



awi

Australian Wool
Innovation Limited

SHEEP SELECTION TOOLS



INTRODUCTION

The modern Merino is a complex animal. It is expected to produce large amounts of high quality wool, compete with specialised breeds in the global red meat market, rear enough progeny to be self-replacing and generate surplus sheep sales.

Merinos are also expected to survive in often harsh environments with the constitution and conformation to overcome long treks to seek feed and water, and to survive and thrive in extended periods of heat and cold conditions.

To breed such animals takes a combination of stockmanship and access to the latest available science and information. By using the tools available, breeders can produce an animal that meets their business requirements. These animals need to be productive and profitable for their environmental conditions and able to compete with alternative enterprises.

In the following pages, a wide range of tools available for breeders to achieve their breeding goals are examined, along with the strengths of each approach, and what is needed to incorporate these approaches into a commercial or ram breeding situation.

All breeding tools have one feature in common. They are designed to allow ram breeders and commercial breeders to compare their sheep, and the genetics they possess, against others, either in a local or national environment.

This comparison, also called benchmarking, allows breeders to make informed selection decisions which will ultimately lead to an increase in genetic gain in the flock.

Ultimately, it is up to individual breeders to choose which combination of tools are right for their business – and to implement those tools as best they can.

Within many of the tools, the term “genetic benchmark” is referred to. A genetic benchmark compares the performance of a bloodline, flock or individual sheep with an industry standard.

“Breeding objective” is also referred to. A breeding objective is a statement that describes where a breeder wants to take their flock in the long term, listing the key production goals for important traits. An example might be “to increase fleece weight, early growth and number of lambs weaned whilst maintaining wool quality”.





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SHEEP SHOWS

There are hundreds of sheep shows held around Australia every year. Regardless of whether they are a major state event or a local country show, the focus of comparing and competing with fellow breeders is the same.

Sheep shows are unique in that they offer ram breeders the opportunity to put what they consider to be their best genetics on public display to benchmark against other studs.

Whilst objective data is becoming more commonplace at major sheep shows, historically the focus of judging has been on visual appraisal and a sheep's suitability to a specific breeding objective or environment.

As a result, sheep shows offer a significant benefit to breeders in that they have their sheep scrutinised by their peers in an environment in which faults are often more obvious than they would be in a commercial environment. This leads to the standard of sheep being shown continuing to improve, which is not only beneficial to the breeder, but the entire industry.

Another benefit of sheep shows is that breeders can inspect, first-hand, sires they may be considering using in an artificial insemination (AI) program. Along with other information that may be available on the potential sire, such as Australian Sheep Breeding Values (ASBVs) or Merino Sire Evaluation results, inspecting the ram or its progeny in the sheep show environment is an ideal way to complete the picture and compare it against other leading sires.

Perhaps the most significant benefit of sheep shows is the networking and social interaction they provide to ram breeders and commercial breeders alike. The opportunity to learn from a wide range of other Merino industry participants is significant at a sheep show, and one that is of particular benefit to young Merino breeders.

Performance, or objective measurement, classes have become more common at sheep shows in recent years. Whilst different formats are used at various sheep shows, in general these classes combine a subjective assessment of the ram's merit with an objective measurement of traits such as body weight, fleece weight, fibre diameter and eye muscle depth.

By using a system agreed at each sheep show, the subjective and objective traits are combined into a single score which determines the winner. In doing so, those sheep that are both subjectively superior and more productive are rewarded.

There are significant costs in preparing and attending sheep shows as an exhibiting ram breeder. A successful showing may be rewarded with semen and ram sales, however, real financial benefits will flow from continued success.

As a commercial breeder, attending sheep shows is generally inexpensive and a social way to gather information on available genetics.

For more information:
www.merinos.com.au



PERFORMANCE CLASSES

Performance, or objective measurement, classes have become common at sheep shows and offer ram breeders and commercial breeders an increase in the level of information available compared to traditional sheep show classes.

Most of the major sheep shows now include a performance class within their judging schedules. Whilst different formats are used, generally these classes combine a subjective assessment of the entrant's merit with an objective measurement of key production traits.

Whilst some performance classes shear the entrants to assess fleece production, others use a visual assessment to estimate each entrant's wool production potential.

