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Animal Production Science

Supplementary Material

An investigation of pathways for rebuilding Australia's sheep flock

F. D. Brien^{A}, R. L. Pitchford^B, S. P. Vogt^B, and D. J. Koopman^A*

^ADavies Livestock Research Centre, School of Animal and Veterinary Sciences, University of Adelaide, Roseworthy, SA 5371, Australia.

^BPinion Advisory, 9 Strickland Street, Clare, SA 5453, Australia.

*Correspondence to: F. D. Brien Davies Livestock Research Centre, School of Animal and Veterinary Sciences, University of Adelaide, Roseworthy, SA 5371, Australia Email: forbes.brien@adelaide.edu.au

Supplementary Material

Assumptions in modelling of flock rebuilding pathways for self-replacing dual purpose (DP) Merino ewe and Maternal ewe flock types

Table S1a. Common assumptions for all rebuild pathways. Sale values, mortality and culling rates

Age of sheep	Sale/Inventory Value (\$)	Annual Mortality Rate (%)	Culling Rate if retained for another year	
			DP Merino (%)	Maternal (%)
8-year-old	100	9.0	15.0	15.0
7-year-old	125	8.0	13.0	13.0
6-year-old	150	6.0	10.0	10.0
5-year-old	175	4.0	6.0	6.0
4-year-old	200	3.5	4.0	4.0
3-year-old	250	3.0	3.0	3.0
2-year-old	275	2.5	2.0	2.0
Ewe hogget	250	2.0	9.0	9.0
Ewe lamb	165	2.0	40.0	45.0
<i>Wether lamb</i>				
- DP Merino	125.00			
- Maternal	160.00			

Table S1b. Common assumptions for all rebuild pathways. Lamb survival rates

Litter size of ewe	Lamb survival from scanning to weaning (%)	
	DP Merino	Maternal
Single bearing ewes	90	90
Multiple bearing ewes	60	70

Table S1c. Common assumptions for all rebuild pathways. Fleece values, lamb weaning and dry ewe rates

Class of breeding ewe	Annual fleece value	Lambs weaned per ewe joined	Dry ewes per ewe scanned
	(\$)	(%)	(\$)
<i>Mature breeding ewes</i>			
- DP Merino	50.00	100	6
- Maternal	10.00	135	3
<i>Maiden ewes</i>			
- DP Merino	50.00	90	10
- Maternal	10.00	120	8

Table S1d. Common assumptions for all rebuild pathways. Feed costs, culling age, ram cost and discount rate applied to future cashflows

Supplementary feed cost per tonne as fed (\$)	260.00
Pasture cost per tonne as fed (\$)	50.00
Ewe cull age (years)	5.5
Average breeding ewe weight (kg)	65
Breeding ewe DSE rating, including raising a lamb	2.5
Total annual feed cost per breeding ewe (\$)	55.00
Ram cost per ewe joined (\$)	6.35
Discount rate applied to future cashflows (%)	3.5

Assumptions for individual rebuild pathways for self-replacing dual purpose Merino and Maternal ewe flock types

1. Retain and join 5½ year-old ewes for 1 year longer

- 200 retained in year 1
- 150 retained in year 2
- 100 retained in year 3
- None retained in year 4 and 5

2. Retain more young ewes

- 5% reduction in lifetime performance of ewes applied to account for the fact that they would normally be culls
- Retain more young ewes in years 1 to 3 than normal, but not in years 4 to 5
- Culling rates as in table S2 below

Table S2. Culling rates implemented when retaining more young ewes. Culling rates return to previous levels in Years 4 and 5

	Year 1		Years 2 and 3	
	DP Merinos	Maternals	DP Merinos	Maternals
	(%)	(%)	(%)	(%)
Current ewe hogget cull rate	9	9	9	9
New ewe hogget cull rate	8	9	9	9
Current ewe lamb cull rate	40	45	40	45
New ewe lamb cull rate	35	40	35	40

