



final report

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Sheep Genetics Australia (SGA) – Routine Evaluation

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Abstract

During the term of the project AGBU performed more than 1,450 fortnightly and monthly genetic evaluation runs to produce ASBVs for LAMBPLAN for terminal and maternal sheep breeds and other species serviced by LAMBPLAN, and MERINOSELECT for merino breeders.

During the projects life approximately 382 million records were processed in 1,459 separate routine analyses (on average 30 analyses a month).

AGBU also provided support for MLA staff and breeders with respect to; diagnostic reports, data files, EBV query reports, parameter files, EBV information and analysis information.

Executive Summary

- During the term of the project AGBU performed more than 1,450 fortnightly genetic evaluations to produce EBVs for LAMBPLAN for terminal and maternal sheep breeds and other species serviced by LAMBPLAN and for MERINOSELECT for the Merino breed.
- The capabilities of OVIS and the functionality of the run control infrastructure were enhanced and the numbers of routine analyses were increased.
- Successful international collaborations have been achieved to routinely produce EBVs for National Sheep Improvement Program in the United States.
- AGBU also provided support for MLA staff and breeders with respect to; diagnostic reports, data files, EBV query reports, parameter files, EBV information and analysis information.

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1 Background

For the last 10 years the Animal Genetics and Breeding Unit (AGBU) has routinely used OVIS to provide LAMBPLAN and MERINOSELECT with ASBVs for their clients. AGBU also provides full support of OVIS and its EBVs and conducts research and development activities for OVIS, LAMBPLAN and MERINOSELECT. This report comes at the end of a four year period from July 2006 to June 2010. This document details the progress and results that have been achieved for each milestone as set out in the work plan and the research contract.

2 Purpose and description

This project delivers routine genetic evaluations for the sheep industry, producing EBVs and other genetic information used by breeders and producers. Furthermore to improve the capacity of the OVIS system to provide accurate Estimated Breeding Values (EBVs) for the range of traits which contribute to sheep enterprises across a range of production systems and target markets.

This project recognized the need to separate the R&D for quantitative sheep genetics which underpins the SG genetic evaluation from the routine monthly or fortnightly evaluations with its specific requirements. The project undertook to provide the routine genetic evaluation at AGBU in the period January 2006 to June 2010.

3 Objectives

The objectives of the project were:

1. AGBU to contract Dr Andrew Swan (currently CSIRO Livestock Industries for the duration of the agreement.
2. Maintain sufficient computer hardware (including backup) to accommodate two runs per months for each SGA sheep evaluation in Australia using OVIS software.
3. Perform evaluations for all SGA data sets to an approved timetable using approved models and parameters using the OVIS software, calculate approved Indices using the SheepObject system or other subroutines and provide diagnostic support.
4. Test new parameters and traits for genetic evaluation into OVIS as approved by the Technical Committee of SGA.
5. Develop and contribute to SGA extension efforts to enhance the understanding by sheep breeders of the SGA evaluation system.

4 Routine Genetic Evaluation

For the duration of the project, fortnightly runs of OVIS have been performed for all breeds for which new data has entered the database. Throughout this time there has been significant growth in all the databases. There has also been a growth in the number of analyses being conducted.

During the projects life approximately 382 million records were processed in 1,459 separate routine analyses (on average 30 analyses a month).

AGBU also provides support for MLA staff and breeders with respect to; diagnostic reports, data files, EBV query reports, parameter files, EBV information and analysis information.

4.1 LAMBPLAN

108 routine fortnightly analyses of OVIS have been performed for Terminal sire database. This number included a number of research evaluations.

There were also 867 analyses for the Maternal breeds during the life of the project, averaging 18 analyses per month from up to 15 different breeds.

4.2 MERINOSELECT

During the project 204 approximately fortnightly evaluations have been performed for MERINOSELECT databases, including research evaluations. There have been an additional 44 “Merino Try Before You Buy” runs and approximately 186 within flock runs.

Additional functionality was incorporated into the run script to enable SG to deliver smaller within flock runs. These runs are a smaller version of the standard Merino run but are used for unlinked or problematic flocks or groups of animals with no pedigree and basic measurements. This functionality also included the ability to run these analyses at the same time as the normal routine runs.

As a result of the research conducted under SHGEN.113 new routine analyses were developed for visual traits. A new version of OVIS was developed to complete a visual trait analysis independently from the main analysis. This additional analysis is now implemented to run after each MERINOSELECT and TBYP run to produce breeding values for breech and body wrinkle. A prototype analysis has been developed with additional traits, including early and late expressions of breech cover, dag score, fleece colour, fleece rot, fleece character, and staple weathering. This is currently undergoing testing.

OVIS and the input files were also modified to accommodate the inclusion of named syndicates into the MERINOSELECT analysis.

4.3 KidPlan

Monthly runs of OVIS have been performed for KidPlan database. This resulted in 82 analyses. The KidPlan database now has 10,224 animals.

4.4 National Sheep Improvement Program of the United States of America

MLA has established an agreement to conduct routine genetic evaluations for the National Sheep Improvement Program (NSIP). AGBU worked with MLA, SG and NSIP staff to evaluate opportunities to collaborate and work through the development of new analyses for NSIP breeds. Currently three new analyses have been developed for Targhee, Suffolk and Polypay breeds from the NSIP database. This process involved importing new data into the SG database, setting up new parameter files for each of the breeds and implementing new runs into the routine evaluation scripts. A large amount of testing and diagnostics were conducted and reported back to SG and NSIP.

This collaboration has worked very smoothly and successfully and has been an excellent demonstration of SG’s and AGBU’s ability to establish international collaborations.

