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## Sheep Genetics Manager's report



Peta Bradley  
Manager – Sheep Genetics, MLA

I am pleased to share the Sheep Genetics 2021–22 *Annual Outcomes Report*. We have achieved a lot this year in delivering our service to clients. In particular, we have been focused on improving our genetics evaluation as well as working with our clients to drive genetic progress within the sheep industry.

As borders opened and restrictions eased, we enjoyed the opportunity to be back travelling, hosting and attending events and interacting with our expanding client base. The efforts of our clients have contributed to doubling the rate of genetic gain across all the standard indexes for all analyses.

The enhancements to our genetic evaluation in May were extensive. Thank you to the Animal Genetics and Breeding Unit (AGBU) team for their extra efforts working with Sheep Genetics on delivering these enhancements to industry. Read more about these improvements in the Research and Development section in this report. Thank you to everyone who contributed to the Sheep Genetics program over the past year. We look forward to working with you over the next 12 months.



## 2021–22 Sheep Genetics highlights

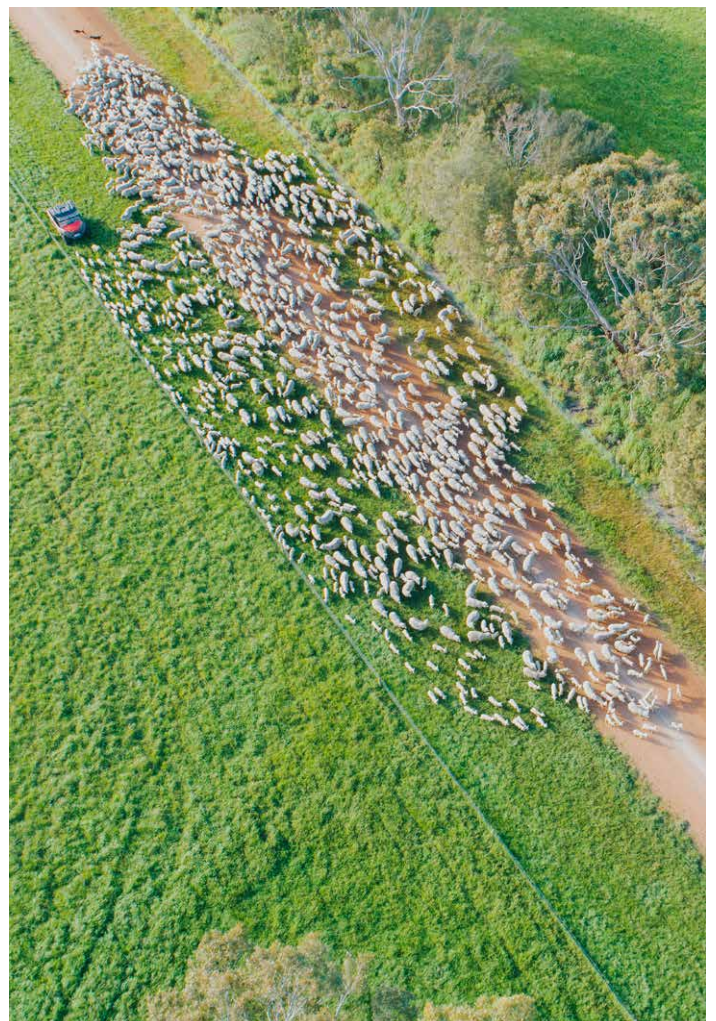
**Newly developed Sheep Genetics database system (our largest scale update in >17 years)**

**Record number of genotypes included in the Sheep Genetics evaluations between July 2021–June 2022**

**Engaging with over 1,000 seedstock and commercial producers at events supported or hosted by Sheep Genetics**

**Weaning Rate now incorporated into Maternal LAMBPLAN and MERINOSELECT indexes**

**Data Quality Score now included in Sheep Genetics reporting dashboard**





# Membership

During 2021–22, Sheep Genetics experienced positive growth in both number of new clients as well as additional flocks with existing clients. There are now currently 1,187 member flocks in Sheep Genetics.

LAMBPLAN membership increased by 68 (9.8%) and MERINOSELECT membership had an increase of 25 (6%). The LAMBPLAN membership included both maternal and terminal breeds/analysis. The MERINOSELECT membership include both Merino and Dohne breeds/analysis.

