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MFS
MONARO FARMING SYSTEMS

Extending wether trial results
The value of good genetics on farm. (Oct 2013)

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Introduction

The MFS wether trial has now completed its second trial shearing representing the first shearing as a mature animal. Having reached maturity this gives us an opportunity to properly determine the mature size of the respective bloodlines and to more accurately evaluate the performance of the various bloodlines relative to their expected intake of pasture.

Unfortunately simply running the animals together in a trial does not ensure that they each eat the same quantity of feed. Equations from SCA (1990) demonstrate that the realized intake of an animal is a function of its potential intake and the availability and quality of pasture and supplements. Intake potential is in turn determined by its standard reference weight (empty shorn weight of a mature animal in condition score 3), relative size (proportion of mature size reached for immature animals) and also whether the animal is lactating.

This analysis uses the equations from SCA (1990) as embodied in the GrassGro animal model (Freer etal 1998) to describe a range of the bloodlines from the MFS wether trial and their performance if they are grazed on identical pastures.

Another limitation of wether trials is that they only generate information about the wool production traits and mature size of the teams and do not give any indication of how their sisters might perform in a breeding enterprise. In this analysis using GrassGro we can characterise the bloodlines as individual genotypes and then run these bloodlines as ewes rather than wethers to determine their performance in a breeding flock. While we still have no hard data on reproductive rates from these bloodlines we can run them with different levels of reproductive performance to explore the sensitivity of profit to the reproductive traits.

Method

Several Monaro farm systems have been tested in the GrassGro DSS to date and for the regular MFS seasonal projections a fertilised native pasture and an improved pasture both on basalt soils at Bungarby have been chosen as the indicator systems. For this analysis these same systems have been used but combined as a farm of 8000 DSE capacity with a mix of the two pasture types in the ratio 80% native and 20% improved. Weather data to run the model is sourced from the Silo website data drill.

The base enterprise is a merino ewe flock joined in April after general shearing. All weaned lambs are run on the improved pasture between weaning and shearing after which wether lambs are sold when their 14 day rolling average weight gain falls to zero. All wether lambs are sold by the end of June at the latest. Ewe hoggets and breeding ewes are given access to the improved pasture from July to November allowing for some pasture recovery before lambs are again weaned on to it in mid-December.

Which teams were modelled.

No teams from flocks that were breeding rams were modelled since it is reasonable to assume they would have access to higher performing rams than a typical sale ram of that bloodline. Six of the remaining teams were chosen representing the range in wool value per head calculated using the DPI wether trial program.

Standard Reference Weight (SRW) of ewes was calculated from the live weight of the wethers according to the following formulae.

Wether Shorn Bwt. = Raw Live weight – GFW **(1)**

SRW (wethers) = (3 - Current CS) *10kg + Shorn Bwt. **(2)**

SRW (ewes) = 0.86 x Wether Bwt (CS 3) **(3)**

Firstly the unshorn weight of the wethers was corrected to a shorn body weight by subtracting the greasy wool cut of the animals. Since there was a range in body condition score (CS) at the time of weighing these shorn body weights were standardised to their weight at CS 3 assuming one condition score is around 10kg (19% of SRW;

Lifetime Wool data). Ewe SRW was then calculated as 86% of the wether SRW which is the typical difference between wethers and ewes of the same breeding in CS 3 (Grassgro).

Table 1. Range in wool production and body weight for the six teams modeled.

Bloodline	GFW %	FD Dev	Yield Dev	Shorn Bwt %	SRW %	Wool Value %
1	9%	0.1	-0.1	+5%	0%	+8%
2	-4%	-1.2	+0.6	-6%	-5%	+8%
3	9%	0.9	-0.3	-4%	-3%	+7%
4	1%	-0.3	+1.4	-1%	-2%	+1%
5	-1%	0.1	-2.6	-8%	-3%	-6%
6	-14%	0.3	+1.2	+14%	+13%	-17%
Average	**6.0**	**17.8**	**71.3**	**48.0**	**46.2**	**$ 43.41**

Where the SRW% is clearly different to the Shorn Bwt % this indicates a team that was either leaner or fatter than the average of the trial.

