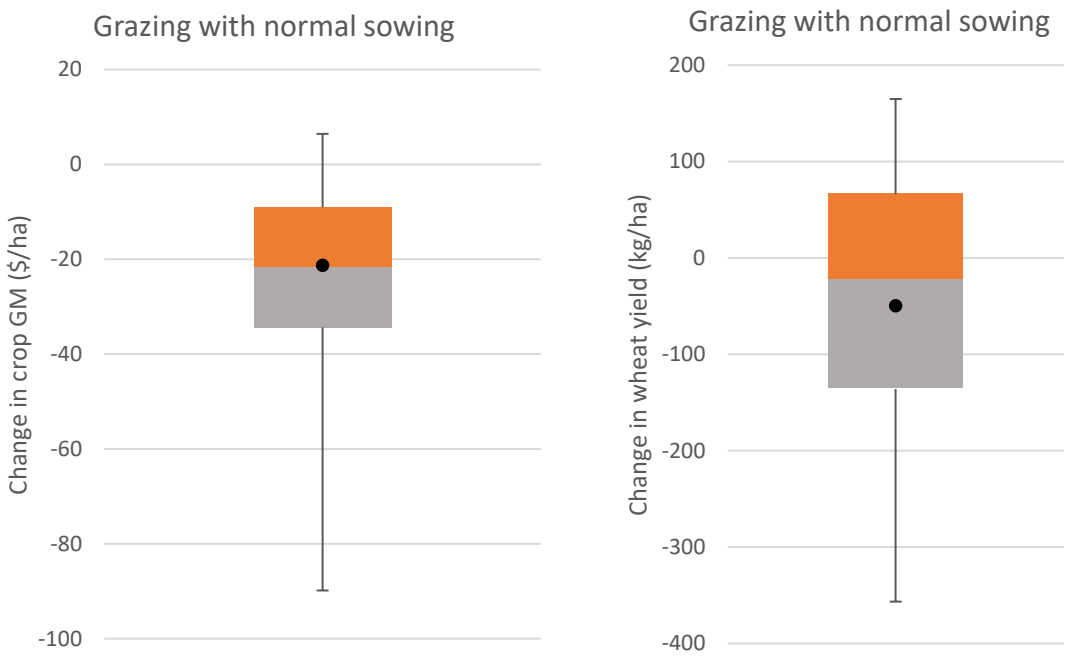


Figure 2. Change in crop GM (left) and wheat yield (kg/ha) with grazing compared to the baseline of not grazing.

1.1. Livestock gross margins

Gross margin increased with grazing crops 89% of the time. On average the GM increased by $12.50/ha (figure 3).

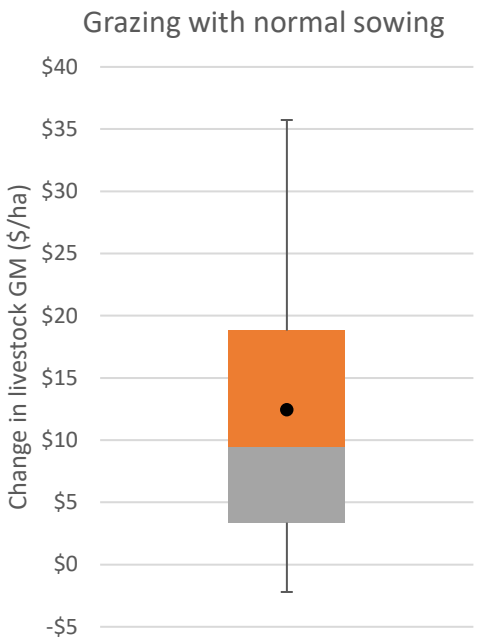


Figure 3. Change in livestock GM with grazing crops compared to a baseline of not grazing crops.

1.2. What is changing the crop GM?

Wheat yield decline with grazing was the main cause of decreased crop GM. The larger area of wheat planted than barley (100 ha wheat versus 70 ha barley) and higher prices of wheat meant the yield declines in wheat had a greater effect on crop margins than barley. Barley yields changed the same proportions from grazing as wheat[1].

Autumn sown canola is not generally grazed in south west Victoria because the winter is too cold for adequate recovery prior to flowering. Therefore, canola was not grazed in the model.

1.3. What is changing the livestock GM?

Lambing percentage

Grazing crops marginally increased lambing percentage for the prime lamb mob (average increase of 1%). It did not affect first cross (Merino x Suffolk) lambing because ewes only started grazing two days before lambing. The first cross self-replacing mob did not graze crops so there was no change in lambing.

[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.

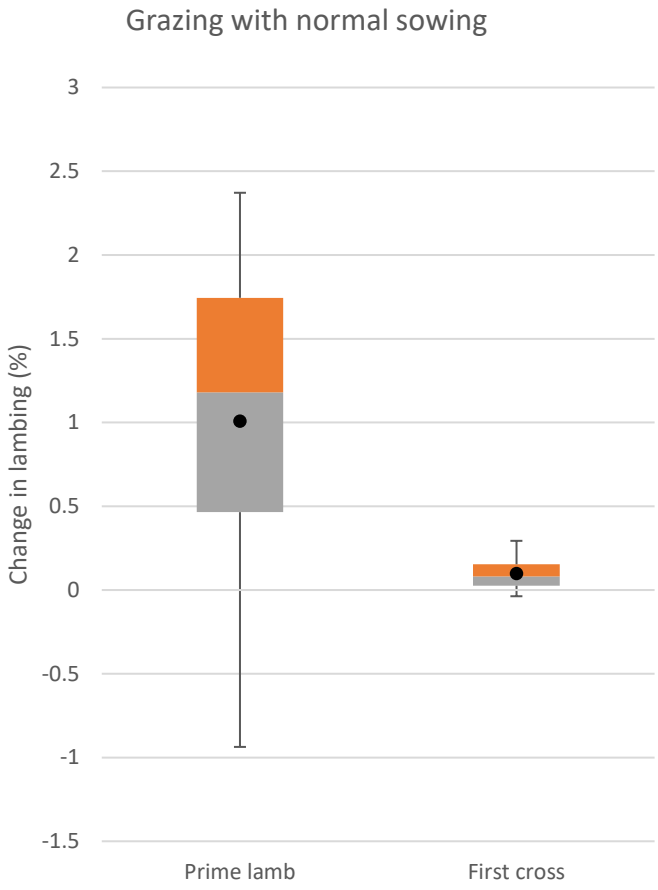
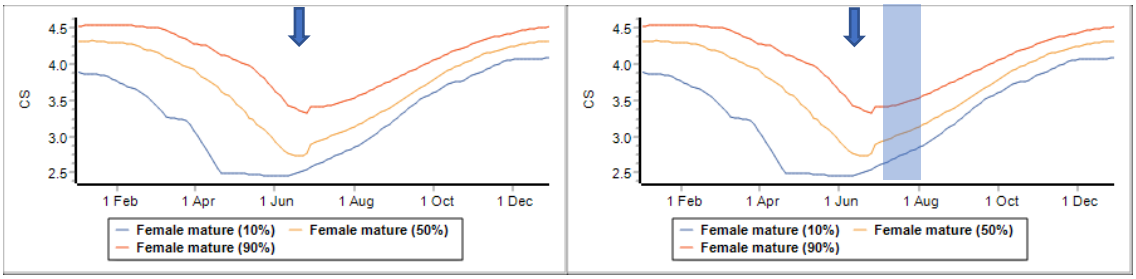