Figure 1: LAMBPLAN and MERINOSELECT total number of flocks over time

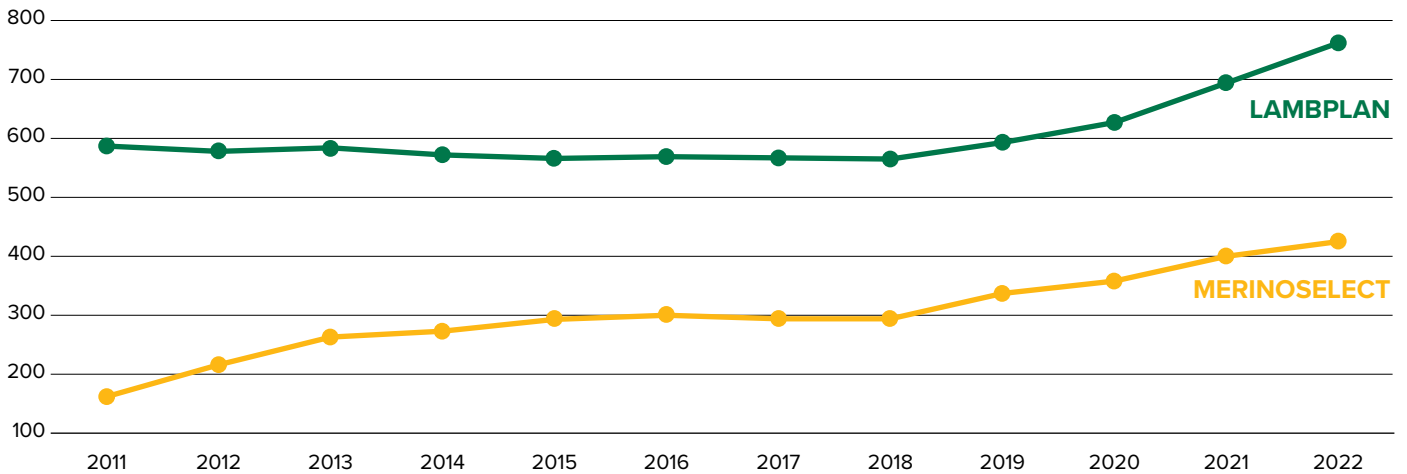
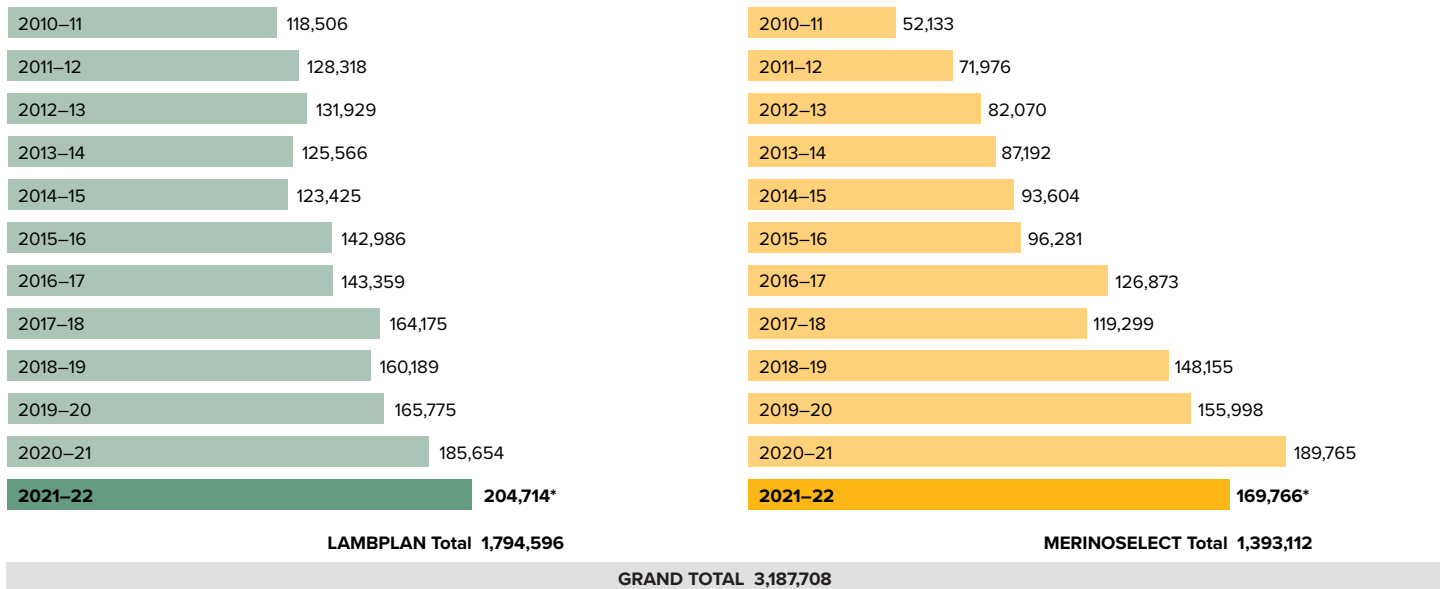


Figure 2: LAMBPLAN and MERINOSELECT animals each financial year



\*Billable animals to May 2022. MERINOSELECT is expected to exceed the total billable animals of 2020–21, and LAMBPLAN to continue to grow with the inclusion of June 2022.



