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Ewe and wether trials - tools for benchmarking your sheep genetics

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Department of Agriculture and Food
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EWE AND WETHER TRIALS – TOOLS FOR BENCHMARKING YOUR SHEEP GENETICS

April 2006

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EWE AND WETHER TRIALS – TOOLS FOR BENCHMARKING YOUR SHEEP GENETICS

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Why benchmark?

Research and sheep productivity trial results demonstrate a huge variability in genetic productivity between flocks. For example a range of up to 2 kg clean fleece weight, 5 microns, 55 percentage points in lambing percentage and 20 kg live weight, can lead to big differences in gross margin between flocks. There is an opportunity for genetic improvement, depending on your current ram source or sires performance. For example, Western Australian (WA) Wether Trial results suggest half the WA flocks could improve clean fleece weight per head by half a kilogram or more. The trial results suggest that this could occur while maintaining fibre diameter, by identifying genetically superior ram sources.

A survey of past participants of wether trials indicated that 90% had learnt something about their flock. Of the 45% who considered they had made a significant change, about half had changed their ram source.

What are the advantages of undertaking genetic benchmarking?

- You know where your flock or individual animals sit in comparison to the standard.
- Identify genetically superior ram sources.
- Identify the potential for improving your flock.
- Direct flock improvement in the right direction.
- Develop product that meets market needs.
- The opportunity to improve your flock value, income and profit.

What is genetic benchmarking?

Benchmarking is the process of evaluating your product against a well performing industry standard. It is a very useful and common business and management tool.

Genetic benchmarking compares the genetic performance of an individual animal, flock or ram source against an industry standard. After determining the relative performance of your current flock, you will have a better idea of the shortcomings of your animals which will allow you to:

- set a clear breeding objective;
- make better informed decisions on improving your breeding program (for example, identify a possible alternative ram source);
- make more effective use of measurement, estimated breeding values and indexes in selecting replacement breeding stock and choosing superior rams.

Benchmarking will be of little value unless you have a clearly defined and effective breeding objective ([Farmnote 13/2003](#)). Without a breeding objective, choosing effective ram sources and/or sires is difficult.

How do you go about it?

The simplest form of benchmarking a flock’s performance is to ‘look over the fence’ and compare your flock performance with that of your neighbour’s. This is of limited value because, in addition to any genetic differences, there are many management and environmental differences between flocks which will bias the comparison. As management and nutrition can have such a large effect on the performance of sheep, this will mask any real genetic differences.

A fairer comparison is to run flocks, or samples of flocks, together under the same management and environment. This removes most of the biasing non-genetic effects and allows a more accurate comparison of the genetic performance of your flock with that of the other flocks represented. You are closer to comparing apples with apples.

What methods are available to benchmark sheep or flocks?

Genetic benchmarking tools are available for **both** commercial breeders and ram breeders. Table 1 lists the different benchmarking methods.

Table 1. The different benchmarking methods that are available

Benchmark	Audience		Method
	Commercial breeder	Ram breeder	
Sheep productivity trials such as: Wether trials	✓	✓	Flock comparison
Sheep productivity trials such as: Ewe trials	✓	✓	Flock comparison
WA productivity trial combined analysis results	✓		Find superior ram sources
‘Merino Bloodline Performance’ results	✓		Find superior ram sources
On-farm comparisons of ram sources	✓		Ram source comparison
Progeny tests of individual sires		✓	Ram comparison on farm
Central test sire evaluation schemes (Yardstick and Badgingarra in WA) – data available through Sheep Genetics Australia		✓	Linked sire comparison

What is a sheep productivity trial?

Sheep productivity trials are the generic term for wether trials and ewe trials. These genetic tools are available to commercial growers as well as ram breeders. All trials have specific formats that allow you to benchmark your flock performance. Wether trials have been running in Western Australia for nearly a decade now and provide information on fleece traits and live weight. Ewe trials are more recent and provide additional information on reproduction and lamb growth.

What's involved in a sheep productivity trial?

Each trial involves running a random sample of animals from each participant flock as one mob on the host farm, and monitoring production performance over a number of years.

You or a coordinator need to find producers interested in contributing a team of weaners to a trial. It is also essential to find a producer willing to host the trial. This means running the teams of sheep as one mob for at least two years. The host monitors the productivity (fleece quality and production, live weight, reproduction and lamb growth) of the teams with assistance from the participants. Other traits can be monitored by negotiation between participants and host.

Some design details are briefly outlined in the box. More detailed guidelines are given in the wether or ewe trial manuals available from the Department of Agriculture and Food, Western Australia (DAFWA) web site (www.agric.wa.gov.au). This information forms the basis for drafting a trial protocol outlining how your trial will be conducted.