Figure 4. Change in lambing percentage with grazing crops compared to a baseline of not grazing crops.

- First cross ewes grazed crop July 9-23 and lambed on the crop (June 12). Any condition gained from being on crops was lost by joining and lambing.
- Prime lamb ewes grazed crop July 2-23 and lambed on August 11. This meant they were 0.1 CS higher coming into lambing, resulting in more of a shift in lambing percentage.

Although both flocks were slightly heavier at lambing, the first cross ewes did not lose weight after lambing like the Dorset ewes in the prime lamb operation.

First cross



Prime lambs

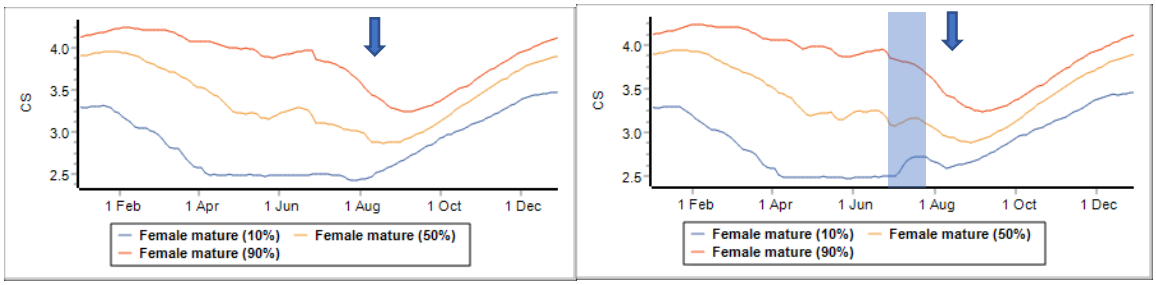


Figure 5. Ewe condition score[2] where crops are not grazed (left) and where they were grazed (right). Blue arrow shows lambing, shaded crop is crop grazing window.

Sale weights

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

Prime lambs were sold when they reached 50kg. The first cross self-replacing flock did not graze crops, so there was no change in the surplus ewe and wether sale weights.

[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.

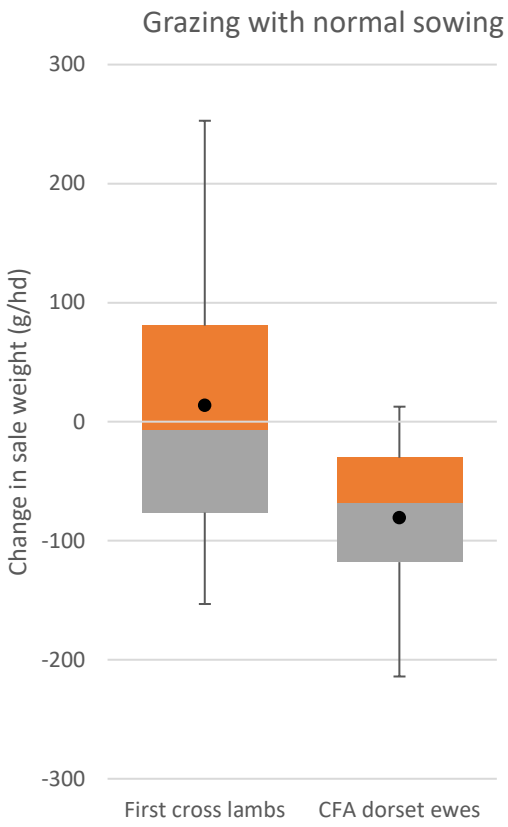


Figure 6. Change in sale weights of first cross lambs and CFA ewes from the prime lamb mob with grazing crops.

It averaged out that lambs were sold at about the same weight whether crops were grazed or not grazed. CFA ewes from the prime lamb mob sold on average 81 g lighter (-$0.10/hd).

Wool cut

Wool cut increased marginally with grazing crops (figure 7). Ewe wool cut increased on average 5 g CFW/hd. At a price of $13.21/kg cln for 19 µm wool that is an average increase of $0.07/ewe.

There was a greater increase in cut from first cross lambs where they grazed stubble and the maternal ewes had been grazing crop at lambing. On average, first cross lamb wool cut increased by 26 g CFW/hd. At a price of $11.04/kg for 23 µm wool that is an average increase of $0.29/lamb.

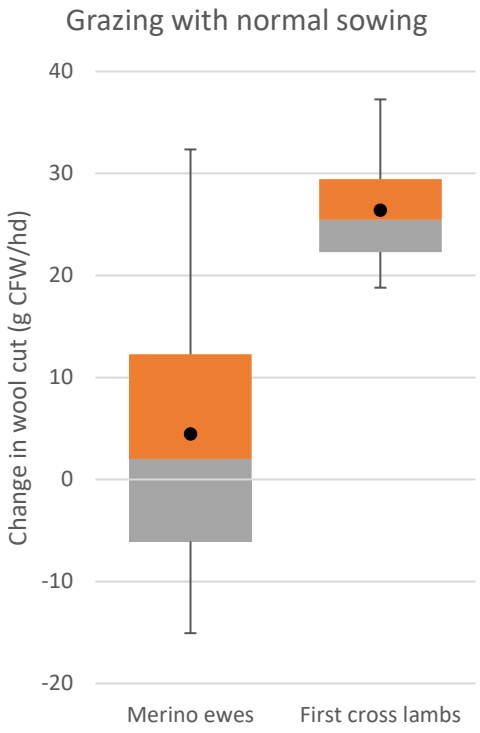


Figure 7. Change in wool cut from merino ewes and first cross lambs with grazing crops

Supplementary feeding

Supplementary feed reductions with grazing crops was a key saving that increased the livestock GM. The change was more substantial in the supplementary feeding of the prime lamb mob than the first cross mob (figure 8). This was because the self-replacing part of the first cross mob did not graze crops and thus did not have any change in feeding out.