To characterise the ewe genotypes reproduction parameters were set the same for all bloodlines ie when joined at CS3 all bloodlines scanned 5% dry and 35% twins for a scanning rate of 130%. This achieved an average weaning rate around 86% for all bloodlines.

Sustainable stocking rates were determined for each of the bloodlines using the probability of exceeding minimum required ground cover targets as the limiting factor. The threshold for this modelling is to maintain minimum annual ground cover above 70% for at least 7 years in ten. Table 2 shows the stocking rates for each bloodline when stocked according to the defined ground cover rule.

Table 2. The sustainable stocking rate achieved for each bloodline.

Bloodline	Ewes Joined/ha
1	4.4
2	4.7
3	4.5
4	4.6
5	4.6
6	3.9

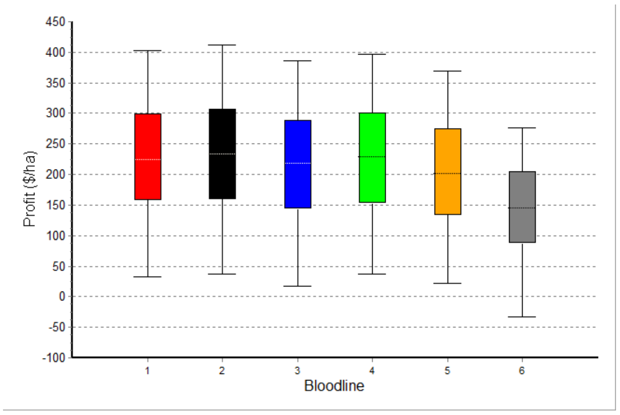
Each of the bloodlines were then run concurrently as separate farm systems to determine their profitability when run as a ewe breeding flock. Commodity prices used were the 5 year median prices for wool, surplus ewe hoggets, lamb and mutton. Costs were the current value for typical inputs and the grain used was wheat valued at $230/tonne delivered on farm.

Results from ewe breeding systems.

Figure 1. is a boxplot of the annual profits derived from modelling the period from 1970 – 2012 inclusive.

It can be seen that due to its smaller SRW and hence higher stocking rate, bloodline 2 was the most profitable genotype by a small margin over bloodline 1 although only by $1000 per year in total over the entire farm. Overall bloodlines 1 to 4 were within $10,000 in terms of annual whole farm profit but teams 5 and 6 were $21,000 and $71,000 behind bloodline 2 respectively.

Figure 1. Boxplot of annual profit from 1970 -2012 for six bloodlines running on a typical Bungarby farm.



The differences in profit result from modelled production differences derived solely as a result of the different genotypes since each bloodline was simulated across the same period of time and on the same soil and pasture types.

Figure 2. Difference in overall numbers of ewes joined compared to bloodline 2 (the most profitable).

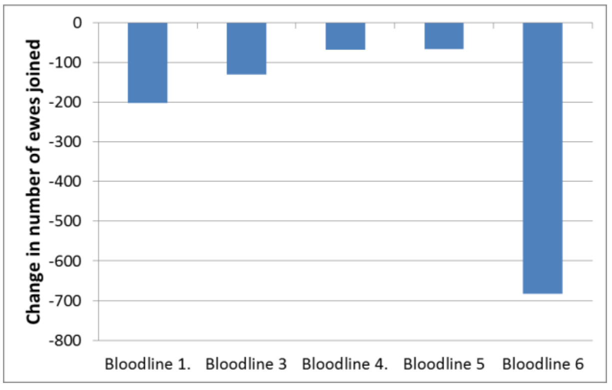


Figure 2 shows the number of ewes joined on the whole farm. Overall because of their larger SRW, bloodline 6 joined around 680 fewer ewes than Bloodline 2.