Designing your benchmarking (productivity) trial

Number of animals per team

Striking a balance between manageable team size and having sufficient animal numbers to provide meaningful team comparisons is an important issue for new trial groups. A minimum of 20 wethers or 50 ewes per team is recommended, however, the larger the team the more accurately it represents the flock. For example, for a team of 20 wethers with an average greasy fleece weight (GFW) of 5 kg, the difference would need to be greater than 0.6 kg before you can be confident there is a real difference between it and another team. No significant differences were detected at Esperance (6 animals per team) and few significant differences at Newdegate (10 animals per team). In contrast 16 of the 18 teams at Mingenew (20 animals per team) differed from the mean for either clean fleece weight (CFW) or fibre diameter (FD), indicating that there is significant genetic variation within the trial and useful performance differences between teams.

Age and environmental effects

To improve the comparison of teams, pre-trial management and age differences should be minimised. All teams should be run together, preferably for three months, prior to the start of the trial and an even-up shearing should take place at the commencement of the trial. A trial can start with animals at any age from weaning onwards. The sooner the trial starts after weaning the better, as this will reduce the pre-trial management and age difference effects. That is, young animals will minimise the effects of differences in flock management before the trial.

Selection of teams

The most accurate genetic representation of the contributing flock will occur with random selection of teams of animals from the whole drop. Random selection from the weaner flock and allowance for rejection of a proportion by the participant (usually by visual culling) better reflects the practical commercial situation and avoids the possibility of a few extremely bad or exceptionally good sheep biasing the results. Random selection can be achieved by drafting at regular intervals (e.g. drafting every 20th animal to select 25 from a flock of 500). Rejection by the participant of a specified number then allows the same

selection intensity regardless of flock sizes (that is; from a drafted group of 25 wethers visually cull 5 animals to reject 20 per cent). Alternatively, the flock could be culled prior to random selection of the team (e.g. visually cull up to about 20 per cent of the flock and then randomly select the required 20 animals with no further culling).

To avoid confusion with identification, a continuous running number sequence is suggested for a tagging system that provides a unique number for each animal in the trial. Different coloured tags for the different teams will assist with drafting.

Information collected

If fleece sampling (strongly recommended from the mid side) takes place prior to shearing the fleece test results will be available at shearing. Body weights and condition scores can be measured at shearing and throughout the trial. Results from the individual fleece samples include fibre diameter, fibre diameter variability traits (coefficient of variation and standard deviation of fibre diameter, percentage of fibres less than 30 microns) and yield. At shearing greasy fleece weight is recorded, allowing for calculation of clean fleece weight. The fleece is also style graded and a fleece value is calculated according to the measured and assessed characteristics at shearing. Reproductive performance of the ewes is recorded by lambing each team in a separate small paddock, or mothering the lambs using the marked udder technique ([Farmnote 37/2004](#)).

Additional measurements that can be collected on individual animals include staple length and strength, faecal worm egg count, and ultrasound eye muscle depth and fat depth. If staple length and strength are measured, predicted hauteur can also be calculated for each team.

Analysis of data

DAFWA will provide data analysis for all linked trials. Fleece values will be calculated using the latest five-year average wool prices. DAFWA will also provide combined results from linked trials throughout the State, showing the comparative performance of all benchmarked flocks since starting with the linked trial approach.

Biosecurity

Biosecurity is a serious issue that affects every farmer. Livestock, machinery, fodder and people can introduce animal and plant diseases, weed seeds and pests that are not present on the property. It is therefore important for the host farmer in particular to develop a biosecurity plan for his farm to reduce the risk of introducing these problems.

Sheep entering a productivity trial must be vaccinated against Ovine Johnes Disease between 4 and 16 weeks of age, unless the host is already known to be infected. This involves drafting the team as lambs, vaccinating them and identifying them so that they can be delivered to the host farm when the host is ready to accept them. Your trial Coordinator will organise for you to share a pack of vaccine with another participant.

All sheep coming together for a trial should be treated with an effective drench on arrival and treated for lice following the even-up shearing. Before delivering sheep to the host farm you must provide information on the animal treatments applied (vaccinations, drenches, mineral supplements, lice and fly treatments) prior to delivery at the host farm. Quarantining the trial animals on arrival and having them inspected for footrot is essential. Trial sheep should be kept separate from other sheep on the host farm to avoid animal health problems

(e.g. running trial sheep through yards and shearing sheds after other sheep on the property). DAFWA veterinary officers can provide information regarding best practice drench, lice and supplementation treatments as well as quarantine procedures.