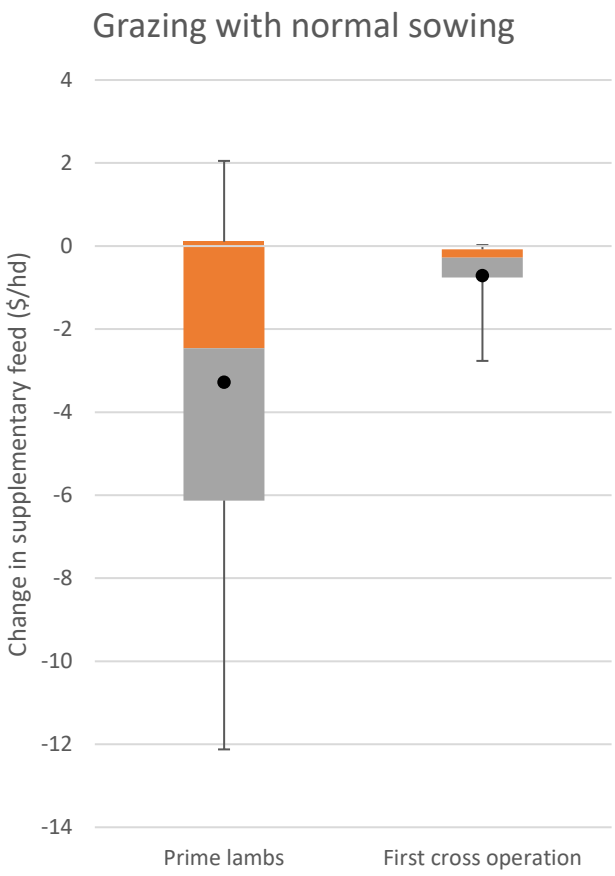


Figure 8. Change in supplementary feeding costs for the whole flock divided by the number of ewes.

The prime lamb operation saved on average 36.9 t feed (barley) which equated to $7,675 across the mob on average. The first cross mobs saved on average 6.7 t of feed, or $1,394.

Occasionally feeding out increased with grazing crops, seen in the upper whisker in figure 8 reaching $2.1/hd. This was mainly driven by increased feeding out to finish 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 <750 kg DM/ha animals were put on crop. First cross lambs grazed stubble every year.

	Prime lambs		**Merino x Suffolk (terminal ewes)**	
	Frequency of years	**Crops grazed**	**Frequency of years**	**Crops grazed**
Grazing with normal sowing	27%	Barley (2-23 July)	18%	Wheat (9-23 July)

2. Grazing early sown crops

2.1. Net farm profit

Grazing crops and stubbles at Inverleigh when longer season varieties were sown resulted in 7.0% increase in whole farm profit ($28,787).

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

There was a greater increase in the poor years than the good years: the top 25% of years increased 5.8% with grazing crops, while the bottom 25% of years increased 7.8%. Sowing earlier meant crops could be grazed in June rather than July and had longer to recover before flowering.

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 in increase in crop gross margin (GM) 80% of the time (figure 11). On average the change in crop GM with grazing was $54/ha (figure 10). See appendix for sowing dates and varieties.

There was only a 6% chance of yield decline from grazing early sown wheat when compared with ungrazed wheat sown at a normal sowing time.

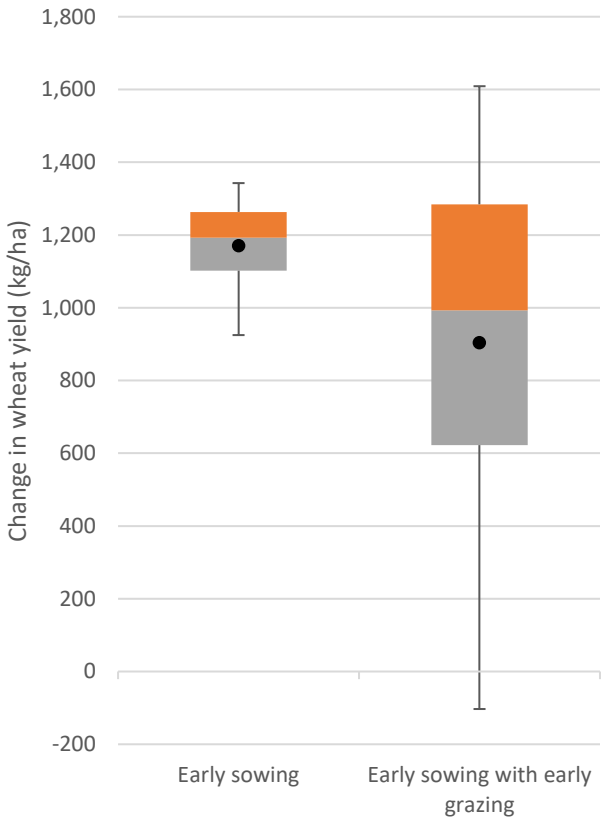


Figure 10. Change in crop yield with earlier sowing compared with normal sowing (left bar), and grazing of early sown wheat compared with normally sown ungrazed wheat (right bar)

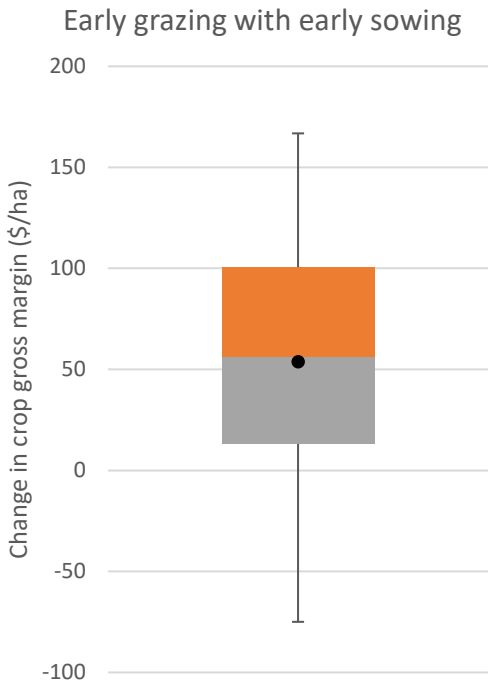


Figure 11. Change in crop GM (left) and wheat yield (right) with early grazing of early sown crops compared to the baseline of not grazing normally sown crops.