Figure 3 shows that this lead to proportionately less wether lambs being sold due to reproduction rates being constrained to the same level for all bloodlines in the model. Despite there being fewer wether lambs sold their sale weight was 6.5kg heavier than bloodline 2 (Figure 4.). This is again a reflection of the heavier ewe SRW and hence higher growth potential of the lambs.

Figure 3. Difference in the average number of wether lambs sold annually for each bloodline modelled.

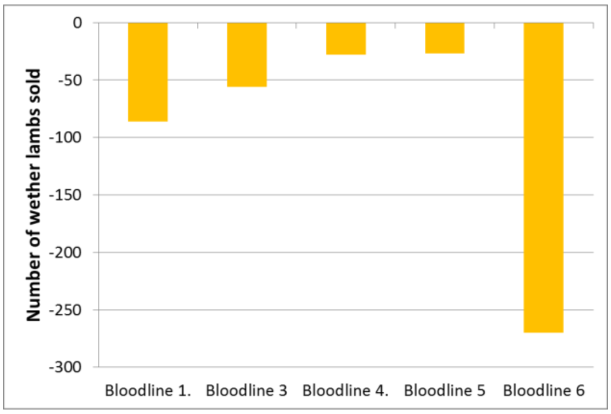
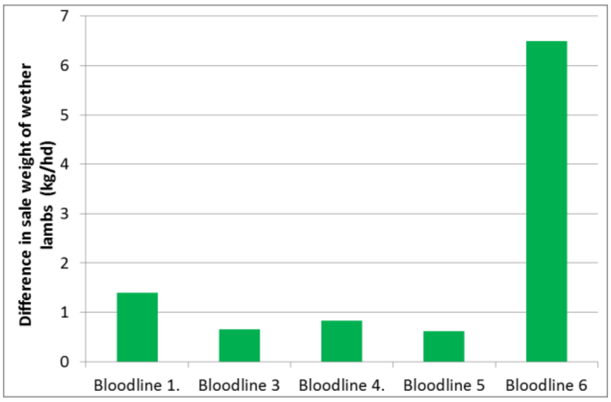
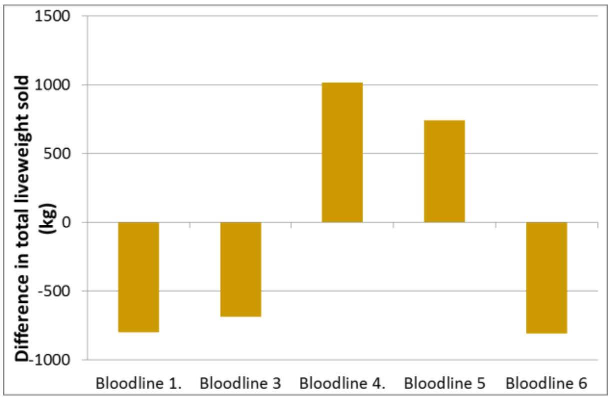


Figure 4. Difference in average sale weight of wether lambs for each bloodline.



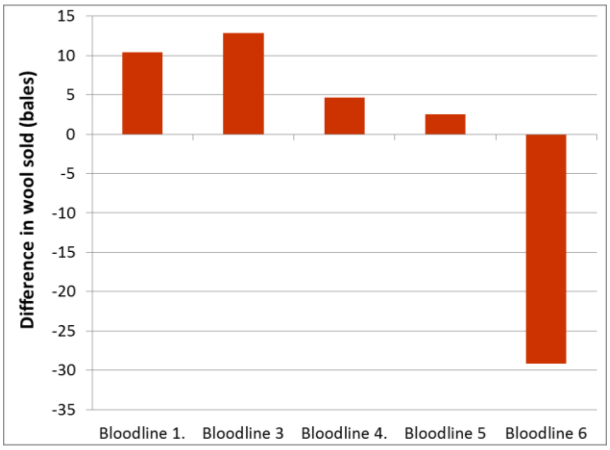
Despite the heavier live weight of bloodline 6 the total live weight sold was about 800kg less than bloodline 2 (figure 5) but this difference is less than 1% of the total kg sold, an insignificant difference on a whole farm scale.

