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SIL-ACE - Increasing access to genetic information for sheep farmers

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ABSTRACT

SIL-ACE is a large-scale, across-flock, across-breed genetic evaluation carried out bi-monthly by SIL. Goal trait groups considered include Growth, Meat (carcass merit), Wool, Reproduction and Resistance to internal parasites. The SIL-ACE dataset comprises over 330 flocks and 3.2 million animals. Leader lists for top-rated 200 sires are published on the www.sil.co.nz website. These comprise the top 5 to 10% of sires for each index or goal trait group considered. Visual depictions of flock connectedness are also provided. Breeders obtaining within flock reports based on the SIL-ACE genetic evaluation, can use a percentile bands table as a scale to judge the merit of animals they are considering for selection. Developments underway will lead to other traits being added to the SIL-ACE evaluation such as lamb survival and ewe performance, resulting in more powerful selection tools to better target genetics suited to a particular users needs.

Keywords: genetic evaluation; sheep; across-flock; across-breed; SIL-ACE.

INTRODUCTION

Historically, sheep farmers wanting to buy rams best suited to their farming objectives, could not easily compare the relative merits of rams for sale from different breeders. Sheep breeders wishing to source high merit animals from outside bloodlines had the same problem. Between farm differences could not be separated from genetic merit for rams from different flocks.

It has been concluded that lack of valid and sufficiently accurate methods for genetic comparison of sheep in different flocks inhibited rates of genetic gain in the New Zealand sheep industry (Piper & Banks, 2003; Amer, 2009). The value of across-flock evaluations had been recognized well before this (Callow *et al.*, 1986; Garrick, 1991) with some breeding groups making use of link sires to provide genetic connections between flocks and getting across-flock genetic evaluations prior to the establishment of Sheep Improvement Ltd (Morris *et al.*, 1999). Such connections allowed the separation of farm effects from genetic sire effects (Clarke, 2003).

Sheep Improvement Ltd (SIL) was set up in 1999 (Geenty, 2000) and provided on-demand access to across-flock evaluations for a number of collaborative breeding groups.

SIL-ACE AND CPT

Although by the early 2000s there were a number of group breeding schemes routinely undertaking across flock analyses there were still generally no links between these groups even where groups were of the same breed.

Genetic connections between the different breeding groups were greatly improved with the establishment of the Alliance Central Progeny Test

CPT) in 2002 (Campbell *et al.*, 2003). This is now known as the Meat and Wool New Zealand (MWNZ) CPT since MWNZ took over funding in 2005. One hundred and forty-three rams from the different breed groups have been used as sires at one or more of the three CPT sites since 2002, establishing good genetic connections between many groups.

Initially the CPT focused on meat traits, carcass meat yield in particular (McLean *et al.*, 2006) so it did not provide connectedness for all traits important to dual purpose sheep such as reproductive rate and wool production. In recent years data has been collected for female progeny of Dual Purpose rams retained as ewes, to improve genetic connections between flock groups for maternal and wool traits.

SIL now routinely undertakes a large, across-flock evaluation, with linkages provided by existing breeding groups and the CPT. Known as the SIL-ACE evaluation, results are published regularly on the SIL website (www.sil.co.nz). This is an across-flock, across-breed genetic evaluation that produces reports on animals from genetically connected flocks.

SIL-ACE NOW

SIL-ACE evaluations have been performed since 2004, and now occur bi-monthly. Goal trait groups in the evaluation that are reported include Growth, Meat (carcass merit), Wool, Reproduction and Resistance to internal parasites (WormFEC). Leader lists of sires for a range of indexes and traits are available on the SIL website (www.sil.co.nz). Only the top 100 or 200 sires are listed, corresponding to the top 5 to 10% of sires for each list.

Only sires from genetically well connected flocks are considered for reporting. SIL conducts

analyses of flock genetic connectedness at each evaluation and visual reports of flock connectedness are reported on the SIL website. In addition, sires must have a minimum number of progeny contributing data on relevant traits to appear on the leader list. Typically this is 20 progeny with measurements for sires from flocks in the analysis and 30 progeny with measurements for sires from flocks not in the SIL-ACE analysis. This constraint is slightly different for Reproduction, since lambing data is collected much later, and sires must have 50 half-sisters or daughters with lambing information to appear on the lists.

Where indexes combine information across different traits such as where ACE Dual Purpose combines Growth, Wool and Reproduction, sires must satisfy the connectedness and progeny/sib measurement criteria for each component trait.

When SIL-ACE evaluations started in 2004, there were 151 flocks and 1.2 million animals in the evaluation. Now over 330 flocks of the 700+ performance recording flocks on SIL participate, contributing 3.2 million animals. The number of flocks connected for each major trait are: Growth, 269; Meat, 197; Wool, 151; Reproduction, 232; WormFEC, 58. More than 75 million breeding values are produced and stored, making this the largest genetic evaluation of sheep in the world.

SIL-ACE THE REPORT CARD

SIL-ACE directly addresses the gap in the genetic evaluation systems for New Zealand sheep identified by Piper and Banks (2003), by providing a regular across-flock, across breed evaluation that allows valid comparisons to be made of animals from different flocks.

Since SIL-ACE was set up, rates of genetic gain in New Zealand sheep breeding flocks have increased (Amer, 2009). While SIL-ACE is not solely responsible for this increase, it has contributed to it. Development of a variety of different composite sheep ‘breeds’, based on traditional breeds and recent imports, has meant that breeders and their ram buying clients are considerably more open to selection of high merit sheep, regardless of breed. SIL-ACE lends itself to this.

SIL-ACE is not a perfect system, more a work in progress. With the range of breeds involved, it is expected that hybrid vigour will lead to biases for some sires. While this is true, experts believe the effects are small and the benefits of having different breeds in a breeding programme more than compensate.

SIL-ACE reports, in their current form, are more suited to sheep breeders than commercial sheep farmers. However, a number of commercial sheep farmers in New Zealand review the SIL-ACE

lists on a regular basis to provide a guide to which flocks have animals of the type they want when purchasing rams. The current system of reporting on only the top ranked animals for specific indexes or traits is not sufficiently flexible to cater for the needs of the variety of commercial ram buyers, and ram breeders. More sophisticated tools are required to make best use of the wealth of information present in the SIL-ACE genetic dataset.

WHERE TO FROM HERE?

SIL is committed to enhancing SIL-ACE to make it more relevant to the sheep industry and to increase usage. To these ends, SIL is developing a web-based search engine to allow users to interrogate the wealth of information in the entire SIL-ACE BV and index database in order to find animals with the combination of genetic merit for traits that they want. This promises new ways of identifying genetic merit and will be critical to growing usage of SIL-ACE.

To increase relevance to industry, SIL-ACE aims to evaluate more traits of interest such as ewe traits and lamb survival. SIL also supports the use of rams in the CPT that enhance or add connectedness to significant populations of sheep.

DNA technologies are rapidly developing worldwide. SIL is working with industry partners to develop a common scale for reporting on, and blending of, measures of genetic merit coming from SIL-ACE type evaluations and those from DNA testing.

SUMMARY

SIL-ACE provides opportunities never before seen in the New Zealand sheep industry. It directly addresses a previously identified weakness in New Zealand sheep genetic evaluation, the lack of a large-scale, across-flock, across-breed evaluation.

SIL-ACE has not yet reached its potential but developments underway will increase its relevance to the sheep industry and provide new ways to identify genetic merit. SIL-ACE will be here in 10 years time, in some form, as farmers and breeders seek to source animals with the best combinations of genetic merit across traits, to suit our agriculture.

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