2.3. Livestock gross margins

Gross margin increased with early grazing of crops 97% of the time. On average the GM increased by $17.8/ha (figure 12).

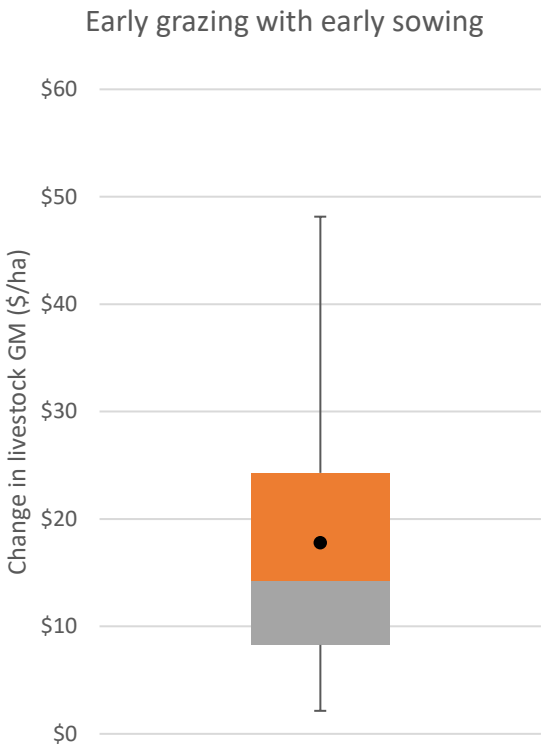


Figure 12. Change in livestock GM with early sowing and early grazing of crops compared to a baseline of not grazing crops.

2.4. What is changing the crop gross margin?

Early sowing of crops with a long season variety (Revenue) lead to wheat yields increasing on average 0.90 t/ha ***with*** grazing and 1.17 t/ha ***without*** grazing (figure 10). The increase in yield saw crop income increase, even though the wheat variety was changed from a milling to feed variety[3].

Barley variety was changed to long season cultivar Capstan, with yield changes being the same proportions from grazing as wheat[4]. Canola was not grazed but the long season cultivar Taurus was sown.

2.5. What is changing the livestock gross margin?

Lambing percentage

Grazing crops increased lambing percentage for the first cross flock (Merino x Suffolk) on average 5.8%. It only increased prime lambing percentage 0.6%. The first cross self-replacing mob did not graze crops so there was no change in lambing.

[3] Discount in feed wheat price was 10% of APW price

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

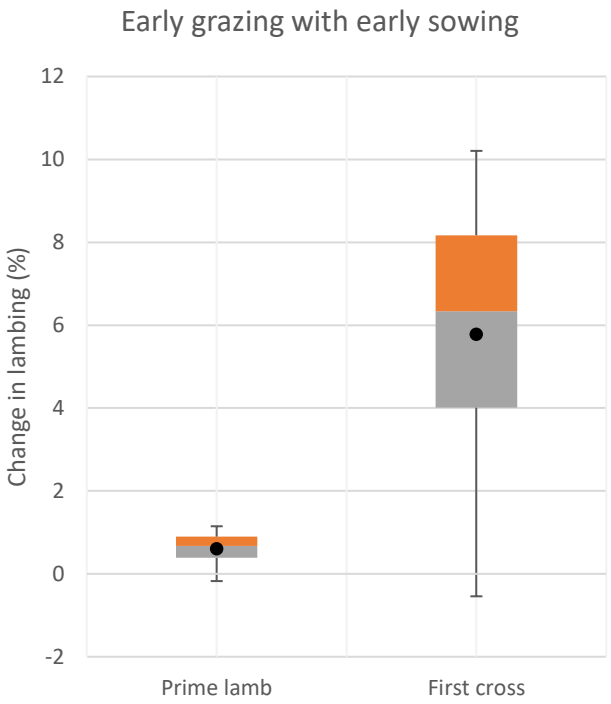


Figure 13. Change in lambing percentage for the prime lamb mob with early grazing of early sown crops compared to a baseline of not grazing crops.

- First cross ewes grazed crop June 4-18 and lambed on June 12. They were 0.2 CS higher at lambing than if they had not been on crop.
- Prime lamb ewes grazed crop June 4-18 and lambed on August 11. They were 0.1 CS higher coming into lambing which did not really affect lambing percentage.

Although both flocks were slightly heavier at lambing, the first cross ewes did not lose weight after lambing like the Dorset ewes in the prime lamb operation.

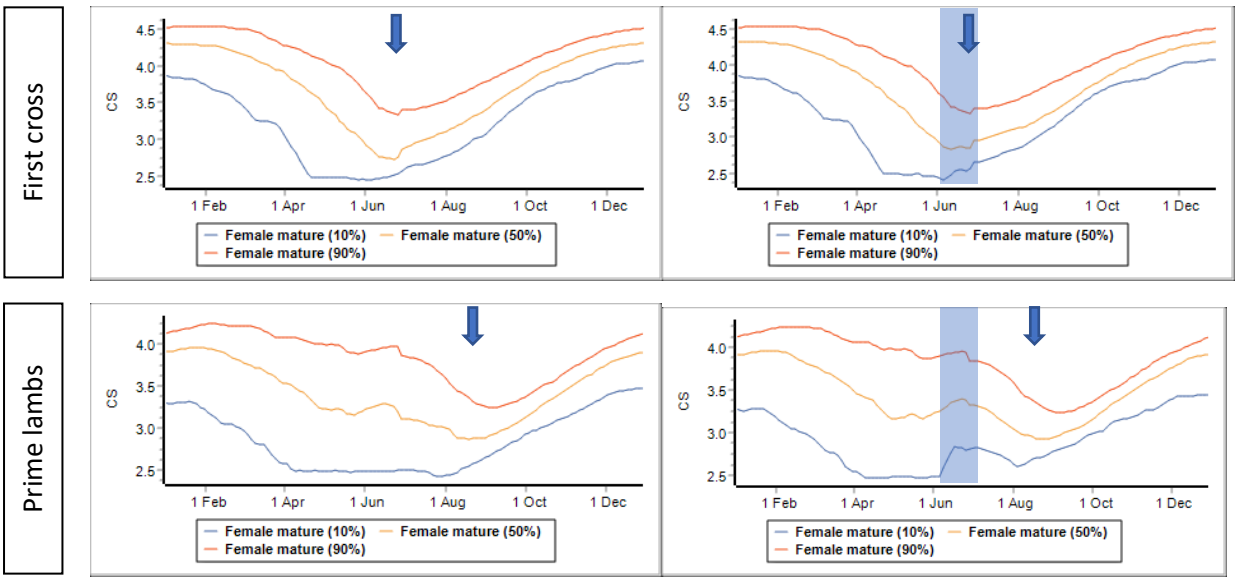


Figure 14. Ewe condition score[5] where crops are not grazed (left) and where they were grazed early at a normal stocking rate (right). Blue arrow shows lambing, shaded crop is crop grazing window.