Traits relating to carcase characteristics, such as body weight, fat depth and eye muscle depth are

generally objectively measured by an independent service provider, as are fibre characteristics including mean diameter and coefficient of variation.

Performance classes provide the opportunity for ram breeders to compare their sheep in the public environment that the sheep show presents, with the benefit of not only relying on a subjective appraisal.

For commercial breeders, performance classes provide the type of information that directly relates to the profitability of their own enterprise and can greatly increase the accuracy of the selection decisions they may implement.

For more information:
www.merinos.com.au



WETHER TRIALS

Locally-run wether trials were likely the first form of genetic benchmarking in the Merino industry, and continue today as an important part of making breeding decisions in many areas in Australia.

A wether trial is the independent comparison of bloodlines when run in the same environment over several years. In its basic form, a wether trial will involve teams of wethers drawn from commercial breeders that represent a bloodline. To achieve robust results, the minimum team size is 10 wethers, but trials can involve up to 30 or more.

Wethers are generally selected at random, usually after the breeder has had a chance to remove a 'tail' of say 30% from the entire mob. In most trials, the breeder is then allowed to select their final team from the randomly selected group which contains surplus animals. For example, 20 wethers might be randomly selected from which the breeder is able to choose the final 15.

Once selected, the teams of wethers are brought together to one property and run together for the duration of the trial, which is generally from two to five years. By doing so, wether trials remove the environmental and management difference between flocks, allowing just the genetics to be compared.

To generate results and compare bloodlines, all wethers in a wether trial are measured or assessed for important production traits each year. These generally include fleece weight, fibre diameter, body weight, yield, fat score and a visual description of wool quality (for example, using the AWEX-ID system).

Many wether trials also measure staple strength, staple length, worm egg count and carcass scanning.

Using the information collected, each wether is assigned a commercial value which is a combination of its wool and meat value. Average values over the trial period are given to each wether team and they are ranked in order from most to least profitable.

The benefit of being involved in a wether trial for a commercial breeder is to benchmark their genetics in a commercial environment against other breeders and bloodlines.

Differences in productivity and profitability are shown to vary significantly in most wether trials. Commercial woolgrowers can use this information to compare the performance of their current bloodline with others, and make an informed choice when considering changing bloodlines.

As with any trial or competition that brings commercial and ram breeders together, wether trials provide a great forum to share and exchange ideas and for participants to improve their knowledge and skills.

The Merino Bloodline Performance analysis is an annual report supported by Australian Wool Innovation (AWI) and coordinated by NSW Department of Primary Industries (NSW DPI). The analysis combines the results from wether trials run around Australia. The report removes all the environmental factors between trials and years, leaving only the genetic variation between the bloodlines.

Generally, the cost to a commercial breeder to be involved in a wether trial is the value of the wethers that are entered. Reports are typically provided free of charge and field days are regularly held and present valuable information to those that attend.

For more information:
www.merinobloodlines.com.au



FLOCK EWE COMPETITIONS

As the foundation of the Merino industry, the flock ewe is perhaps the most important member of any flock and for many years has been the basis of benchmarking trials across Australia.

The format of flock ewe competitions, also known as maiden ewe competitions, can vary from competition to competition. The more traditional competitions involve the judging of an unclassed line of ewes, whereas others may allow the ewes to be classed or for a minimum percentage of the drop to be displayed.

All ewes are judged on their home properties, and as such the competitions are usually conducted over 1 or 2 days as the judges and spectators travel between properties inspecting the ewes.

Some competitions cover vast areas, meaning the environment can play a large role in determining the differences between the flocks. In those competitions, each flock owner provides detailed information about their seasonal conditions which helps the judges to accommodate these factors into their assessment.

Judging is generally based on the productivity of the flock and its suitability to the environment it is managed in. Some of the larger competitions have different sections, such as short wool and long wool flocks.

For commercial breeders entering a flock ewe competition, the opportunity to benchmark their genetics against other breeders in a similar environment helps to compare the productivity of alternative ram sources, as well as explore management techniques that may help improve production.

For other breeders that join the judging tour, usually travelling by bus as a group, the experience of attending a flock ewe competition allows for networking, socialising and discussion. These discussions allow the exchange of ideas and information that can often lead to changes to their current practices at home.

Flock ewe competitions are also a great opportunity for those commercial breeders that

are considering a change in bloodlines. Inspecting many potential bloodlines in a commercial environment, and talking to other breeders that are already using those bloodlines, offers significant insight.