# Genetic trends

A selection index is an important tool to drive genetic improvement in breeding programs, particularly where there are a range of traits of economic or functional importance. Index trend is used as a gauge of the genetic gain industry is making.

In 2021–2022, all reported indexes increased across all major analyses. There was also notable improvement in the genetic trend for key trait groups including:

- improved reproduction trend, with the introduction of Weaning Rate in Merinos and Maternals
- improved intramuscular fat and shear force while continuing to improve lean meat yield in Terminals
- further reduction in early breech wrinkle in Merinos
- improved growth across all analyses.

For more information on Sheep Genetics selection indexes go to [sheepgenetics.org.au/getting-started/asbvs-and-indexes](https://sheepgenetics.org.au/getting-started/asbvs-and-indexes)

Figure 3: Merino indexes

↑ 3.3% to 156  
Dual Purpose Plus (DP+) index  
Based on 07/10/2022 MERINOSELECT run

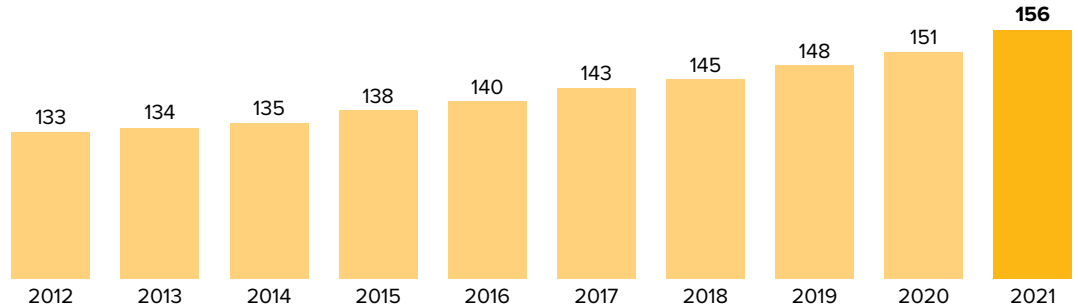


Figure 4: Terminal indexes

↑ 1.4% to 136  
Terminal Carcase Production (TCP) index  
Based on 01/10/2022 LAMBPLAN run

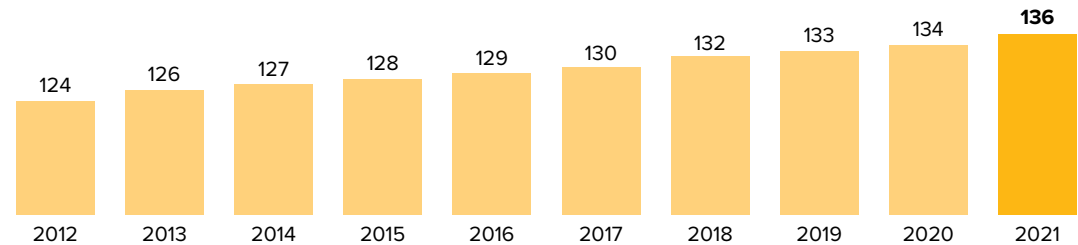


Figure 5: Maternal indexes

↑ 2.9% to 141  
Maternal Carcase Production Plus (MCP+) index  
Based on 01/11/2022 LAMBPLAN run

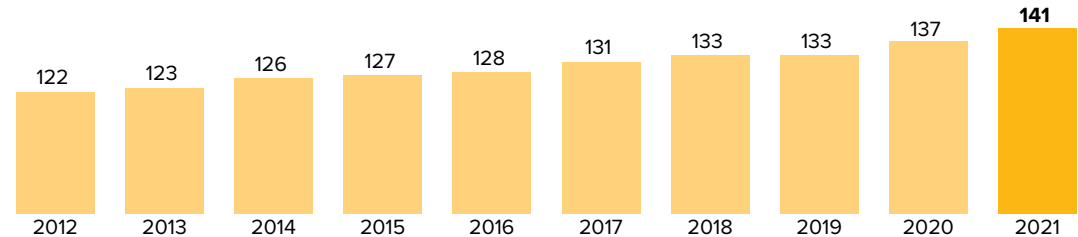
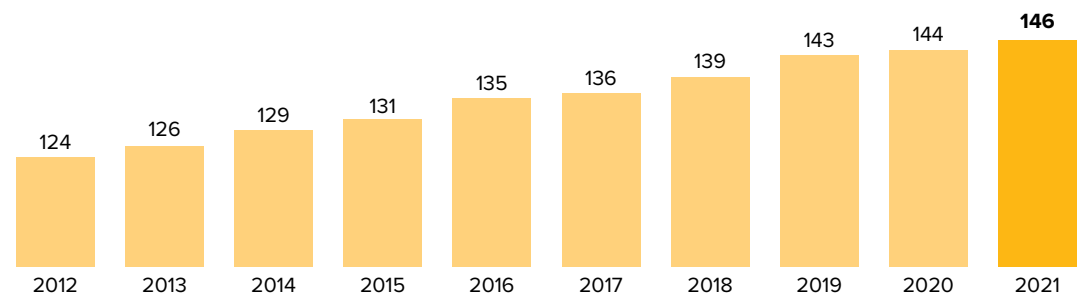


Figure 6: Dohne indexes

↑ 1.4% to 146  
Dohne Plus (DOHNE+) index  
Based on 07/10/2022 DOHNE run





# Genotyping

Strategic genotyping enables breeders to more accurately select animals at a younger age for hard-to-measure traits e.g. eating quality, or traits that are measured later in life e.g. reproduction. Accurately selecting animals and using them at a young age (e.g. using ram lambs) increases the rate of genetic gain.