3. Buy 150 ewe hoggets in year 1 only

- Age at purchase – 1.5-year-old
- 150 head purchased at \$300/head
- 15% reduction (from the average in the main flock) in lamb weaning percentage in the first year as they adjust to the property
- Purchased as dry ewes

4. Buy and join 200 5½ year-old ewes in Year 1 only

- Culled after 1 year
- 200 head purchased at \$200/head
- 10% reduction (from the average in the main flock) in lamb weaning percentage in the first year as they adjust to the property
- Purchased as dry ewes

5. Re-join once-dry ewes (identified at scanning). Undertake for 5 years

The assumed reduction in lambing weaning rate of once-dry ewes at later successful lambings and in their resulting lamb sale values are given in Table S3.

Table S3. Assumed reduction in lamb weaning rates of once-dry ewes at later successful lambings and in lamb sale values

Age class of ewe	Reduction in lamb weaning rate relative to the main flock	Reduction in lamb sale value relative to the main flock, to account for the lighter turn-off weight with a later lambing	
		DP Merinos	Maternal
	(%)	(\$)	(\$)
Mature breeding ewes	-15	-25	-30
Maiden ewes	-15	-25	-30

6. Increase twin lamb survival – supplement twin-bearing ewes in late pregnancy to gain 0.5 of a condition score by lambing. Undertake for 5 years

The assumed costs of pregnancy scanning and supplementary feed and previous and new twin survival rates are given in Table S4.

Table S4. Assumed costs of scanning and supplementary feed and lamb survival rates

	DP Merino	Maternal
Cost of scanning per ewe including travel (\$)	1.00	1.00
Total cost of feed per ewe to gain 0.5 condition score (\$)	4.55	4.55
Previous twin lamb survival (%)	60	70
New twin lamb survival (%)	67	77

7. Supplement ewes pre-joining. Undertake for 5 years

The assumed costs of feeding a low-cost supplement to ewes pre-joining to gain half a condition score by joining time and the uplift in scanning percentage are given in Table S5.

Table S5. Assumed supplementary feeding costs pre-joining and uplift in scanning rate

	DP Merino	Maternal
Feed cost per ewe (\$)	4.55	4.90
Feed costs for each additional twin bearing ewe to account for increased demand in late pregnancy and lactation (\$)	6.25	6.25
Uplift in scanning rate (%)	10	10

8. Flushing with lupins 1 week prior and 1 week into the joining period. Undertake for 5 years

The assumed duration and costs of feeding lupins at joining time and extra related-costs of feeding in late pregnancy and lactation, as well as the uplift assumed in pregnancy scanning rate are given in table S6.

Table S6. The assumed duration and costs of feeding lupins and related costs of extra feeding in late pregnancy and lactation and the uplift in scanning rate expected

Number of days on lupins (days)	14
Lupins fed grams/head/day (g)	500
Total amount fed per ewe (kg)	7.0
Cost of lupins \$/t	450
Feed out costs \$/t	100
Total cost as fed \$/t	550
Cost of lupins per ewe (\$)	3.85
Feed costs for each additional twin bearing ewe to account for increased demand in late pregnancy and lactation (\$)	6.25
Uplift in scanning rate (%)	10

9. Inject Ovastim pre-joining. Undertake for 5 years

The assumed costs of drug application and extra related feeding in late pregnancy and lactation as well as the assumed uplift in scanning rate from injection of Ovastim are given in Table S7.

Table S7. Assumed costs of drug application and extra feeding in late pregnancy and lactation and the uplift in scanning rate expected from Ovastim injection

Ovastim injection cost per ewe (\$)	4.00
Feed costs for each additional twin bearing ewe to account for increased demand in late pregnancy and lactation (\$)	6.25
Uplift in scanning rate (%)	20

10. Join ewe lambs. Undertake for 5 years

The assumed lamb weaning rates, lamb sale values and additional husbandry and feed costs when joining ewe lambs are given in Table S8.