Cost of entry into flock ewe competitions is generally limited to the commercial breeders' time to muster and present the ewes, however, some competitions do have nominal entry fees.

As a spectator, the cost is also generally limited to your own time, travel and accommodation costs, as required. Most trials are well sponsored, with costs such as bus hire and some meals supplied.

Another form of flock ewe competitions also exists whereby commercial breeders select a team of ewes (usually between 5 and 10) to be judged against other teams. Commonly held in conjunction with multi-vendor ram sales or field days, these competitions attract strong interest from commercial breeders.

Whilst different competitions include varying levels of objective measurements to aid the judge in making their decision, all competitions are designed to reward productive and profitable genetics managed in a commercial environment.

As with the more traditional flock ewe competitions, these team-based competitions offer the opportunity to benchmark against other flocks and to view first-hand the alternative bloodlines that may be available.

For more information:
www.merinos.com.au



MERINO SIRE EVALUATION

Independent Merino Sire Evaluation has operated in Australia since 1989. Historically referred to as Central Test Sire Evaluation (CTSE), the program involves the evaluation of a ram's genetic potential through the measurement and visual assessment of its progeny.

Operating at numerous sites across Australia, Merino Sire Evaluation joins over 100 of Australia's leading sires every year through AI programs to a minimum of 50 ewes each.

The progeny that result from these AI programs are measured for a wide range of objective traits and assessed for an even wider range of visual traits.

All Merino Sire Evaluation sites are run on properties independent of ram breeding operations, and measurements and assessments are undertaken by independent service providers.

Link sires are joined at all sites to ensure the information collected at each site can be compared to others and that all sires, regardless of where they are evaluated, can be benchmarked against each other.

Merino Sire Evaluation is managed by individual site committees and is governed by the Australian Merino Sire Evaluation Association (AMSEA), which plays an important role in ensuring that all evaluations are carried out in the same manner.

Merino Sire Evaluation delivers results and information to ram and commercial breeders in two formats.

Each site produces an independent Site Report. This is the result of the evaluation of the progeny for the rams entered in that site for that year. The Site Report includes Flock Breeding Values (FBVs) and Sire Means for measured traits such as fleece weight, body weight and worm egg count, as well as summaries of visual traits such as Fleece Rot, Wool Character, Breech Wrinkle and Jaw. Site Reports also publish a Classer's Grade for each sire. This trait is determined by an independent sheep classer assessing each progeny and

allocating it to a grade of either Top, Flock or Cull, based on the sites breeding objective. When the results from all the progeny are combined, an individual Classer's Grade result is available for each ram entered.

Results from all Merino Sire Evaluation sites are also combined in the annual Merino Superior Sires publication.

Merino Superior Sires includes a range of information including ASBVs, MERINOSELECT indexes, summaries of visual traits and contact details for sire owners.

Merino Sire Evaluation offers significant benefit to both ram and commercial breeders by combining the benefits of FBVs with robust and independent visual assessment of a large group of progeny from each sire. In doing so, it combines the latest science with the skills and experience of sheep classers to provide a balanced appraisal of a ram's genetic potential.

Whilst genetic benchmarking is a key reason for a ram breeder to enter a ram in Merino Sire Evaluation, access to linkage in a cost-effective manner is also a key benefit. Linkage, which is important in MERINOSELECT and the publication of ASBVs, can be achieved in flocks by entering a ram in Merino Sire Evaluation as well as using that same ram in the breeder's home flock. The resulting progeny, when evaluated in both flocks, will create linkage for the traits they are measured for.

The cost of Merino Sire Evaluation is largely borne by ram breeders who pay an entry fee for every ram joined at a site. AWI also supports Merino Sire Evaluation through funding link sires and the management of AMSEA.

An exciting development in Merino Sire Evaluation in recent years has been the establishment of the Merino Lifetime Productivity (MLP) Project. The 10-year partnership between AMSEA and AWI will see current trials extended to cover the lifetime of the ewe progeny that are born as part of the original Merino Sire Evaluation trials. In total, 5000

ewes will be evaluated throughout their lives for the full range of production traits, including reproduction, as well being assessed for visual traits each year.

It is hoped that the Merino Lifetime Productivity Project will be able to answer many of the questions that Merino breeders regularly ask about selecting for lifetime productivity and the balance between wool, meat and reproduction.

