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WHAT DOES *OVIS* OFFER THE MERINO SHEEP BREEDER?

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SUMMARY
Genetic gain is one of the primary goals of most breeding programs. *OVIS*, a software program which estimates multiple-trait breeding values for sheep, offers the potential to improve genetic progress in Merino breeding programs. The software fits a model that has direct genetic, maternal genetic, direct maternal genetic covariance, permanent environment due to dam, interaction between sires and flocks and residual effects. There are 41 available traits comprising growth, carcase, wool, fitness and fertility measured at a maximum of 7 stages of maturity or times (birth, weaning, post-weaning, yearling, hogget, adult and carcase). The EBVs are computed with a model including genetic groups and accommodating for different levels of variance between flocks.
Keywords: EBVs, wool, genetic evaluation, LAMBPLAN.

INTRODUCTION
The overall aim of any livestock breeding program is to achieve as much genetic progress in the key traits that determine profitability and sustainability. One of the major determinants of genetic progress is accuracy of selection. An important way of improving the rate of genetic progress is through accurate performance recording, accurate genetic evaluation and correct use of estimated breeding values (EBVs). Accuracy of selection is discussed in more detail by Brown *et al* (2001a). While the benefits of using EBVs have been clearly demonstrated in all major livestock species, they have been under-utilised by Merino breeders.

OVIS is a software program developed to estimate breeding values (EBVs) for the many traits used by sheep breeders participating in LAMBPLAN (Brown *et al.* 2000). *OVIS* has been utilised since late 1999 to produce EBVs for approximately 800,000 meat sheep and approximately 92,000 Merino sheep all recorded within the LAMBPLAN system. *OVIS* replaced BVEST, the software previously used by LAMBPLAN, as a result of a number of factors including growth in the data, the number of traits to be analysed and analysis model it utilises. *OVIS* presents an opportunity for more Merino breeders to increase their genetic progress. This paper outlines some of the benefits that *OVIS* offers the Merino breeder.

THE MERINO LAMBPLAN DATABASE
As of January 2001 the Merino LAMBPLAN database consists of records on approximate 92,000 Merino related sheep. Approximately 86,000 of these are the traditional Merino breeds comprising medium, fine and superfine Merino flocks. The remaining 6,000 sheep originate from other Merino related breeds including Meat Merinos (SAMM), Dohne, Rambouillet and Meridale.

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Table 1 illustrates the number of observations in the Merino LAMBPLAN database. The predominant traits recorded are liveweight, fleece weight (greasy and clean), mean fibre diameter, fibre diameter variation and fecundity.

Table 1. The number of observations in the Merino LAMBPLAN database for each trait type (January 2000)

Trait	No. observations	Trait	No. observations
Liveweight	81,196	Fibre diameter variation	59,172
Fat depth	4,955	Staple length	637
Eye muscle depth	5,007	Staple strength	915
Greasy fleece weight	69,039	Faecal egg count	1,332
Clean fleece weight	49,033	Scrotal circumference	3,491
Mean fibre diameter	70,719	Fecundity traits	18,968

In the 91,000 animals there are 1,374 sires and 12,783 dams. Of the 1999 and 2000 born animals (N= 6,370), 77% have both their sire and dam recorded, 2% have dam only recorded and 21% of the animals have only their sire recorded. Figures in Table 2 illustrates that the Merino LAMBPLAN database has increased by approximately 10% each year for the last 10 years. These animals are mostly medium to fine wool Merinos with fibre diameter ranging from 13 to 31 microns.