Table S8. Assumed lamb weaning rates, lamb sale values and additional husbandry and feed costs when joining ewe lambs

	Lamb weaning rate (%)	Lamb sale value (\$)	Additional husbandry costs (\$)	Additional feed costs (\$)
Ewe lambs				
<i>DP Merino</i>	50	100.00	10.00	40.00
<i>Maternal</i>	70	130.00	10.00	40.00

11. Accelerated Lambing – Type 1. Join ewe flock every 8 months. Undertake for 5 years

The assumed additional costs of feeding, reduction in lamb values and increase in lamb weaning rates when joining ewes every 8 months are given in Table S9.

Table S9. Assumed additional costs of feeding, reduction in lamb values and increase in lamb weaning rates when joining ewes every 8 months

	DP Merinos	Maternals
Additional DSE rating per breeding ewe	0.6	0.6
Proportion of extra feed demand fed by supplementary feed (%)	30	30
Total annual cost of feed per ewe (\$)	30.66	30.66
Extra husbandry/labour cost/ewe (\$)	15.00	15.00
Total extra costs per ewe (\$)	45.66	45.66
Reduction in ewe lamb sale/inventory value to account for lighter turn off (\$)	-30	-30
Reduction in wether lamb sale value to account for lighter turn off (\$)	-25	-30
Annualised lamb weaning rate – Breeding ewes (%)	143	173
Annualised lamb weaning rate – Maiden ewes (%)	128	158

Accelerated Lambing – Type 2. Split ewe flock system. Dry ewes are removed to a second flock and a mating opportunity is provided every 4 months. Undertake for 5 years

The assumed additional costs of feeding, reduction in lamb values and increase in lamb weaning rates when providing a joining opportunity every 4 months in a 2-flock system are given in Table S10.

Table S10. Assumed additional feeding costs, lower lamb values and increased lamb weaning rates when providing a joining opportunity every 4 months in a 2-flock system

	DP Merinos	Maternals
Additional DSE rating per breeding ewe	0.6	0.6
Proportion of extra feed demand fed by supplementary feed (%)	35	35
Total annual cost of feed per ewe (\$)	33.95	33.95
Extra husbandry/labour cost/ewe (\$)	20.00	20.00
Total extra costs per ewe (\$)	53.95	53.95
Reduction in ewe lamb sale/inventory value to account for lighter turn off (\$)	-30	-30
Reduction in wether lamb sale value to account for lighter turn off (\$)	-25	-30
Annualised lamb weaning rate – Breeding ewes (%)	150	180
Annualised lamb weaning rate – Maiden ewes (%)	135	165

13. Increase Merino x Merino joinings by 200 ewes in Year 1 and 2

- 200 ewes joined to a Merino instead of a terminal sire in years 1 and 2 and none after that
- 7% reduction in lambing percentage in Merino x Merino lambings when compared to crossbred lambings
- \$35 decrease in progeny sale value

14. Use sexed semen that is sorted to produce only female progeny. The flock must be mated by artificial insemination (AI)

- 200 ewes AI'd in year 1, 2 and 3 and none in years 4 and 5

The assumed additional costs of conducting and AI program and the expected reproductive performance of an AI mating with sexed-semen are given in Table S11.

Table S11. The assumed additional costs of conducting and AI program and the expected reproductive performance of an AI mating with sexed-semen

	DP Merino	Maternal
Cost of semen per dose (\$)	30	30
Cost of artificial insemination per ewe (\$)	40	40
Cost of sexing semen per dose (\$)	30	30
Total semen/AI costs per ewe (\$)	100	100
Conception rate to AI (%)	60	60
Conception rate to back up rams (%)	30	30
Percentage of ewes scanned dry (%)	10	10
Lamb weaning rate (inc. AI and back up conceptions) (%)	100	135
Percentage of AI sired lambs born as ewes (\$)	70	70