There has been an ongoing significant increase in genotyping. Genomic information is included and contributes to MERINOSELECT, LAMBPLAN – Terminal, and LAMBPLAN – Maternal breeding values.

There are two key genomic services used by Sheep Genetics clients:

- DNA parentage
- genotyping (50K SNP chip).

## Why use Genomic Selection?

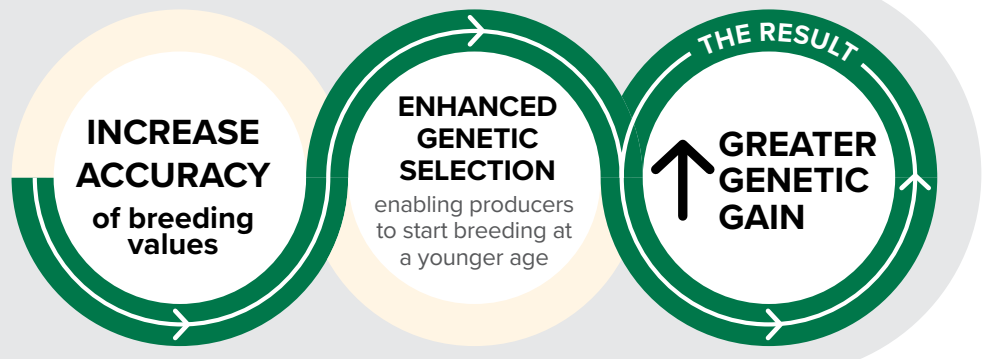
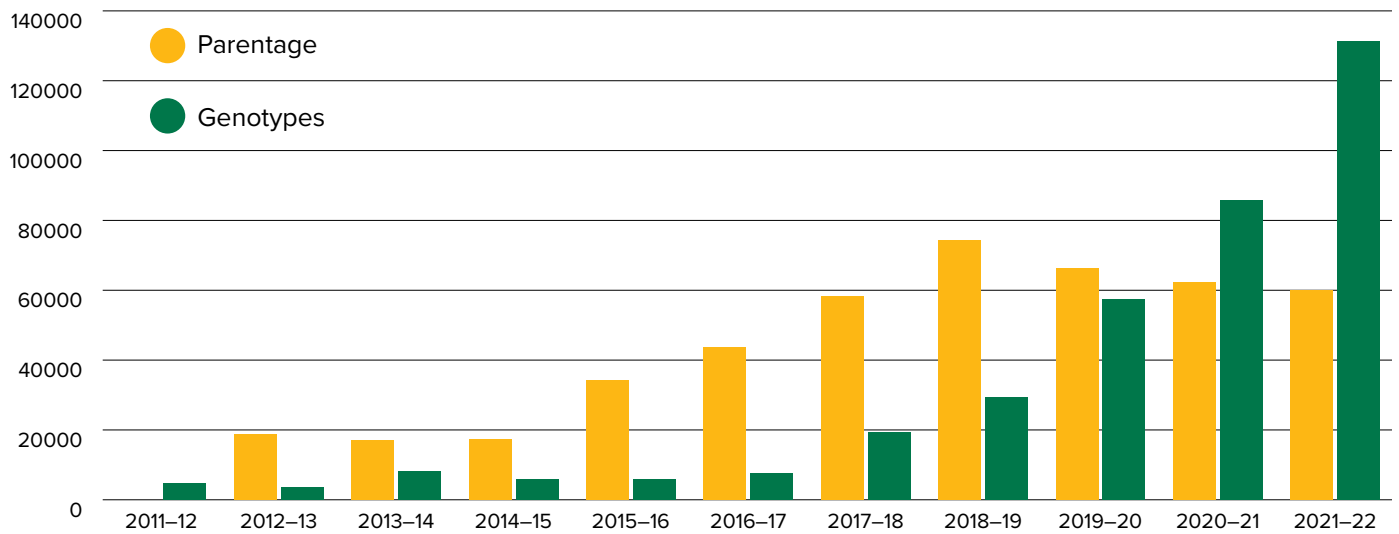


Figure 7: Count of genotypes processed each year





Sheep Genetics engaged with over 1,000 stakeholders and producers through 2021–22. These interactions were across a range of events, with a mix of in-person, and online delivery through participation in online workshops.