Sale weights

The only animal class to change sale weight were the first cross lambs and CFA ewes from the prime lamb mob (figure 15).

Prime lambs were sold when they reached 50 kg. The self-replacing operation did not graze crops, so there was no change in the surplus ewes and wethers sale weights.

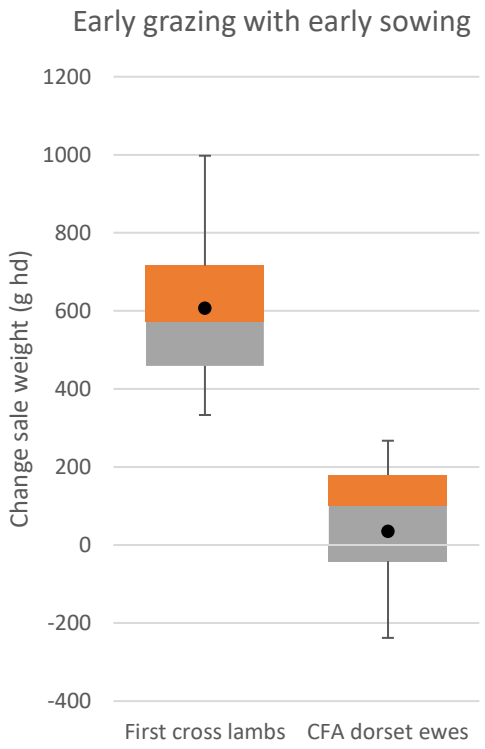


Figure 15. Change in sale weights of first cross lambs (left) and CFA ewes from the prime lamb mob with early grazing of early sown crops.

First cross lambs were sold on average 606 g heavier (+$1.33/hd) while CFA ewes were around the same weight.

Wool cut

Wool cut increased marginally with grazing crops (figure 16). Ewe wool cut increased on average 8 g CFW/hd. At a price of $13.21/kg cln for 19 µm wool that is an average increase of $0.11/ewe.

There was a greater increase in cut from first cross lambs where they grazed stubble and the maternal ewes had been grazing crop at lambing. On average, first cross lamb wool cut increased by 27 g CFW/hd. At a price of $11.04/kg for 23 µm wool that is an average increase of $0.30/lamb.

[5] 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.

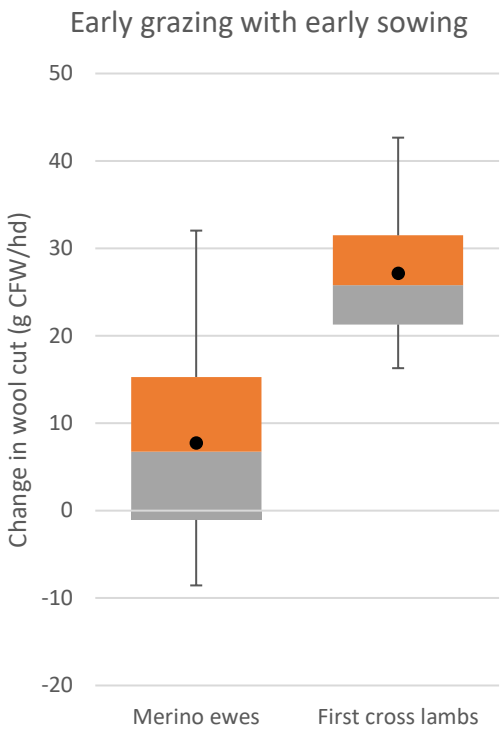


Figure 16. Change in wool cut from merino ewes and first cross lambs with grazing crops

Supplementary feeding

Supplementary feed reductions with grazing crops was a key saving that increased the livestock GM. The change was more substantial in the supplementary feeding of the prime lamb mob than the first cross mob (figure 17). This was because the self-replacing part of the first cross mob did not graze crops and thus did not have any change in feeding out.

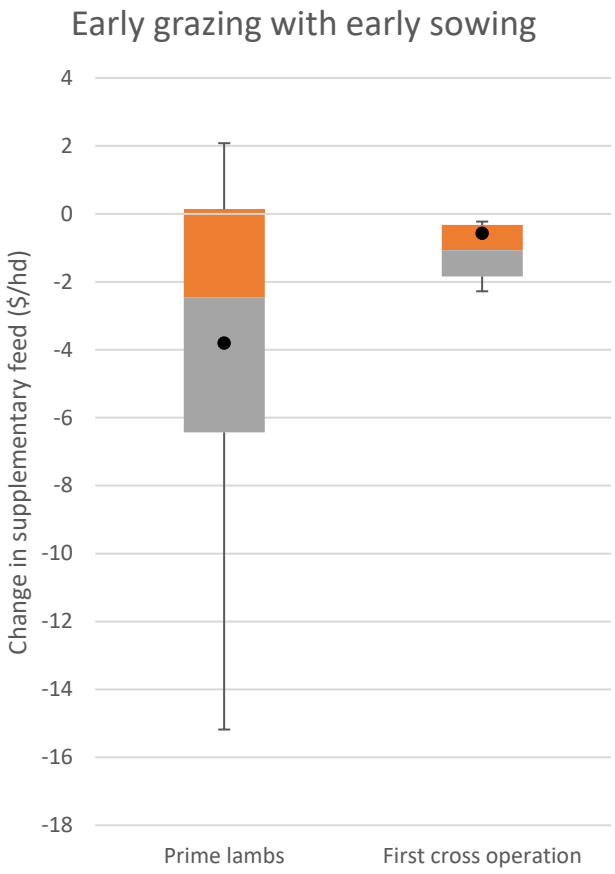


Figure 17. Change in supplementary feeding for the whole flock divided by the number of ewes in the flock where early sown crops were grazed.