Figure 5. Difference in average annual total live weight sold for each bloodline.



Due to the combination of lower fleece weights and lower stocking rates *bloodline 6* sold 29 less bales of wool per year than *bloodline 2* which was the main source of variation in farm profit (Figure 6).

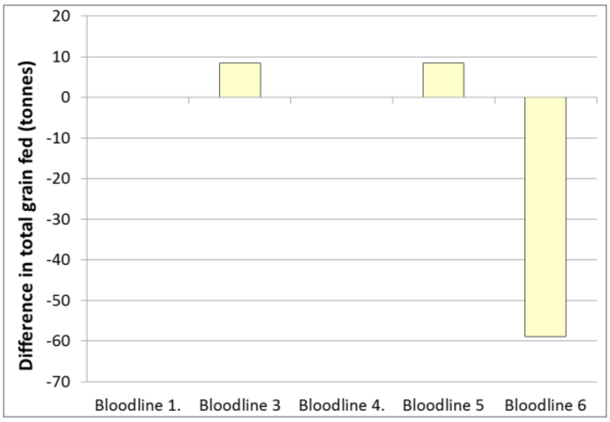
Figure 6. Difference in number of bales of wool sold for each bloodline.



Another particularly interesting result was that bloodline 6 required significantly less feed supplements than all other bloodlines (Figure 7).

While this appears counter-intuitive for sheep of larger size, the effect is due to the relatively low allocation of energy and protein toward wool growth leaving a higher proportion of intake available for body maintenance. Fleece weights for wethers from bloodline 6 in the trial were only around 8% of SRW while all of the other five teams modelled had fleece weights between 11 and 12% of SRW. In periods of feed shortage, this means bloodline 6 takes longer to reach threshold body condition scores to trigger feeding so they were fed for significantly shorter periods.

Figure 7. Difference in the average annual supplementary feeding rate for each bloodline.

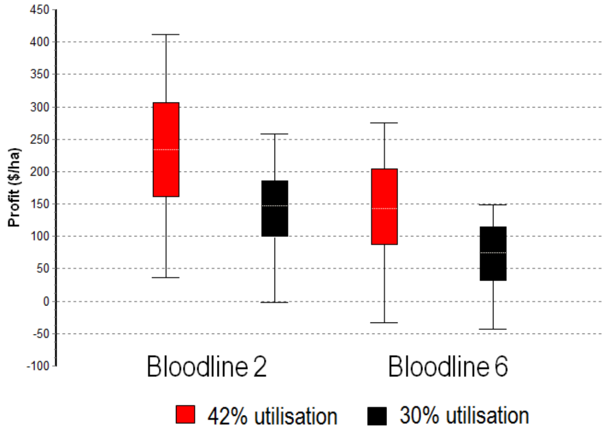


Effect of stocking rate.

Not all farms are stocked to their sustainable capacity. In many cases labour limitations or simply more conservative targets for ground cover mean many farms utilise less pasture than the 42% achieved by the optimised GrassGro systems. Figure 8. shows the impact of running lower but equivalent stocking rates for bloodlines 2 and 6.

If the two bloodlines are run to utilize the same amount of pasture bloodline 2 maintains a similar proportional profit advantage over bloodline 6. But if bloodline 2 is run at a lower stocking rate than bloodline 6 farm profits will be similar. Clearly to get the best value out of the best genetics, stocking rates must be at the highest sustainable levels. Also clear is that to get the best value out of your valuable pasture you need the most productive genetics.

Figure 8. Boxplot of profit for Bloodlines 2 and 6 running at two different rates of pasture utilization.