Options to improve the trials

To further minimise age and pre-weaning management differences, teams of pregnant ewes could be brought together prior to lambing. These teams would be run together through lambing and up until weaning, at which stage the ewes would be removed from the trial and lambs would begin in the trial with the same pre-weaning environment. This would reduce bias caused by environmental differences prior to the start of the trial.

The trial could also be used as a progeny testing ground for individual rams. Some woolgrowers may want to compare the progeny of a certain ram with another through the trial process. If this is the case the teams entered in the trial may be the progeny groups from different rams, as opposed to the whole ram flock, indicating differences between ram progeny groups, not flocks.

Advantages of hosting a trial

If you host a sheep productivity trial and include your own sheep in the trial, you are benchmarking the performance of your own sheep on your own farm under your management. This is the advantage of hosting a trial as it compares the performance of your team with other teams under your environmental and feeding conditions.

Comparing your flock with other flocks Statewide

The Western Australian linked wether and ewe trials allow you to easily compare flocks that have been benchmarked anywhere in the State. This is made possible by the including a team from a common (link) flock in all trials. This means you will compare the relative performance of your flock with flocks in other trial comparisons. As a simple example, examine the live weight results of the three teams in three linked trials in Table 2. The three teams in three different trials all weigh the same at 60 kg. So at face value they all appear to have the same productivity. However the performance of the link team in each trial is different. Relative to the performance of the link team, team 3 (+20 kg) is better than team 2 (+10 kg) which is better than team 4 (+5 kg). Therefore even though the three teams are run in different trials (and environments) we can compare them genetically because of the presence of the link team.

Table 2. An illustration of how the link team works

	Trial 1	Trial 2	Trial 3
Team 1 (Link)	50	40	55
Team 2	60		
Team 3		60	
Team 4			60
Difference	+10 kg	+20 kg	+5 kg

What is progeny testing?

We progeny test to determine how good individual rams are by evaluating their progeny. Progeny testing (Farmnote 59/93) assumes that any environmental effects and management of the progeny of all sires tested is the same. That is, progeny testing relies on the average genetic merit of ewes to which a ram is mated, and the environment in which the offspring are reared being the same for all rams.

To accurately identify genetic differences between rams, ewes should be allocated at random, giving the same number of each age group to each ram. Rams to be tested should be single sire mated (or artificially inseminated) to their allocated ewes. Ewes should be run together from mating until weaning, except for the lambing period when lambs are identified according to their sire. The progeny are reared together and treated alike until the end of the test when their productivity has been evaluated.

On-farm ram comparisons

On-farm ram comparisons ([Farmnote 16/2003](#)) can be the next step after a productivity trial. They benchmark a ram or ram source against other rams or ram sources of potential interest to you, providing an accurate comparison of performance of rams or ram sources on your own farm. They are effectively a progeny test, using the relative merit of the progeny to assess the breeding value of the sire(s).

Careful planning is needed to ensure you get useful information from an on-farm ram comparison. Contact the Sheep Genetic Improvement Team of Department of Agriculture and Food for more detail on effective design of a comparison.

Some advantages of on-farm ram comparisons:

- Provide accurate comparison of performance of rams or ram sources.
- Minimise the effect of environment by using your farm resources.
- Can assess traits not evaluated by wether trials.

Progeny testing schemes for individual sires

Progeny testing is a method of genetic evaluation available to ram breeders who want to compare the genetic merit of **individual rams**, and identify the best rams for their breeding objective. Testing usually occurs in the nucleus flock of a group-breeding scheme or in a stud's elite flock. While some ram breeders may already know the breeding value of a ram from his own performance values, progeny testing allows you to increase the accuracy of a sire's own breeding value by comparing the average performance of his unselected progeny with those of other rams.

The data is analysed using Best Linear Unbiased Prediction (BLUP) methodology to estimate breeding values for the rams tested. Link rams across years and trial sites allow BLUP to use the information from all relatives that increase the accuracy of the EBVs of the sires being tested. If progeny testing has been carried out over a number of years in the flock, then this also allows the calculation of genetic trends for the flock being evaluated.

Central Test Sire Evaluation

A Central Test Sire Evaluation (CTSE) evaluates selected sires from different flocks on the one property under the same management and environment. Comparison of rams across flocks occurs at CTSE sites and provides a comparison of individual rams but not a comparison of ram sources. There are 13 of these evaluation schemes operating throughout Australia. Two are operating in WA, these are YARDSTICK and BADGINGARRA. WA ram breeders can enter rams into either of these schemes to link their results to those of other participating ram breeders. These links allow WA ram breeders to benchmark their flocks against others in WA and throughout Australia.