The prime lamb operation saved on average 43.0 t feed (barley) across the whole flock, which equated to $8,944. The first cross flocks saved on average 5.4 t of feed, or $1,123.

Occasionally feeding out increased with grazing crops, seen in the upper whisker in figure 8 reaching $2.0/hd. This was mainly driven by increased feeding out to finish 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 <750 kg DM/ha animals were put on crop. First cross lambs grazed stubble every year.

	Prime lambs		**Merino x Suffolk (terminal ewes)**	
	Frequency of years	**Crops grazed**	**Frequency of years**	**Crops grazed**
Early grazing with early sowing	61%	Barley (4-18 June)	55%	Wheat (4-18 June)

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 Executive Summary for a calculation example).

At Inverleigh, the area and grazing period was only substantial enough for the Merino x Suffolk part of the first replacing flock to increase stock number from 987 to 1008. The self-replacing merino part of the first cross flock did not graze crops. Dorset ewes in the prime lamb flock did not have access to adequate crop and/or for long enough to increase stock number.

3.1. Net farm profit

Grazing crops and stubbles at Inverleigh when longer season varieties were sown and higher stock number resulted in 7.7% increase in whole farm profit ($31,557).

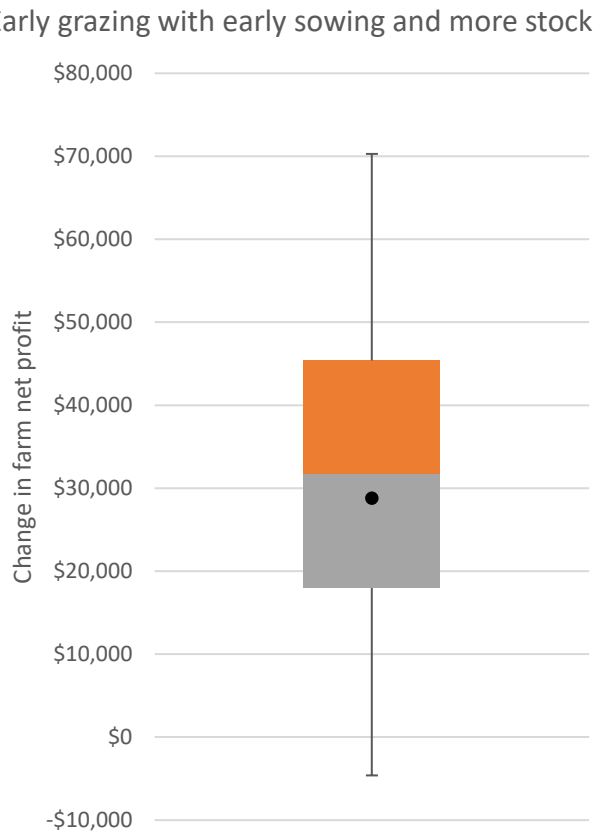


Figure 18. Change in whole farm profit with grazing crops compared to a baseline of not grazing.

There was a greater increase in the poor years than the good years: the top 25% of years increased 6.3% with grazing crops, while the bottom 25% of years increased 8.6%. Sowing earlier also meant crops could be grazed in June rather than July, allowing more recovery time before flowering.

3.2. Crop gross margins

The marginal increase in stock number did not affect crop yields, so the crop margin was the same as when crops were sown early and stock number was kept the same (see section 2.2. Crop gross margins)

3.3. Livestock gross margins

Gross margin increased with grazing crops 99.3% of the time. On average the GM increased by $21/ha (figure 19).

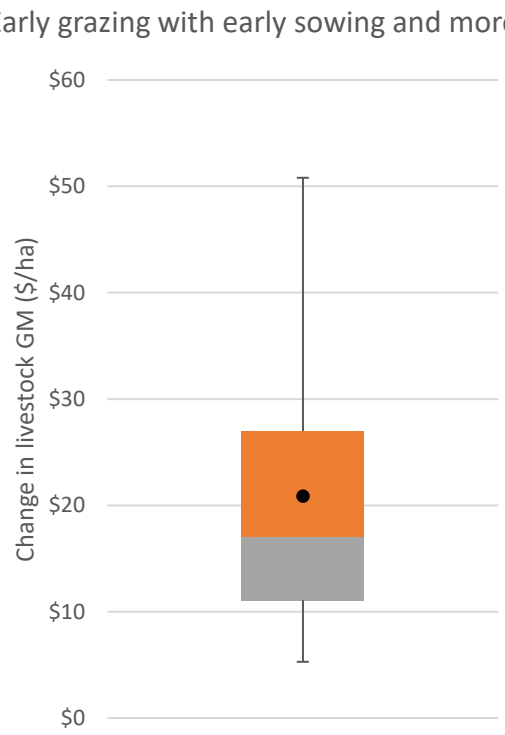


Figure 19. Change in livestock GM with a higher stock number and early grazing of early sow crops compared to a baseline of not grazing crops.

3.4. What is changing the crop gross margin?

Sowing earlier with long season varieties caused a significant shift in crop gross margins. See Section 2.4 for more.

3.5. What is changing the livestock gross margin?

Lambing percentage

Grazing crops marginally increased lambing percentage for the prime lamb mob. First cross (terminal) ewes lambed on crop. The first cross self-replacing mob did not graze crops so there was no change in lambing.

