



Sheep CRC Practical Wisdom Notes

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Genomic testing ram lambs helps increase rates of index genetic gain by 50% at Centre Plus

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Abstract

Centre Plus are a Merino stud with a large industry influence. Centre Plus are objective and subjective Merino breeders who use Australian Sheep Breeding Values to benchmark their progress. They measure pedigree, record reproductive data, lifetime measurements on many body and wool traits, and use genomic testing. In 2012 Centre Plus began testing 20% of their top ranked ram lambs to more accurately add ram lambs to their sire team. When comparing the 10 year period of pre-genomics to the last 5 years of using genomic testing, Centre Plus have increased rates of genetic gain of MP+ and DP+ indexes by 47% and 53%, respectively. Specific trait increases included 25% in yearling clean fleece weight, 95% in adult clean fleece weight, while maintaining fibre diameter at -1.9. Number of lambs weaned also increased by 95% but as there is no genomic prediction for reproduction yet, it demonstrates Centre Plus' dedication to measuring pedigree and using selection tools such as Matesel to drive gains in important profit driving traits.



Mark Mortimer - Centreplus

Introduction

Centre Plus are a co-operative Merino stud based at Tullamore, NSW with a large industry influence. Currently, they have a nucleus flock of 1100, a multiplier nucleus of 400 and 12 commercial members with a total of 20,000 ewes. The commercial flocks contribute to the multiplier nucleus with their elite commercial ewes. Centre Plus are very proactive and aim to achieve the best possible genetic gain per dollar invested. They measure pedigree, perform genomic selection and record reproductive data and lifetime measurements on wool traits. Centre Plus have extensively used the mating program Matesel since 1999 to maximise the potential rates of genetic gain while minimising rates of inbreeding. Since 2011, Centre Plus have genomic tested 20% of their top ranked ram lambs to more accurately add ram lambs to their sire team each year.

Genomic testing

Genomic selection works by DNA testing an animal and comparing its DNA profile with that of thousands of other animals that have been measured for traits used for selection. Based on this DNA comparison we can predict the genomic breeding value of an animal. In Australia, we use information from the Sheep CRC Information Nucleus Flock and MLA Resource Flock. Across all these research flocks there are close to 30,000 animals that have been DNA tested and measured for important traits, including meat quality traits. The MLA Resource Flocks continue to measure and genotype animals every year to maintain an ongoing data resource that can be used for predicting genomic breeding values. When an animal is tested, the DNA information is merged with other information in the Sheep Genetics database, such as pedigree, the breeding value of its parents and its own performance information; this is used to predict the animal's breeding value. Ram breeders and ram buyers can use ASBVs to select animals based on genetic merit as they are the best prediction of breeding value, combining all the available information.

New Single-Step analysis

The Animal Breeding and Genetics Unit (AGBU) have developed and now implement a new routine analysis called "Single-Step". The use of "Single-Step" integrates genomics into traditional genetic evaluation, allowing for more accurate calculation of breeding values (ASBVs). Traditionally, ASBVs used only pedigree data to estimate the genetic similarity of animals and then blended in genomic breeding values based on genomic relationships to the reference population. However, the new Single-Step evaluation incorporates all genomic, pedigree, and performance data in the one model. This genomic data is more accurate as it fills in "gaps" when calculating relationships to the rest of the sheep population which allows for more accurate ASBV calculation. Furthermore, with Single-Step analysis, any sheep that is genomic tested and has a measurement or progeny with measurements submitted to Sheep Genetics becomes part of the reference population for those measured traits. Genomic predictions become more accurate the closer tested individuals are related to the reference population.

Genomic testing at Centre Plus

Modelling of breeding programs utilising genomic testing has suggested Merino breeding programs can increase the rate of index genetic gain by 15-20% by genotyping 20% of top ranked ram selection candidates. In 2012 Centre Plus began testing 20% of their top ranked ram lambs to more accurately add ram lambs to their sire team. They only tested rams they thought would be capable of mating at 7 months of age. After receiving genomic enhanced ASBVs on their ram lambs, they would add the top 5 ranked rams into the sire team each year, which consists of 25 rams. The extensive testing and measurement of genomic tested rams and extensive trait measurement of progeny means Centre Plus are very closely related to the reference population and therefore continuing to increase the accuracy of genomic prediction for generations to come.