For more information:

www.merinosuperiorsires.com.au
www.wool.com/MLP



MERINOSELECT

MERINOSELECT is the national genetic evaluation service for the Merino industry and is delivered by Sheep Genetics.

MERINOSELECT provides a range of information to breeders that is based around the publication of Estimated Breeding Values (EBVs). An EBV is an estimate of the genetic potential of an animal that may be passed on to its progeny.

The way an animal looks or measures is determined by how it is programmed (its genes) and how it has been managed (the environment). Only an animal's genes are passed onto its progeny. EBVs remove the environmental differences between raw measured performance so that animals can be compared solely on their genes.

Environmental differences that impact on the performance of animals include where it was born, the quality and quantity of feed on offer (e.g. paddock run versus shed fed, high rainfall areas versus low) and other factors such as whether that animal was born a single or twin, or was raised by a maiden or experienced ewe.

EBVs also account for other genetic factors such as the relationship of traits to each other (correlations).

Two types of EBVs are available from MERINOSELECT, Australian Sheep Breeding Values (ASBVs) and Flock Breeding Values (FBVs), both of which are referred to as breeding values below.

Whilst the two different breeding values are calculated in a similar way, the difference between them is that whilst ASBVs compare all the animals included in the MERINOSELECT database right across Australia, FBVs only compare those animals within the same flock.

For ASBVs to compare sheep across different environments, a system of linkage is required between those flocks that are involved. This means that progeny from the same ram needs to be evaluated in more than one location. By replicating this across many flocks, a network of

linkage is created that increases the accuracy of the ASBVs. The more accurate the ASBV is, the more likely the sheep will breed the way its ASBV estimates.

For breeders that don't have the required linkage within their flock, FBVs are available. FBVs are a tool to compare sheep within the one flock and allow breeders to make selection decisions using a comparison of the genetics of those sheep within their own environment.

Indexes are also available from MERINOSELECT which combine several breeding values into one value. The bigger the value the more suited that sheep is to that breeding objective. Depending on the breeding objective being used, there is a MERINOSELECT index to suit most breeders.

When used in combination with other selection tools available, MERINOSELECT offers significant benefits to both ram and commercial breeders.

For ram breeders, it allows the comparison of their genetics with an Australian industry standard. It also enables breeders to identify alternative genetics that can be potentially used to help them achieve their production goals.

For commercial breeders, the selection of rams with the assistance of breeding values offers the opportunity to accurately select rams that will improve their flock's performance based on their own breeding objective. Commercial breeders with a clearly defined, long-term breeding objective have had considerable success in reaching their breeding goals by incorporating breeding values into their selection decisions.

Breeding values should not be used for selection in isolation and need to be combined with visual appraisal to deliver a balanced evaluation of a sheep's genetic potential.

The Sheep Genetics website provides detailed information on sheep included in MERINOSELECT, including a wide range of ASBVs and indexes. Ram sale and semen catalogues are also available on the Sheep Genetics website.

Also available on the Sheep Genetics website is the Pocket Guide to ASBVs. This handy publication provides more detail on using ASBVs and indexes.

MERINOSELECT relies on the collection of pedigree and robust measured and scored information by the ram breeders. For some, this is not a simple task and the cost is borne by those ram breeders involved in the system. The level of that cost depends on the traits that are being measured.

Some traits, such as fleece weight, fibre diameter and body weight, are relatively inexpensive to measure. Whereas carcase, reproduction and

worm egg counts can be both expensive and time consuming, which leads to an increase in the cost of production of the rams bred for sale.

Ram breeders pay an annual subscription fee to Sheep Genetics and animals entered incur an individual cost.

Whether that increased cost of production is rewarded by higher sale prices is determined by the market.

For more information:
www.sheepgenetics.org.au
www.wool.com/merinoselect



VISUAL SHEEP SCORES

Visually assessed traits are an important component of ram breeding and commercial Merino businesses and are included in all breeding objectives.

In 2007, AWI and Meat and Livestock Australia (MLA), with the assistance of Sheep Genetics and AMSEA, combined to develop the Visual Sheep Scores booklet.

The Visual Sheep Scores booklet is designed to provide a common language for visually assessed traits and a standard method of scoring and recording those traits.