### New member workshops

With the huge growth in membership over the last few years, Sheep Genetics have developed a New Member workshop. These online workshops are run regularly and are targeted at helping new members get started with genetic evaluations, including what information is needed to calculate Australian Sheep Breeding Values (ASBVs) and how results are accessed.

### Sheep Genetics updates

Given the scale of the enhancements being made to Sheep Genetics evaluations through 2021–22, Sheep Genetics ran a series of online information sessions, both before and after the release of these changes, to assist breeders in understanding the enhancements and what to expect from these. These webinars directly engaged over 100 breeders and service providers and were recorded to share with those who were not able to attend the live sessions. To access these webinar recordings and further reading on the Sheep Genetics updates, go to:

[www.sheepgenetics.org.au/news/analysis-enhancements](http://www.sheepgenetics.org.au/news/analysis-enhancements)

### MateSel training

MateSel is a tool designed to assist breeders in making ram and ewe selection and allocation decisions by balancing both genetic gain and genetic diversity. Given the ongoing impact of COVID, all 2021 MateSel training was run online. This training was broken into two sessions, the first being a theory session, and the second being an interactive practical. Thirty-two new users were given access to MateSel following this 2021 training, and 22 existing MateSel users took the opportunity to complete 'refresher' training.

### Service provider engagement

Sheep Genetics run an annual service provider workshop for those who advise and support Sheep Genetics breeders in the use of ASBVs. This workshop offers valuable information and tools required to support clients and deliver quality breeding program advice. During 2021, Sheep Genetics engaged with this group via online platforms. The easing of restrictions in 2022 allowed an in-person workshop to be hosted in Adelaide, alongside MLA's Livestock Genetics Forum. This workshop had 30 providers in attendance, including data managers, genetic advisors, software and genotyping companies.

### Regional forums

Annually, Sheep Genetics run a series of workshops across Australia to keep breeders updated on enhancements to genetic evaluations and to learn how to get the most out of their breeding program.

In 2022, regional forums were held in Armidale NSW, Hamilton VIC, Adelaide SA, Bendigo VIC, Wagga Wagga NSW, Esperance WA and Perth WA.



The Sheep Genetics team worked alongside breeders in the DNA Stimulation Project.

### Breeder groups and other events

Sheep Genetics continues to contribute to and participate in a number of breeder group conferences and webinars. This year's group activities included involvement in the final meeting of the DNA Stimulation Project group, whose participants make up 25% of all animals submitted to the MERINOSELECT evaluation.

Sheep Genetics had a presence at several key industry events including the Bendigo Sheep and Wool Show and Hamilton Sheepvention.

Sheep Genetics also contributed to MLA's Livestock Genetics Forum in Adelaide which covered how genetics act as an important tool in tackling issues faced by sheep and beef producers. This event boasted an exciting line up of speakers from across the supply chain and had 120 people in attendance.



The National Livestock Genetics Consortium (NLGC) is governed by a skills-based taskforce. The role of the NLGC Taskforce is to provide advice to support MLA's efforts in driving transformational change within the investment areas of genetics and genomics for the benefit of the livestock industry and whole of supply chain. The primary aim of this initiative is to significantly increase the rate of genetic progress achieved in the sheep and beef industries. The NLGC functions as a collaborative co-investment vehicle for new investments in genetics and genomic Research, Development and Adoption (RD&A) that utilises MLA and MLA Donor Company (MDC) governance structures to engage and oversee projects.

## 2021–22 NLGC project call

Toward the end of 2021, MLA invited applicants to submit full proposals to the 2021–22 NLGC annual project call for sheep and beef genetics RD&A.

Project proposals were reviewed by the NLGC Taskforce against NLGC's strategic priorities. The three key priority areas included:

1. meeting Carbon Neutral 2030 targets
2. utilising genetics to improve all aspects of production system sustainability
3. novel and disruptive innovation in genomic technologies.

## 2021–22 NLGC project call submissions

Two sheep-specific projects were supported for funding by the NLGC, with one currently contracted and underway.

### Understanding the genetic variation in shedding characteristics of sheep to develop a shedding breeding value

Self-shedding breeds are becoming an appealing choice for commercial prime lamb production systems due to their ability to reduce and/or remove the need for shearing and wool management practices. The project, in conjunction with seed stock maternal shedding sheep breeders, will improve understanding of the genetic architecture behind the trait with the aim to develop breeding tools to aid the selection for, and infusion of, shedding characteristics into commercial flocks.

Increasing the number of animals with recorded phenotypes and genotypes will enable the discovery of key genes and the development of breeding values for industry.







The new sheep projects that arose from the recent NLGC call are in addition to a range of key projects relating to Sheep Genetics in the MLA Genetics portfolio. This section provides a summary of the key projects in this area:

## DNA Stimulation Project: Accelerating rates of genetic gain in Merinolink with DNA testing

This project aimed to increase the rate of adoption of genetic and genomic tools and build producer and service provider capability to make data informed decisions resulting in increased accuracy of selection and faster rates of genetic gain.