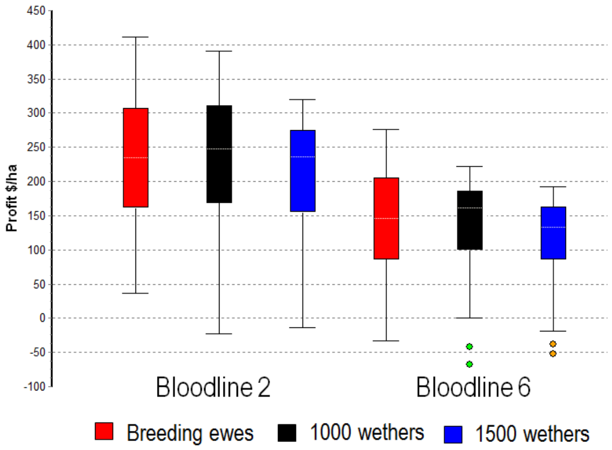


Systems running ewes and wethers.

While farms that solely trade wethers for wool growing are rare these days, it is common practice for breeding enterprises to retain a relatively small mob of wethers usually in order to boost the stock numbers with limited farm labour or to provide a safety valve in case of drought.

Figure 9. shows the impact on profit of including a mob of 1000 or 1500 wethers in the farm systems for bloodlines 2 and 6. Ewe numbers have been reduced proportionately to keep stocking rates balanced maintaining the same rules regarding ground cover.

Figure 9. Boxplot of profit for two rates of inclusion of wethers in a mixed enterprise compared to the baseline ewe enterprise for bloodlines 2 and 6.



Running 1000 wethers gave a higher median profit than running ewes alone for both bloodlines although the long term average (not shown) was slightly lower. From the perspective of the breeding objective the shift to running wethers is important since it changed significantly the proportion of income derived from wool.

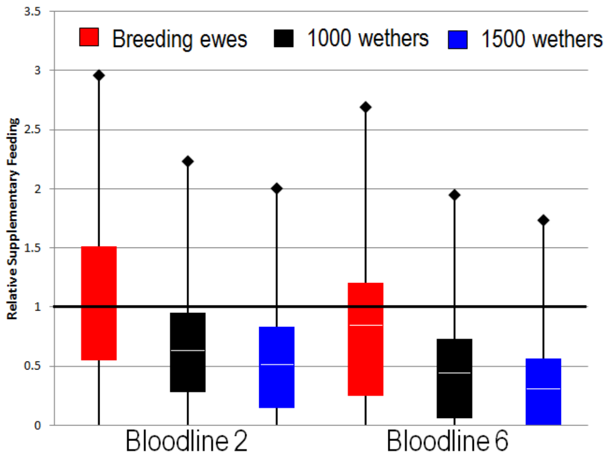
Table 3. shows that for bloodline 6 the proportion of income coming from wool rises from 48% to 55% with the shift to 1000 wethers in the enterprise indicating there might be even greater importance attached to wool genetics within these mixed enterprise structures.

Table 3. Impact of including wethers on the proportion of income coming from wool

Bloodline	Enterprise Mix		
	No wethers	1000 wethers	1500 wethers
Bloodline 2	57%	63%	65%
Bloodline 6	48%	55%	58%

Another factor of interest is that the mixed enterprises had significantly lower expenditure on supplementary feeding (figure 10). This is particularly important where labour available is already stretched an feeding may lead to a requirement for casual labour.

Figure 10. The relative requirement for grain for mixed enterprises. Feeding is expressed relative to the median feed required for a straight breeding enterprise of bloodline 2.



If labour and machinery costs to feeding of $80/tonne are added into the analysis then running a mixed enterprise with 1000 wethers becomes around $20/ha more profitable than a purely breeding enterprise for bloodline 2 and about equal to the breed alone for bloodline 6.

Effect of reproduction.