4.5 Dohne

MLA has established an agreement with the Dohne society to conduct preliminary genetic evaluations for the society to trial the system. AGBU worked with MLA and SG staff to evaluate opportunities to collaborate and work through the development of a new analysis for the Dohne breed. A new analysis has been scripted for the Dohne breed and run as a “Try Before You Buy” scenario. This process involved importing new data into the SG database, setting up new

parameter files for this breed and implementing a new run into the routine evaluation scripts. Testing and diagnostics were conducted and reported back to SG and members of the Dohne society.

This process has also worked very successfully and again has been an excellent demonstration of SG's and AGBU's ability to establish collaborations with other organisations.

4.6 AMSEA

AGBU has continued to analyse the AMSE CTSE database and produce the Merino Superior Sires publications.

Within flock analyses have been conducted on behalf of the Australian Merino Sire Evaluation Association for the following sire evaluation sites:

Site	2005 drop	2006 drop	2007 drop	2008 drop
Badgingarra (WA)		✓	✓	✓
Elders Victoria	✓	✓	✓	✓
Longreach (QLD)				✓
Macquarie (NSW)				✓
New England (NSW)	✓	✓	✓	✓
South West Slopes (NSW)	✓			✓
Tasmania			✓	

Additional analyses were conducted on behalf of the Australian Merino Sire Evaluation Association to compare ASBVs to EBVS from analysis of AMSEA data only. A report on the comparisons was prepared and presented to the AMSEA Executive meeting on 25 June 2008. As a result of this presentation AMSEA have decided to continue using ASBVS for future editions of Merino Superior Sires.

4.7 Lambing Ease and Gestation Length

As a result of the research conducted under SHGEN.113 new routine analyses were developed for lambing ease and gestation length. The CATCON program and supporting software were used to implement an additional analyses for each breed with records for these traits.

4.8 Marker assisted breeding values

OVIS has been enhanced to handle genomic data in the form of marker estimated breeding values (GEBV). These GEBV have been developed using the Sheep CRC's Information Nucleus Flock as a discovery population, and are predictions of breeding value given genotypes derived from a 50K SNP panel.

GEBV are included in OVIS as correlated traits and a major part of the research has been to estimate genetic covariances between MEBV traits and standard OVIS traits. This was achieved for 8 MEBV traits in Merinos, and will be extended to terminal sires and maternal breeds in the near future. The prototype model will be tested as further MEBV's become available through the pilot project.

As part of this development a database of runs has been developed with a series of programs to make the process of developing and co-ordination of runs more streamlined.

4.9 Index Accuracy

A program was developed to estimate index accuracy. After approval by the Technical Committee the OVIS analysis system was modified so that after each analysis index accuracies are estimated for all the standard indexes.

4.10 Screening for failed service sires

Removal of failed service sires was implemented into the routine runs scripts.

4.11 Diagnostics

Diagnostic support was regularly provided to Sheep Genetics staff on a range of issues covering all breed groups. The majority of this diagnostic work was related to changes in ASBVs over time.

Development of a comprehensive database to store summary statistics from each run has continued. This database stores breed, flock, breed by trait, and flock by trait level statistics. These statistics are calculated after each run and stored in the database. OVIS then compares these statistics between runs and will email warnings and even hold results back as required. This database will also be a valuable tool for conducting routine EBV diagnostics.

The COMPARE program was also re-implemented. This program compares the EBVs between consecutive runs for each breed and emails a summary of breeding values and animals that have changed more than anticipated. Improved summaries and formatting of emails which detail changes in ASBVs between consecutive runs were developed.

Test runs of OVIS were conducted as required to evaluate changes made to the OVIS software, the parameter files and the databases. Comparisons have also been made of the EBVs, genetic group solutions and genetic trends from each of these runs. Within flock runs have also been completed to help investigate problems with genetic trends and genetic group solutions.

4.12 Other activities

To enhance operational flexibility access to OVIS within AGBU was improved so that it could be easily run and maintained from a number of computers. This required moving the OVIS system (source, parameter and executable files) and re-compiling for a number of platforms using a new and more efficient compiler. All these files are now stored in a central location with a number of AGBU staff having access. This creates a backup system if the main server were to fail, and allows large scale test analyses to be performed without interfering with the routine runs.

An internal SQL database system for hosting OVIS files has also been developed. This has simplified the task of preparing data files for research projects.

5 Impact on Meat and Livestock Industry

Continued uninterrupted delivery of ASBVs by a team of experienced sheep geneticists has allowed the industry to utilize recorded information in a timely manner to maximum benefits.

The major outcome of this project has been to facilitate more accurate selection of breeding animals for the Australian sheep flock. This has been achieved by producing more accurate breeding values for a greater range of traits in a more timely manner. Additional outputs, including breeding value accuracy, inbreeding coefficients and selection indexes assisted to improve selection accuracy.

6 Conclusions and Recommendations

The objectives for this project have been achieved. The system developed for the routine genetic evaluations continues to work well. This is also strengthened by the excellent cooperation between AGBU, MLA and SG staff. More recently, facilitated by SG, there has been a large increase in the collaborative work conducted with leading geneticists from other research organisation. Research has been conducted on a range of issues related to the genetic evaluation system and the results have been implemented into OVIS to improve the accuracy of the EBVs. All databases have been increasing in size and the release of ASBVs through SGA has highlighted the benefits of this research and development. Additional EBVs, reports, and diagnostic tools have been developed to enhance the service provided to sheep breeders.

Run time for the largest analysis has increased to 2 days. Computer requirements will need to be monitored and computer upgrades may be required to continue to provide a timely service.