Historically, pedigree recording has been a limiting factor in increasing accuracy of breeding values in Merino flocks. The project was developed to double the rate of genetic gain in a group of Merino breeders that represented a cross section of the industry. The collective group moved from 12% sire and dam pedigree allocation to 68% sire and dam pedigree allocation. The collective group were able to increase the rate of genetic gain by 134% in the duration of the project compared to the previous five years' rate of genetic gain.

## The MLA Resource Flock: Further development of a reference population for genomic prediction

This project aims to further develop the reference population needed for genomic predictions in the Australian sheep industry.

For the 2022 joining, 150 sires were selected with the following breeds represented: White Suffolk, Poll Dorset, Suffolk, Merino, Dohne, Dorper, White Dorper Southdown, Texel, Border Leicester, Hampshire, Coopworth, Corriedale, Aussie White, Composite Maternal, Composite Terminal and Composite Shedder. Sires were selected based on relationship to sires previously used in the Resource Flock, genetic diversity and index values. All sires have been genotyped with a high density SNP chip (700k) for genomic evaluation.

### Update of where the cohorts of animals are up to in the project

#### 2022 cohort – Pregnancy scan phenotypes in database:

Overall, 2,493 ewes were artificially inseminated with 1,808 scanned

as pregnant with 2,813 embryos, resulting in a fertility rate of 72.52% with 1.13 lambs per ewe mated and an average litter size of 1.56.

#### 2021 cohort – Early slaughter phenotypes in database:

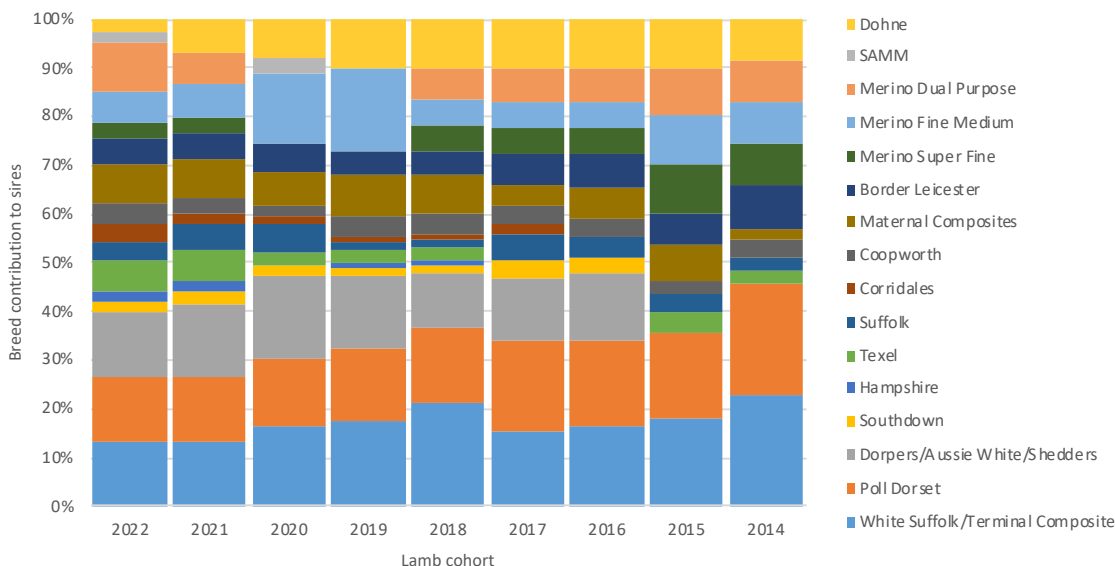
The complete 2021 drop (946 lambs) at Katanning were processed between 7 February and 21 August 2022. The 2021 drop lambs from Temora (237) were measured in a single cohort on 18 December 2021. The Kirby cohort of 2021 drop lambs will be measured and data submitted to the database over the coming months.

## Interesting facts about the MLA Resource Flock projects:

- 1,376 sires progeny tested since 2014.
- Sires reflect the diversity of the National Flock encompassing Maternal, Terminal, Merino and Shedding breeds.
- All Resource Flock sires are genotyped along with their progeny and the research dams. This is essential to creating an industry genomic reference population.
- Sires are joined to a combination of Merino and First-cross Merino ewes at both sites. There is also a proportion of animals mated to Dorper ewes at the Katanning site.
- Each sire is artificially inseminated on average to 16 ewes per year across three research sites, Kirby (NSW), Katanning (WA) and Temora (NSW).
- The Resource Flock is designed around providing a genomic reference for carcase and eating quality traits. Progeny from each sire are recorded for hard to measure carcase traits including:
  - » carcase fat depth, carcase eye muscle depth, carcase weight, GR fat
  - » intramuscular fat, pH decline, ultimate pH, Shear Force.