In all results shown above the fecundity and lamb survival was held constant. Across all bloodlines the average weaning rate was 86% on ewes joined. Despite this there is industry and research evidence that bigger framed plain bodied ewes are more fecund and are better mothers leading to higher lamb weaning rates than smaller more wrinkled bloodlines.

http://www.elmorefielddays.com.au/Field_Days_Features_Detail.asp?FeatureID=3

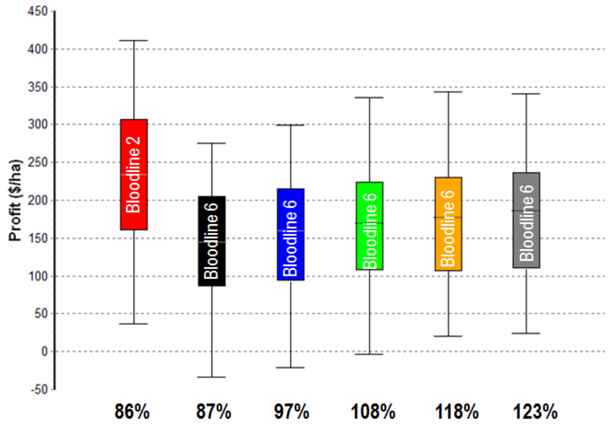
Parameters in GrassGro allow the user to increase both the fecundity (scanning rate) and the lamb survival rate of the genotypes and in the following figure these parameters were progressively changed to explore the impact on profit of increased weaning rates for bloodline 6. Since enterprises with higher weaning rates also consume more feed, stocking rates have also been re-optimised to meet the same ground cover rules described above and are shown in table 4.

Table 4. Reoptimised stocking rates to accounting for increase in number of lambs weaned by bloodline 6.

	Bloodline					
	2	6				
Weaning Rate %	86	87	98	108	118	123
Ewes/ha	***4.7***	***3.9***	3.7	3.6	3.5	3.4

Figure 11. shows that even if weaning rates were as high as 123% for bloodline 6, the median profit remains over $50/ha behind bloodline 2. Projecting a trend line, a weaning rate of more than 150% would be needed in order to compensate fully for the relatively poor wool performance of bloodline 6.

Figure 11. Boxplots of the impact of increased lamb weaning rates for bloodline 6 compared to the bloodline 2 at the baseline rate of 86%.



A genetic difference of this magnitude within merino strains is implausible. The current MERINOSELECT ASBV percentile band table 21/6/13 shows that even the top 5% of all animals tested are only 18% points higher than the bottom 5% (+11% vs -7%). However genetic differences between whole mobs of merino sheep are likely to be much less than this. (www.sheepgenetics.org.au/Breeding-services/MERINeOSELECT-Home)

Conclusions.

For typical merino enterprises on the Monaro genetics for wool production are still paramount to the profit realised. This is not to discount the importance of reproduction or lamb growth but it is important not to sacrifice wool production in their pursuit.

As to lamb weaning rates experienced on farms, differences are typically more due to environment than genetics and for most producers bigger gains can be made in reproduction through adopting best management practice such as Lifetime Ewe Management than can be achieved through a change in bloodline.

Whole farm profits are underpinned by three fundamental pillars; genetics, pasture productivity and stocking rate (utilisation). For top level productivity the farm must rank highly for all three. Wether trials, especially if analysed in terms of the farms system using a model like GrassGro, provide not only a sound benchmark of performance for individual traits but also how these traits combine to effect farm profit.

References.

Freer, M., Moore, A.D., Donnelly, J.R., 1997. GRAZPLAN: Decision support systems for Australian grazing enterprises - II. The animal biology model for feed intake, production and reproduction and the GrazFeed DSS. Agricultural Systems 58, 77-126.

SCA, 1990. Feeding standards for Australian livestock. Ruminants. Standing Committee on Agriculture and CSIRO, Melbourne, Australia.