Designed to be used on both stud and commercial sheep, the Visual Sheep Scores booklet includes an extensive range of traits over four areas: Wool Quality, Conformation, Breech and Classer's Grade.

Provided as an easy to use 'flip' booklet, the Visual Sheep Scores provide a set of illustrative standards and simple instructions on how and when to score each trait. Most traits use a common scoring system of 1, 2, 3, 4 or 5, with Score 1 being the LEAST expression of the trait and Score 5 being the MOST expression of the trait.

Whilst the key use of the Visual Sheep Scores is to allow breeders and classers to record consistent information to be submitted to MERINOSELECT, all breeders can benefit from the tool by allowing them to consistently and accurately record those visual traits that are important to them.

Merino Sire Evaluation is a major user of the Visual Sheep Scores, with all progeny assessed at least once for the complete set of the traits included. By using the visual trait results provided in Merino Sire Evaluation reports, and using the same scoring system in their own flock, breeders can quickly benchmark themselves against leading industry genetics.

A significant industry benefit of breeders using the Visual Sheep Scores and submitting that data to MERINOSELECT is that it will enable researchers to estimate the genetic influence of visual traits and to measure their relationships to important production traits, such as fleece weight, growth and reproduction.

The Visual Sheep Scores booklet is free to access and only takes a commitment of time to implement.

For more information:
www.wool.com/visualscores
www.merinosuperiorsires.com.au



RAMSELECT

RamSelect is a web-based tool developed by the Sheep CRC, in conjunction with NSW DPI and Telstra, which allows ram buyers to find and rank rams based on ASBVs that match their own breeding objective.

Using an easy to navigate and comprehensive interface, RamSelect allows commercial breeders to search for rams via sale catalogues that have been loaded by ram breeders using MERINOSELECT.

To do so, commercial breeders can either use a standard MERINOSELECT index to set their search criteria, or they can create their own index by adjusting any of the traits where ASBVs are available to match their breeding objective. RamSelect can then save this index or breeding objective for future use.

Once the index is set, RamSelect displays a list of rams ranked in order from highest to lowest relevant to the selection criteria. Individual rams can be examined more closely to benchmark against industry averages.

RamSelect offers a useful tool to select potential rams to purchase prior to attending a sale. With a list of suitable rams predetermined, maximum time can be spent at the sale focusing on those rams and assessing them for other important traits that may not be in MERINOSELECT, such as conformation and wool type.

Another significant benefit of RamSelect is that it allows breeders to store information on the rams they have purchased from catalogues listed on RamSelect. In doing so, breeders can build a database of their ram team which allows them to benchmark potential new rams against those they have previously purchased, as well as benchmark their ram team against the rest of the industry.

For those commercial breeders that have carried out a Sheep CRC Genomic Flock Profile test, this information can also be stored in RamSelect. Using this tool, commercial breeders can benchmark their flock against industry for a range of traits based on the results of the genomic test.

For more information:
www.ramselect.com.au

RamSelect

.com.au



Australian Government
Department of Industry,
Innovation and Science

Business
Cooperative Research
Centres Programme



WORKSHOPS

Developed and funded by industry organisations, there are many workshops and seminars that both commercial and ram breeders can attend to improve their knowledge when it comes to sheep breeding.

Targeted at different levels of knowledge, interest and time availability, there are a range of workshops available to suit most breeders.

Whilst the theoretical and practical knowledge gained from attending a workshop makes the investment in doing so worthwhile, the networking and sharing of ideas is equally as beneficial.

There is generally a small cost to attend workshops which covers catering and administration.

Some of the workshops available include:

BRED WELL FED WELL

A one day practical workshop that includes information on both selecting for superior genetics as well as managing the flock to improve reproduction and profitability.

Key areas the workshop focuses on are:

- Understanding and using ASBVs
- Developing a breeding objective
- Managing ewe nutrition and understanding energy budgets

The workshop includes both theory and practical sessions.

Bred Well Fed Well workshops were developed under the Making More from Sheep (MMFS) Program, which was jointly funded by AWI and MLA.

RAMSELECT

Developed by the Sheep CRC and NSW DPI, RamSelect is a one day workshop for commercial breeders to learn about ASBVs and how to use them when selecting rams for their flock.