The Resource Flock has been important in helping validate and test new carcase technologies such as DEXA (dual-energy x-ray absorptiometry) and different devices for measuring intramuscular fat (IMF).

Figure 8: Breed contribution to Resource Flock sires for the 2014 to 2022 lamb drops





### Collection of methane and feed intake in sheep

To contribute to the MLA target of being carbon neutral by 2030 (CN30), there are two projects focusing on collection of methane and feed efficiency phenotypes. Both of these utilise the animals in the Resource Flock to ensure all other important production traits are recorded. These projects have commenced in 2021–22 and we can expect to see outcomes from these incorporated into Sheep Genetics over the coming years.

### Emissions Avoidance Partnership – selecting for more efficient sheep

This project aims to enable Australian sheep breeders to select for enteric methane emissions, enabling industry to achieve a permanent and cumulative 4.2% reduction (0.8 MtCO<sub>2</sub>e) in methane emissions from sheep by 2030 and a 15% reduction (2.6 MtCO<sub>2</sub>e) in 2040.

By 2027, the project outcomes will include a reference population of 5,000 sheep for feed efficiency and 10,000 sheep for methane emissions. These will include:

- phenotypes and genotypes
- development of Australian sheep breeding values reported through the sheep genetics pipeline
- development of selection indexes and modelling to value reduction of methane in commercial production systems
- development of a mobile methane measurement facility.

### Sustainability traits of the Resource Flock

This project aims to collect data for feed intake and methane emissions utilising Resource Flock lambs at the site in Katanning. It will utilise the new facilities that have been built onsite, including

a feed intake shed and portable accumulation chambers (PAC). This project complements the project above, by starting the recording of the datasets required to generate Australian sheep breeding values (ASBVs).

By 2024, the project outcomes will include data collected for feed intake, growth, methane production and body composition on 1,500 lambs from the Resource Flock. These records will be submitted to Sheep Genetics for routine evaluation and to contribute to the larger dataset required to develop ASBVs.



Sheep being measured for methane emissions in portable accumulation chambers (PAC)

Source: Murdoch University

## Development of the analytical software behind the Sheep Genetics evaluations

One of the major projects in the Livestock Genetics' portfolio is with the Animal Genetics and Breeding Unit (AGBU), to continually develop the analytical software and capabilities of the beef and sheep genetic evaluations. During 2021–22, our previous project with AGBU was completed. This project had many key highlights that improved the Sheep Genetics evaluations and worked across both the sheep and beef evaluations to leverage the knowledge and developments in both systems. The final report for this project (L.GEN.1704) can be viewed at [mla.com.au/lgen1704](http://mla.com.au/lgen1704).

Key enhancements delivered through this project included:

- creating evaluations that can handle large volumes of data in the genomics era. This included the introduction of Single Step Sheep Genetic evaluations in 2017 for Merino, Maternal and Terminal evaluations
- implementation of Flock Profile for Merinos
- updated terminal indexes so all include eating quality
- single step breeding values for the component traits of reproduction in Merinos and Maternals.

A new project with AGBU has commenced which is aimed at continuing to develop our evaluations in beef and sheep. There are three key themes that will be worked on under this project including:

- breeding animals for resilient enterprises delivering socially responsible products valued by consumers
- increased speed and power for Australia's red meat genetic evaluations
- breeding program tools and advice.

It was under this project that our 2022 Sheep Genetics analysis enhancements were developed. These enhancements were released in May 2022 and are summarised in Figure 9.

**Figure 9: A list of updates as part of the 2022 Analysis Enhancements, and the different analyses impacted.**

Analysis enhancement	Merino	Terminal	Maternal	Dohne
Weaning Rate	✓		✓	
Weaning Rate in Indexes	✓		✓	
Lambing ease in Terminal Indexes		✓		
Improved accuracy algorithm	✓	✓	✓	
TBLUP	✓			
Retirement of Maternal \$ Index			✓	
Database redevelopment	✓	✓	✓	✓
Data Quality Score Reports	✓	✓	✓	✓
Website upgrades	✓	✓	✓	✓
Corriedale Analysis Reporting			✓	



# Case study: Balanced breeding that brings results

## SNAPSHOT



**RICK AND JILL BALDWIN,**  
Bundilla Poll Merino Stud,  
Young, NSW



**AREA**  
2,000 grazing, 1,000ha cropping

**ENTERPRISE**  
Poll Merinos and cropping

**LIVESTOCK**  
2,500 stud ewes, 3,000 commercial ewes

**PASTURES/SOIL**  
Pastures are renovated every 10 years, with a legume-based pasture in the more arable paddocks and mixed grass with clover in less arable paddocks

**RAINFALL**  
700mm

### Rick and Jill Baldwin

Driving genetic gain by maintaining weaning rates at a high 143% is one of the main focuses of the Baldwins' Bundilla Poll Merino Stud near Young in NSW's south-west slopes.