The data from all sites are now collated under the one protocol of Sheep Genetics Australia (SGA). SGA is a national genetic information and evaluation service for the meat and wool sectors of the sheep industry. SGA incorporates LAMBPLAN for the meat breeds and MERINOSELECT for the wool breeds. It provides simple, practical information on the genetic potential of animals to ram breeders and commercial producers. This information is in the form of Australian Sheep Breeding Values (ASBVs) which allow you to select the best sire or dam for your breeding objective across a comprehensive range of commercial production and quality traits. Further information can be accessed via www.sheepgenetics.org.au.

What data is available?

1. Linked Productivity Trials

Figure 1 represents the relative productivity for clean fleece weight and fibre diameter of the teams represented in all of the Linked Productivity Trials completed in Western Australia to date since the 1997 drop. The data from hogget and first adult shearing in wether trials have been combined to obtain a more accurate measurement of the genetic merit of each team. The first (hogget) shearing data from ewe trials is also included.

Clean Fleece Weight vs Fibre Diameter - Where does your flock sit on this graph?

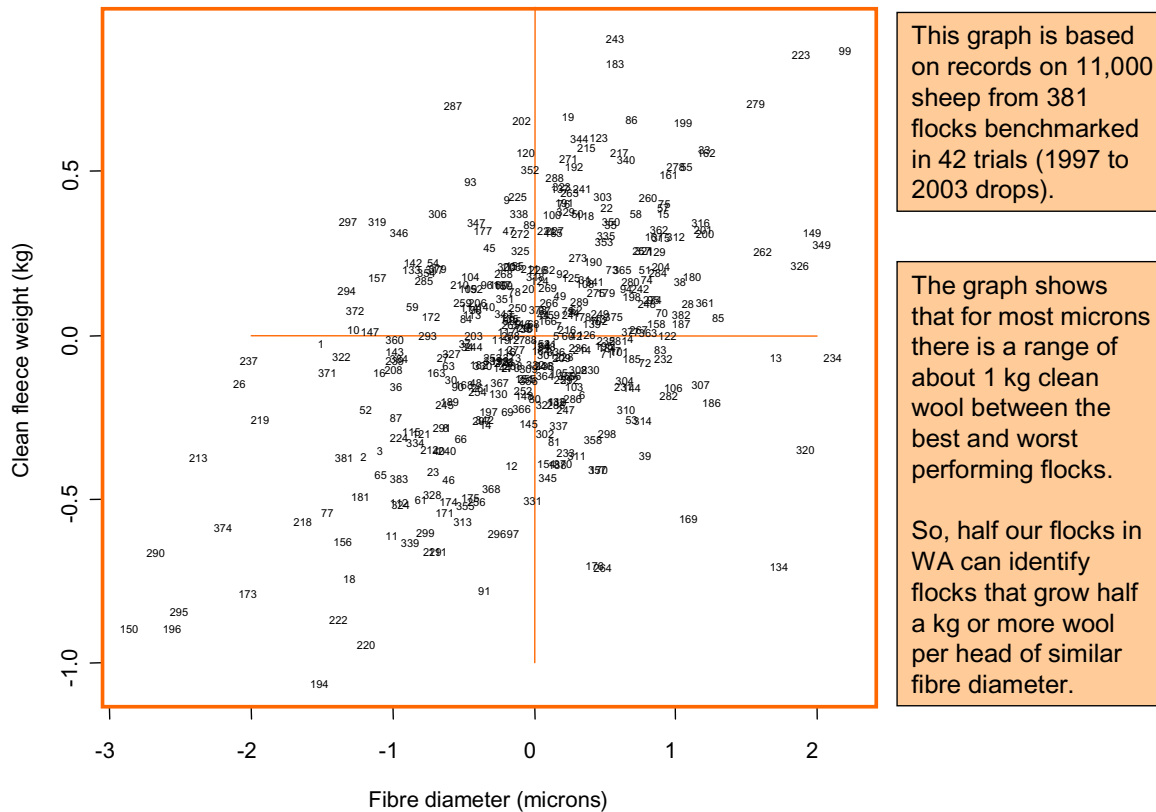


Figure 1. The relationship between clean fleece weight and fibre diameter. The overall average for all animals (hogget and first adult shearings) was 3.5 kg clean wool of 19 microns fibre diameter.

The numbers plotted on the graph are the team codes. Their position shows how much they vary from the overall mean (i.e. deviation from the mean) for fibre diameter and clean fleece weight. For example, compared with the average for all the teams, the sheep in team 287 cut about 0.5 kg more clean wool which was 0.7 micron finer.