Usually run on farm with rams available for practical demonstrations, the workshop covers:

- What are ASBVs and how to use them
- Ranking animals using ASBVs
- Visual inspection of rams
- Preparation prior to attending a sale

SHEEP CLASSING WORKSHOP

Developed and presented by AWI, these one day sheep classing workshops are aimed at increasing the productivity of Merinos in any environment.

Through a combination of theory and practical components, experienced sheep classers lead the workshop to take commercial producers through the process of classing sheep, including:

- Understanding the type of sheep breeders are aiming for
- Comparing individual traits between sheep
- Using other sources of information

For more information:

www.makingmorefromsheep.com.au

www.sheepcrc.org.au

www.wool.com/workshop-resources

SHEEP CLASSERS AND ADVISORS

The term 'sheep classers and advisors' covers a broad range of service providers that are available to both ram and commercial breeders to aid in sheep selection and breeding programs.

Sheep classers are used in the Merino industry to firstly help set the breeding objective, then, through their involvement in the annual classing program, select the sheep to be retained in the flock that best meet that breeding objective.

Sheep classers have traditionally been involved in the selection of rams for commercial breeders and the sale of rams for ram breeders.

The traditional sheep classer has vast experience and knowledge of Merinos, coupled with a good eye for sheep and the ability to select a ram from a sale catalogue that will perform well in their clients' flock.

As such, sheep classer's can add value to many sheep breeding enterprises by providing an independent view or information from the wider industry that can be used by the breeder to improve the flock.

In recent years, other breeding advisors have emerged who possess a knowledge of measurement, breeding programs and contemporary science and technology to deliver sheep breeding advice to the client. Many advisors were previously associated with the state agriculture departments, but are now more likely to be found in private practice.

Several individuals now combine visual sheep selection and the use of technology to deliver a complete package to breeders that allows them to use all available information in the selection process. These advisors allow the breeder to focus on their core business whilst ensuring they are provided with up-to-date and relevant information across all selection tools.

Whilst ensuring the production of the flock continues to improve is a major role of a sheep classer or advisor, another benefit of using the service is for the breeder to have someone

independent of the business to communicate with, and seek input on changes to breeding direction or management. With most sheep classers and advisors involved with multiple enterprises, their experience and knowledge can prevent breeders making costly mistakes that may have been made by others.

Generally, sheep classers and advisors operate on a daily rate which varies considerably based on their experience and the services they provide.

For more information:
www.sheepgenetics.org.au
www.wool.com



SALEYARDS

Perhaps the most accessible of all selection tools, saleyards operate in all sheep breeding areas of Australia and provide a large resource base of which breeders can compare bloodlines.

Special store sheep sales regularly process thousands of sheep in a single day, selling sheep from a property in one or more sale lots. Most of these sales have information on each lot offered including bloodline, which provides a tool for breeders to benchmark bloodlines directly against each other in one location.

Whilst the management and selection of each lot is unknown, for most sales that draw sheep from a local area, useful comparisons can be made between bloodlines and how they perform in the local environment.

Saleyards are also a great place for breeders to share knowledge and ideas and major, annual store sheep sales often attract large crowds which bring a diverse range of breeders and service providers.

Saleyards don't need to be at physical locations; online saleyards now offer large numbers of sheep on a regular basis. Whilst the sheep cannot generally be inspected in person at an online saleyard, the level of detail that is presented in the description, together with photos, provides a large amount of information that can be used to compare bloodlines.

Offering sheep for sale through a saleyard allows breeders to directly compare their genetics to others, the ultimate comparison being the sale price received compared to other sheep of a similar description.

Besides their time and travel costs, there is no cost for breeders to attend a saleyard. If the right saleyards are selected, generally, this small cost can yield some useful information.

For more information:

www.australiansaleyards.com.au

www.auctionsplus.com.au



INDUSTRY ACRONYMS

AI	Artificial Insemination
AMSEA	Australian Merino Sire Evaluation Association
ASBV	Australian Sheep Breeding Value
AWEX	Australian Wool Exchange
AWI	Australian Wool Innovation
CTSE	Central Test Sire Evaluation
EBV	Estimated Breeding Value
FBV	Flock Breeding Value
MMFS	Making More From Sheep
MLA	Meat & Livestock Australia
MLP	Merino Lifetime Productivity
NSW DPI	New South Wales Department of Primary Industries
Sheep CRC	Sheep Cooperative Research Centre



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