Table 2. The distribution of the animals in the database by year of birth and by micron where they have been tested for fibre diameter

Year of birth	Percentage of animals	Micron	Percentage of animals
Pre 1990	10%	17 and Finer	13%
1990	5%	18	15%
1991	7%	19	19%
1992	9%	20	19%
1993	12%	21	15%
1994	13%	22	9%
1995	13%	23 and Broader	9%
1996	11%		
1997	8%		
1998	6%		
1999 and 2000	7%		

TRAITS

At present *OVIS* analyses up to 41 growth, carcase, wool, fitness and fertility traits simultaneously. Traits can be measured at 7 stages of maturity or times of measurement: birth, weaning, post-weaning, yearling, hogget, adult and carcase. The range of traits which can be measured at these later ages include: liveweight, fat depth, eye muscle depth, greasy and clean fleece weight, mean fibre

diameter, fibre diameter variation, staple length, staple strength, faecal egg count and scrotal circumference. Growth rate, carcase and reproduction traits are becoming increasingly important components of the Merino breeders' breeding objective. These traits have implications for lamb and mutton production and also influence wool growth (Brown 2000). Faecal egg count is a heritable trait and as a result can be included in Merino breeding programs (Greeff and Karlsson 1998). Many sheep and wool producers are now incorporating this trait into their breeding objective. Three faecal egg count traits are analysed in *OVIS*. There is scope for additional traits to be analysed by *OVIS* if economically desirable. Future traits may include yield, prickle, mean and coefficient of variation in fibre curvature and measures of along-staple variation in fibre diameter (Brown 2000). Multiple adult fleece records may provide a method to gauge decline in fleece weight and micron blow out as sheep age. This may also be a heritable trait that can be included in the breeding program (Hickson *et al.* 1995).

As in all livestock species, female fertility has a large impact on both the level of production and profitability. Consequently ratios of lambs born and weaned to lambing opportunities are included in *OVIS*.

ANALYSIS

OVIS utilises Best Linear Unbiased Prediction methods the estimate breeding values for all animals in the pedigree. The analysis utilised by *OVIS* accommodates all known systematic effects such as dam age, age, birth type, rearing type and liveweight. The fixed effects of flock, year, paddock and management group are all included by including them in the definition of contemporary group. It is well know that the phenotype of a sheep is a combination of the its genes and their interaction with the environment. A good example for the need to accommodate both these components in genetic evaluation was illustrated by Brown *et al.* (2001b) where animals born as twins are phenotypicaly broader in fibre diameter however they can be genetically finer and superior for fecundity. All these traits need to accommodated for in the genetic evaluation system and breeding objective.

OVIS utilises a complete animal model with the following components or effects included;

- Direct genetic,
- Maternal genetic,
- Direct maternal genetic covariance,
- Permanent environment due to dam,
- Interaction between sires and flocks, and
- Residual.

Separate maternal traits are included for birth and the later liveweight traits (weaning, post-weaning, yearling and hogget). Permanent environment effects due to dam are also fitted for these traits. As the maternal pedigree deepens and the quality of the data improves over time, maternal effects for the traits will be investigated using genetic analysis. Although *OVIS* can include sire by flock interactions in the model, they are not included at present as there are insufficient data to estimate these effects.

An important capability of *OVIS* is the inclusion of genetic information of base animals. The present analysis of Merino data sets allocates base (unknown sire and dam) animals to genetic groups based on breed and the average fibre diameter of the flock.

At present the analysis is primarily across flock however there is also a small proportion of other non Merino wool sheep which are related to the Merino through crossbreeding. At present no adjustment is made for possible heterosis, however animals are grouped genetically by breed and micron group within breed. It is intended to use an across breed analysis as soon as sufficient data are collected to estimate the required parameters. *OVIS* can also analyse repeated observations for any trait. At present repeated observations are only analysed for post-weaning weight but this functionality can be easily extended to include adult weight and fleece traits.

Planning for the development of *OVIS* in the future includes the ability to incorporate genotypic information.

INDEXES

For Merino breeders LAMBPLAN utilises the EBVs produced by *OVIS* to generate 4 indexes for their clients. These are an 8%, 15% and a 20% micron premium index and a 8% dual-purpose index which includes wool, growth, carcase and fecundity traits. Indexes can be designed to include any of the economically important traits desired for Merino breeding programs.

CONCLUSIONS

OVIS has been designed to give sheep breeders a range of important benefits which has been possible by utilising the experiences gained from BREEDPLAN and the beef industry. There are also many more features and components of *OVIS* that await data and development. With these components in operation and improved data quality and parameter estimates, Merino sheep breeders will have access to a very efficient means of identifying and selecting their best animals for breeding purposes.

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