Using GrassGro to extrapolate wether trial results to bloodline impacts in a merino breeding enterprise.

Doug Alcock, Livestock Officer, Cooma

Introduction

One of the major stumbling blocks for producers wanting to use the results from wether trials to make decisions about bloodline choices is the uncertainty of how wool performance in wethers translates into the overall performance of their sisters in a breeding flock.

Running full breeding ewe comparisons is complex and expensive. Many more animals are neede per team in order that impacts of reproduction can be accounted for. Reproductive traits measured in individuals (number of lambs weaned) give the result of either 0, 1 or 2 meaning a much greater sample size is needed to demonstrate differences are statistically significant.

Groups of 40 – 50 ewes are required rather than the usual 15 wethers and because of their higher feed requirement 6 – 7 times the land area is required to run a trial with the same number of teams. Also the cost to entrants becomes much greater since it requires the sacrifice of probably more than $5000 in livestock capital.

This analysis uses GrassGro modelling to explore an alternative way to determine how wether trial bloodline differences might translate into the breeding flock.

Method

As an illustration of the method I have taken the results from the last Bombala wether trial to demonstrate the concept. Even though we have the first years results from the new MFS wether trial, because some of the teams in this trial were quite immature in their first year it was not possible to use the weight and fat score data to determine a phenotypic value for mature size with sufficient accuracy. (This doesn't detract in any way from the wether trial information as already presented)

The last wether trial in Bombala had just 11 teams and for the purposes of this report I will not identify them specifically. Rather I will use the variation between them as an illustration of the method.

The first step required is to convert the data we have on the wethers into the mature size and performance we would expect had they been ewes of the same genotype.

One of the key inputs to GrassGro is the concept of mature size or Standard Reference Weight (SRW). This was determined by taking the final two years of the Bombala trial data and fitting a model to calculate the average weight of the wethers at FS 3. This mature weight of wethers was then converted to a Standard Reference Weight using published relationships between the sexes (SCA 1990).

The second stage of conversion was to calculate potential fleece weight as a percentage of SRW to provide the input parameter for fleece weight. Average micron was transposed directly between sexes since most of the difference between ewes and wethers for this parameter are nutritionally driven resulting from the demands of reproduction. The final genotype input parameters used in GrassGro are shown in Table 1.

Table 1. GrassGro Input Parameters

Team	SRW	Micron	Yield	GFW	Ewes/ha
1	44.0	20	74%	5.2	5
2	44.7	20.4	73%	5.4	4.9
3	46.5	19.1	75%	4.9	4.7
4	48.2	20	76%	5.3	4.5
5	45.1	19.3	68%	5.8	4.8
6	48.1	19.9	73%	4.9	4.5
7	46.9	19.9	73%	5.6	4.6
8	41.6	19.5	73%	5.0	5.3
9	50.5	20.5	73%	5.1	4.3
10	47.0	19	72%	5.4	4.6
11	48.8	19	74%	5.2	4.5

Farm System Details

In keeping with the seasonal conditions reports and climate change impact analyses already completed and disseminated to MFS, the "Twin Lake" system from Redcliff west of Bombala was chosen as the basis to compare the 11 genotypes.

The "Twin Lake" system is a well fertilised perennial grass systems based on cocksfoot running 4 ewes/ha, lambing in August with surplus young sheep sold as hoggets.

Each of the 11 new genotypes defined were run in this system using historical weather data for the 21 years from 1990-2010 setting the usual target of keeping ground cover above 80% in 7 out of ten years to determine the maximum sustainable stocking rate for each genotype individually (Table 1). These stocking rates were the basis for comparison of the genotypes.

Reproductive rates were assumed to be the same across all genotypes in the first instance with the proportion of ewes conceiving singles, twins and triplets being set to the same starting parameters for all genotypes and achieving an average of 85% weaning rate. These parameters were then varied to explore the impact that better inherent fertility might have on the enterprise economics.

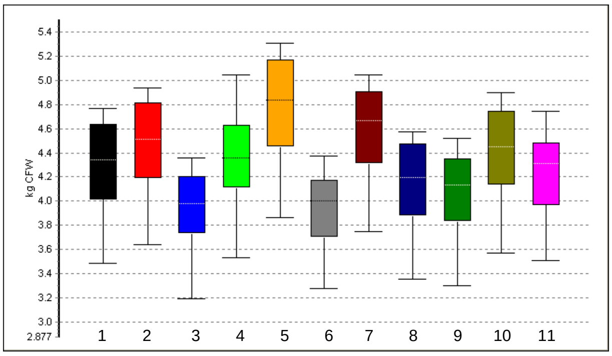
Cost and price structures were the 5 year averages for the same period as previously reported for the Climate Change impact work.

Results

Wool Cut

Figure 1. shows the boxplot for the clean fleece weight cut for each of the eleven genotypes for the period from 1971 to 2010.