The family runs about 2,500 stud ewes alongside 3,000 commercial ewes and is on track to sell more than 800 Poll Merino rams this year.

"We've been using breeding values for about 30 years – we're one of the original Merino benchmark flocks.

"What sets us apart from many Merino flocks throughout Australia is that we've got a long pedigree for fertility background, which has been one of the main selection criteria for our flock for more than 40 years.

"We've got full pedigrees dating back to 1976 with that focus on fertility," Rick said.

### Balanced approach

Over the years, the Baldwins have paid particular attention to boosting weaning rates within their stud and commercial flocks to accelerate their genetic gain.

"When my parents first started building the flock, they introduced Booroola genetics to produce high fecundity Merinos. These Merinos were scanning 220% in utero but didn't have the ability to wean all the lambs scanned.

"As a result, the major focus for the past 40 years has been on increasing the maternal ability of the animals to wean multiple lambs and wean them well. There's no point going all out on fertility without having a focus on the rest of the ASBVs that are provided.



Rick and Jill Baldwin

"With all these traits, you should have a balanced approach, so you don't risk just swapping the direction the animal positions its energies on rather than actually increasing the genetic gain of the animal," Rick said.

Rick believes the introduction of the new Weaning Rate (WR) ASBV marks a significant step forward for Merino producers like them, who are looking to select for higher weaning rates.

"For us, with the Number of Lambs Weaned (NLW) trait, all the different components that built a fertility background weren't clearly represented in the ASBV.

"The way this new ASBV is constructed – with its ability to focus on the different aspects that contribute to weaning more lambs – it's definitely more accurate and representative of what we're looking for when selecting animals based on pure pedigree.

"It will take some work to collect the data for it, but it will give industry a lot more confidence in selecting animals if they put the work in and we're excited to see all the components that build a fertility background represented in this ASBV," Rick said.



# Case study: Values drive flock forward

## SNAPSHOT



**NICK AND PEN GAY,**  
Heulen Pastoral Company,  
Hovells Creek, NSW



**AREA**  
4,000ha

**ENTERPRISE**  
Merino and Merino x Border Leicester sheep

**LIVESTOCK**  
10,000 ewes joined annually with first-cross ewe lambs sold to restockers and first-cross wethers grown out for export

**PASTURES**  
Mostly native with sub-clover, perennial pastures and annual fodder crops

**SOIL**  
Granite

**RAINFALL**  
650mm



Nick Gay

### Nick Gay

In Nick Gay’s experience, good management and genetic tools are the criteria for success when it comes to breeding Merinos that will pay dividends.

Nick and his wife Pen run a Merino and first-cross flock at Hovells Creek, NSW, where they are set on producing sheep that consistently perform, despite the challenging conditions of their production zone.

“The breeding objectives for our pure Merino flock are to produce a high growth, good carcass sheep that is going to stand up to this high rainfall environment, with a white, soft wool that’s about 18.5 micron.

“Meanwhile, as most of our first-cross ewe lambs are sold to local clients to be joined while they’re still lambs, our focus with the crossbreds is getting them up to a joinable weight for our clients and boosting weaning rates,” Nick said.

### Built to achieve

ASBVs have been a vital tool for achieving the breeding objectives Nick and Pen have set for their flock.

“It’s all about selecting the rams that help us achieve our breeding objectives in both our Merino and crossbred flocks.

“If you’ve got two really good rams that look exactly the same and you want to make a selection between them, you need the ASBVs to make sure you’re buying the ram that helps you achieve your breeding objective.

“All the rams we purchase have full ASBVs from a stud that is capturing data on their whole flock, so we can see both in and across the flock how those rams stand up in the industry,” Nick said.

In recent years, Nick has seen his attention to genetics drive productivity to new heights – and his clients are noticing the difference.

“Selecting for fertility and number of lambs weaned has meant we’ve seen our scanning rates rise from 120–125% last year to 160% this year, which is the best we’ve achieved so far.

“We’re also getting some really good results for our clients by focusing on the genetics that pay them back.

“One client bought our ewe lambs and joined them at seven and a half months to achieve 120% lambs to ewes joined, before joining them the following year and achieving a 138% scanning rate,” Nick said.

### Benchmark to benefit

Using the other genetic tools available to assess flock performance is another step Nick has taken to ensure his flock’s growth, fertility and weaning rates maintain their edge.

“There are some really exciting tools now that let you look underneath the skin and see if you’re achieving what you set out to do.

“Commercial producers can now do a Flock Profile test to understand the genetics of their sheep flock, and costs for DNA testing are continuing to come down all the time if you want to see where your sheep are at.

“Genetic tools really just help you identify the highly productive sheep and back the ones that are going to perform for you – and that will flow through directly on to your profitability,” Nick said.



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