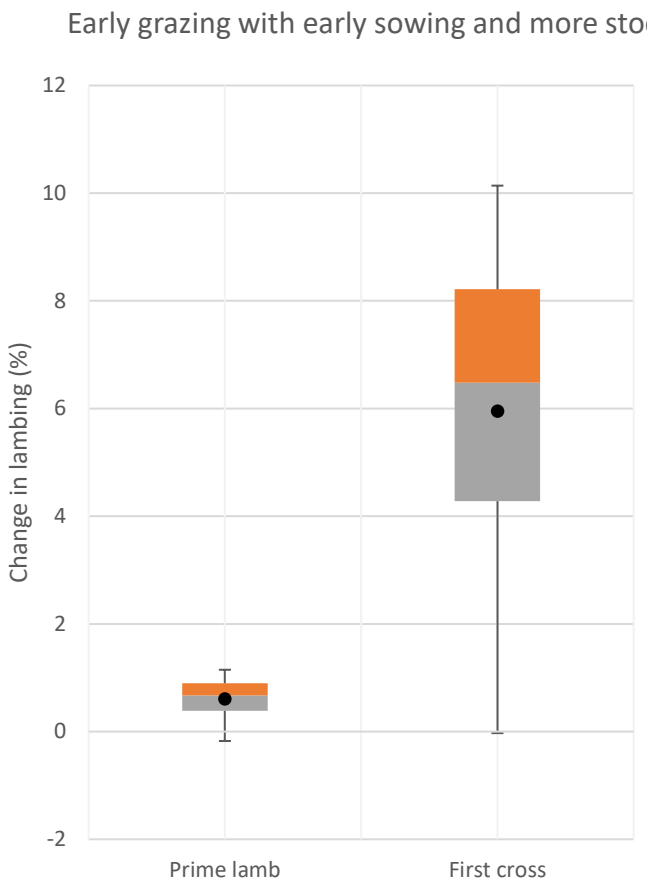
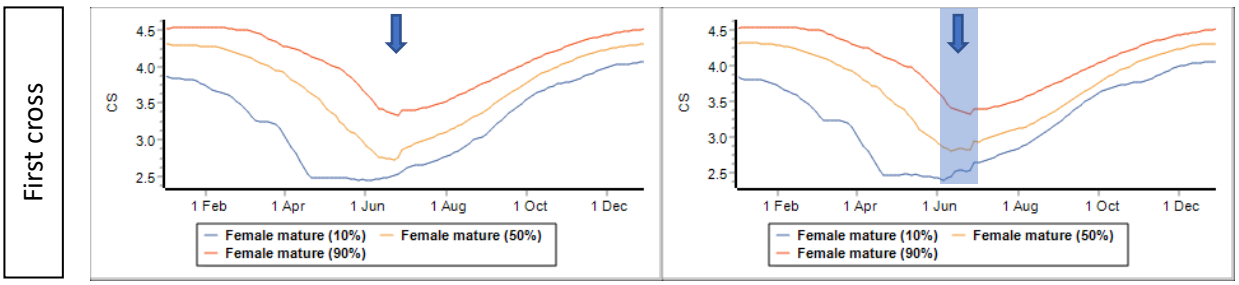


Figure 20. Change in lambing percentage for the prime lamb mob with early grazing of early sown crops and more stock compared to a baseline of not grazing crops.

- First cross ewes grazed crop June 4-18 and lambed on June 12. This meant they were 0.1 CS higher coming into lambing.
- Prime lamb ewes grazed crop June 4-18 and lambed on August 11. This meant they were 0.1 CS higher coming into lambing.

The two flocks were 0.1 CS higher at lambing but the first cross did not lose condition after lambing like the prime lambs did (figure 20).



Prime lambs

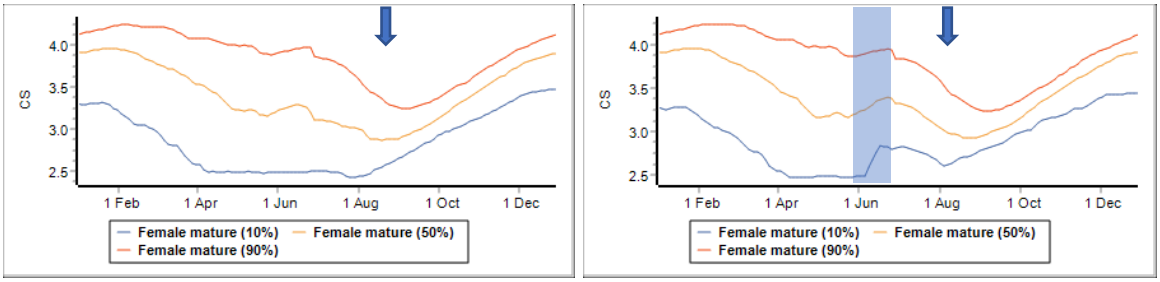


Figure 21. Ewe condition score[6] where crops are not grazed (left) and where they were grazed early at a higher stocking rate (right). Blue line = decile 1; yellow = median; red line = decile 9. Blue arrow shows lambing, shaded crop is crop grazing window.

Sale weights

The only animal class to change sale weight were the first cross lambs and CFA ewes from the prime lamb mob (figure 22).

Prime lambs were sold when they reached 50kg. The self-replacing operation did not graze crops, so there was no change in the surplus ewes and wether sale weights.

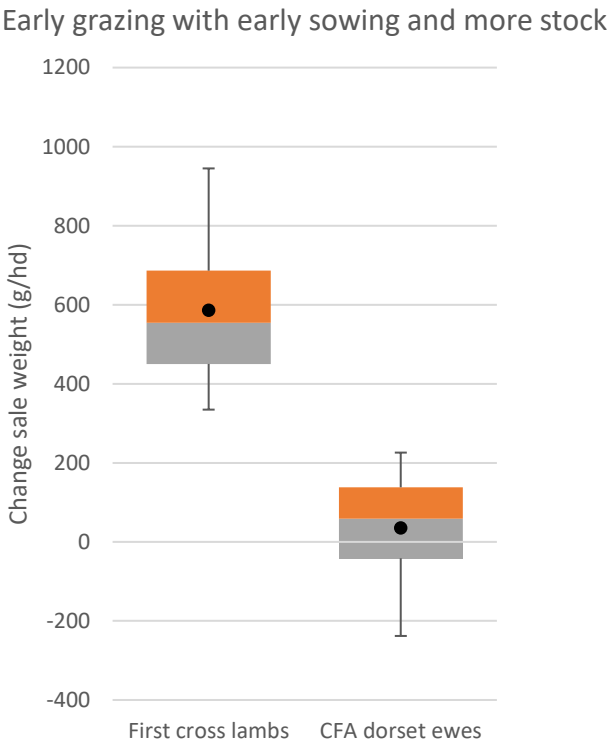


Figure 22. Change in sale weights of first cross lambs (left) and CFA ewes from the prime lamb mob with early grazing of early sown crops.

First cross lambs were sold on average 586 g heavier (+$1.29/hd) while CFA ewes were around the same weight.

[6] 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.

Wool cut

Ewe wool cut did not change with grazing early sown crops at a higher stocking rate (average change of -2.6 g/hd), as seen in figure 23.

There was a greater increase in wool cut from first cross lambs where they grazed stubble and the maternal ewes had been grazing crop at lambing. On average, first cross lamb wool cut increased by 32 g CFW/hd. At a price of $11.04/kg for 23 µm wool that's an average increase of $0.35/lamb.