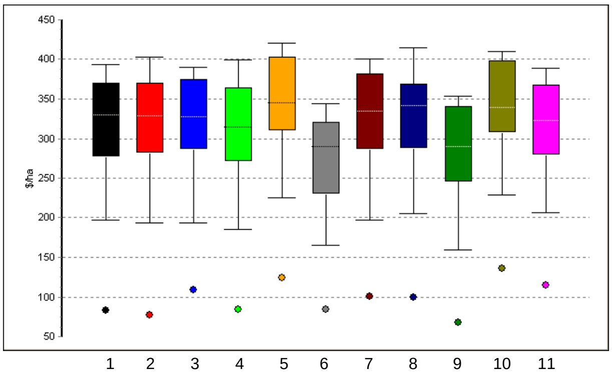
Figure 1. Greasy Fleece Weight by team 1971 – 2010.



The team with the highest fleece weight was team 5 while the team with the lowest clean fleece weight was team 3 with teams 6 & 9 very similar.

Gross margins per hectare (Figure 2.) were calculated based on the value of the wool and surplus animals produced which was driven by the combination of the animal performance and the sustainable stocking rates.

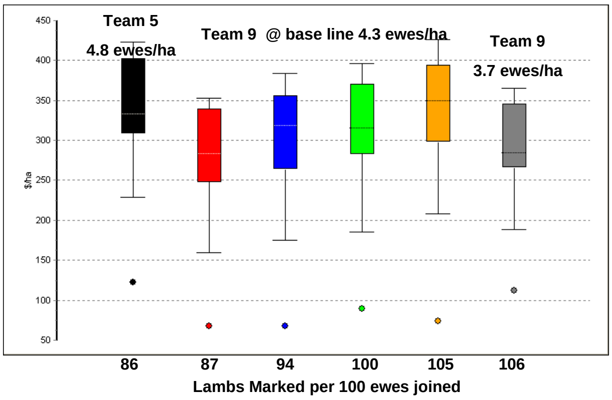
Figure 2. Gross Margin /ha for the eleven genotypes across the period 1990-2010.



In terms of gross margin team 5 still ranks first but has lost considerable ground due to it's lower yield. Team 3 has lifted into the pack because of it's relatively higher yield and finer micron. Team 9 has fallen back toward team 6 because of its bigger size hence lower sustainable stocking rate (ewes/ha) as well as its broader micron.

However it is often postulated that these bigger plainer ewes are inherently more fertile thereby offsetting their other disadvantages. This effect can be tested in GrassGro by manipulating the input parameters for reproduction leading to higher weaning rates in these bigger framed ewes.

Figure 3. Weaning rate vs gross margin for Team 9.



In figure 3 the black and red boxplots are the baseline scenarios for teams five and nine with weaning rates of 86% and 87% respectively. The reproductive genotype of team 9 was altered incrementally to increase the weaning rate to the point where gross margin was equivalent to the baseline scenario for team 5. Weaning rate had to increase 18 percentage points to 105% for the lesser wool performance to be fully offset and for the same gross margin as team 5 to be reached.

Comparing Apples with Apples

Unaccounted for in the process of simply increasing the reproduction of team nine is the attendant increase in pasture utilisation and hence real stocking rate in DSE/ha. As reproduction increases so does the stocking rate. In practise this can be a profitable strategy as long as the farm is not already running at the maximum sustainable carrying capacity (Warn etal 2006). In this analysis the increase in reproduction leads to the original ground cover rules to be broken. The stocking rate for team nine running at a 105% weaning rate therefore needs adjusting downward so that the system again meets the required maintenance of ground cover (ie not overstocked). The sustainable stocking rate for the higher fertility team 9 genotype is just 3.7 ewes/ha and a boxplot (grey) is shown for this scenario in figure 3. At the new sustainable stocking rate the increased gross margin derived of the higher weaning rate has been almost entirely offset by the need to run less ewes per hectare.

Conclusion

Based on this preliminary analysis it would appear that the bloodline analysis of merino genotypes based on the wool performance characteristics of wethers corrected for mature size is likely to give an accurate picture of the relative value of the bloodlines as they impact upon merino breeding enterprises. The differences in profitability driven by wool production are likely to be far greater than those derived of what are likely to be relatively small genetic differences in reproductive capacity.

On real farms the experience of individual farmers may not be in line with this conclusion but in the main improved enterprise performance through genetically higher weaning rates in bigger framed plainer ewes is likely to have emanated from the incidental increase in stocking rate that comes from selection for higher reproduction. In most cases this hidden increase in stocking rate comes at no real cost since many farms are not running at their carrying capacity to begin with.

I could be argued that a choice to increase stocking rate through running more animals per hectare would give similar economic benefits without the lag time of selecting for higher weaning rates. This strategy also means that a greater selection emphasis can be placed on the wool productivity traits such as fleece weight and fibre diameter further increasing the economic performance over time.

In enterprises where progeny are finished as lambs the relative contribution of wool vs meat will be different and greater emphasis on reproduction may be more warranted in order to increase the proportion of feed consumed being converted into saleable product.

ISSN 1832-6668