You can check the Department of Agriculture and Food web site (www.agric.wa.gov.au) for an updated graph as new data is included.

Figure 2 provides summary data from the two ewe trials that have been completed to date and indicate that wool alone is no longer necessarily the driver of profitability. The most profitable team had the lowest returns from wool and highest returns from lamb.

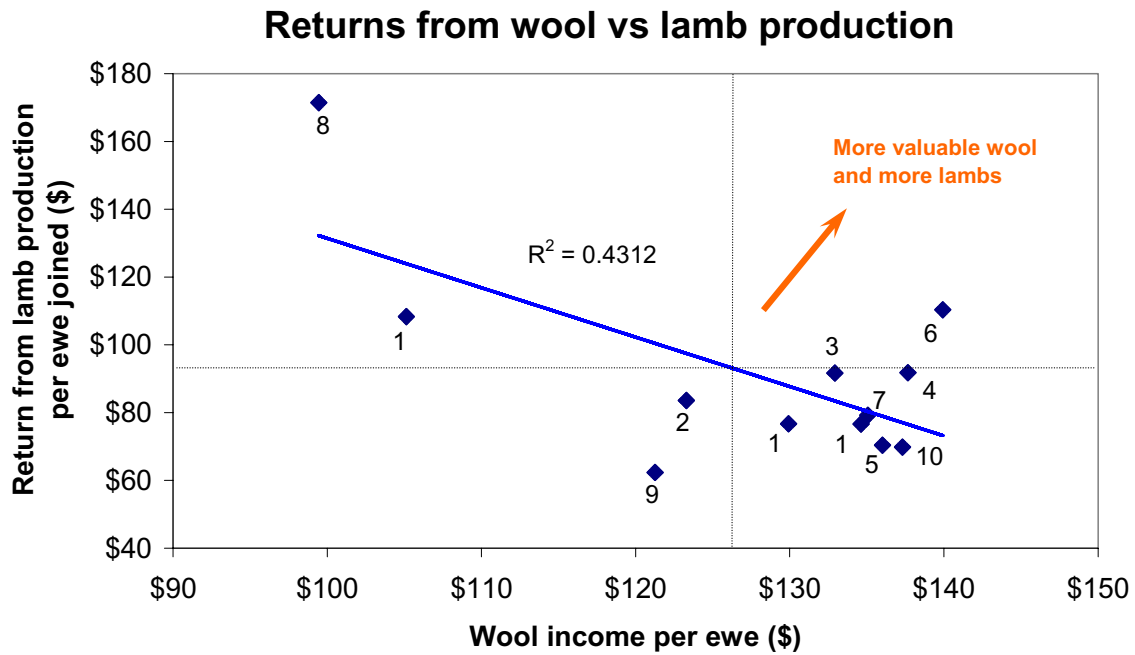


Figure 2. The relationship between the return from lamb production per ewe joined and the wool income per ewe.

2. Progeny tests

Central Test Sire Evaluation. A large data base of information on the genetic performance of rams from many ram sources throughout Australia is available from the [Merino Superior Sires](http://mss.anprod.csiro.au) website at <http://mss.anprod.csiro.au>. Sheep Genetics Australia has been launched in 2005 as a genetic evaluation service delivering credible accurate breeding values in a single language for both meat (LAMBPLAN) and wool (MERINOSELECT) sectors of the sheep industry. MERINOSELECT will combine the data from the various progeny testing schemes into a consistent national and quality assured service. The web site can be accessed via www.sheepgenetics.org.au.

How can I use this data?

To use the data from linked productivity trials, you need to identify where your flock sits in relation to others for the traits of interest. You can then consider options to improve your breeding program, for example identify flocks that may help you achieve your breeding objective more rapidly. However, unless you have participated in a benchmarking exercise you will only be able to make a guess at your position.

In considering ram sources you need to ensure that they are genetically superior to yours, and the Linked productivity trial results provide valuable information to validate this. Before considering any ram source, first ensure that it has a breeding objective compatible with yours.

If you wish to contact the owners of any teams benchmarked through the productivity trials to discuss their breeding strategy, or participate in a productivity trial, please contact Lock Butler at the Narrogin Office of the Department of Agriculture and Food, phone 9881 0222.

Where can I get more information

Visit the Department of Agriculture and Food web site at www.agric.wa.gov.au.

Contact the Sheep Genetic Improvement team through the Narrogin Office of the Department of Agriculture and Food on 9881 0222, or the Katanning Office on 9821 3333.

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