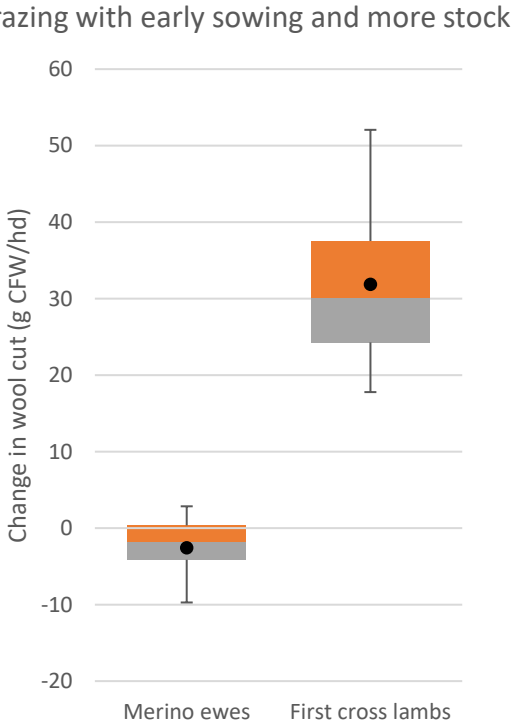


Figure 23. Change in wool cut from merino ewes and first cross lambs with grazing crops

Supplementary feeding

Supplementary feed reductions with grazing crops was a key saving that increased the livestock GM. The change was more substantial in the supplementary feeding of the prime lamb mob than the first cross mob (figure 24). This was because the self-replacing part of the first cross mob did not graze crops and thus did not have any change in feeding out.

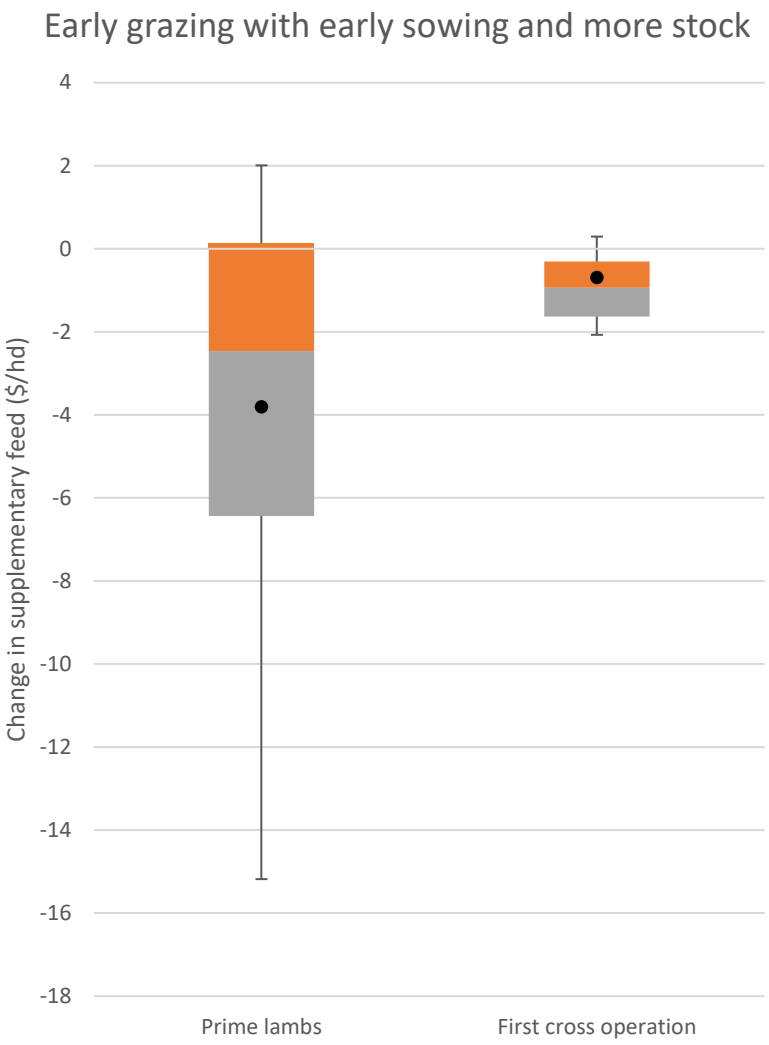


Figure 24. Change in supplementary feeding for the whole mob divided by the number of ewes in the mob where early sown crops were grazed with more stock.

The prime lamb operation saved on average 43.0 t feed (barley) which equated to $8,944 across the mob. The first cross mobs saved on average 5.3 t of feed, or $1,102.

Occasionally feeding out increased with grazing crops, seen in the upper whisker in figure 8 reaching $2.0/hd. This was mainly driven by increased feeding out to finish lambs in a late autumn break because more there were more lambs born than when crops were not grazed.

3.6. How often are crops grazed?

Crops were only grazed when the extra fodder was needed. When green pasture FOO was <750 kg DM/ha animals were put on crop. First cross lambs grazed stubble every year.

	Prime lambs		**Merino x Suffolk (terminal ewes)**	
	Frequency of years	**Crops grazed**	**Frequency of years**	**Crops grazed**
Early grazing with early sowing and more stock	61%	Barley (4-18 June)	52%	Wheat (4-18 June)

Appendix – Inverleigh farm system

Soil type

Clayey Sand (Inverleigh No 737); PAW 138mm

Grazed area

490 ha with 2354 Dorset ewes for prime lambs

410 ha with 1974 Merino ewes. Half joined with a Merino ram for self-replacing ewes, half joined with a Suffolk ram for first cross lambs.

Cropped area

100 ha wheat; 70 ha canola; 70 ha barley

Flock break down

Varieties and sowing dates

Crop	**Normal sowing date and variety**		**Early sowing date and variety**	
Canola	Hyola 650 TT	April 25 – May 5	Taurus	April 11 – April 18
Wheat	Bolac	May 8-15	Revenue	April 1 - 10
Barley	Commander	May 20-27	Capstan	May 7-14

Crop grazing

	Prime lambs		**Merino x Suffolk (terminal ewes)**	
	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	27%	Barley (2-23 July)	18%	Wheat (9-23 July)
4. Early grazing (normal SR), normal sowing	61%	Barley (4-18 June)	55%	Wheat (4-18 June)
5. Early grazing (high SR), normal sowing			52%	Wheat (4-18 June)