



Pedigree recording in Merino flocks

Linda Hygate BAgSc(Hons) DipAgEc

Over recent years many industry experts have advocated the use of pedigree recording in Merino flocks. A simple analysis of the benefits and costs for an open nucleus breeding program shows that while the benefits could be high, they are not quite as high as the costs of collecting this information.

For ram buyers, purchasing rams from flocks that are collecting and using full pedigree information annually will produce economic gains, providing that you are not paying too much extra for this gain.

Collecting full pedigree information for ram breeders

Many industry experts are recommending that all ram breeders collect full pedigree information in order to maximise their rate of genetic gain. Collecting full pedigree information means identifying all lambs born to their dam within 1-2 days of birth of the lamb. This is not a job for the faint-hearted!

Improving the pedigree information that you collect on your animals will increase the accuracy of your EBVs. As the accuracy increases, your genetic progress also increases. This is more important as the heritability reduces. Collecting full pedigree information also includes collecting information such as sire and dam, age of dam, birth type (whether or not the sheep are twins or singles), and date of birth.

There is a huge difference in cost between collecting sire only or no pedigrees and collecting full pedigrees from each animal. If you have an open nucleus breeding program, and are breeding rams for yourself, collecting full pedigree

information will considerably add to your labour requirement for the farm, if you do this manually. If you collect sire information only, and randomly allocate your rams to ewes, while this has an infrastructure cost, the cost of labour is considerably reduced.

By collecting sire information, you are in a position to benchmark the improvement in your flock and ensure that you will not encounter inbreeding problems, as you know the relationships between rams, based on their sire information. Knowing sire information goes some way towards improving the accuracy of your EBVs.

The NSW Department of Primary Industries and the Sheep CRC produced a document in 2003 which shows the benefits of collecting (and using) different forms of information in ram breeding programs. In their study, they showed that if you were selecting on a 6% index, the genetic gains (over 10 years) that you could achieve by collecting a "full dataset of information" are more than 70% higher than those if you simply measure rams and ewes.

The "full dataset" involves collecting sire and dam pedigree, age of dam, date of birth and birth rearing type. The cost of collecting this information is high. However, if you achieve higher rates of genetic gain as a consequence, then is the investment in collecting this information worthwhile?

Cost benefit of pedigree records

To work out whether or not the benefits justify the costs, I constructed a simple spreadsheet to calculate the benefits from the

additional genetic gains, relative to the additional cost of achieving those gains.

Assuming that you are selecting on a 6% index, which aims to increase fleece weight and decrease fibre diameter, then using a simple approach of collecting measurements on rams and ewes, then this would result in gains of 3.6% in fleece weight and -0.96 in fibre diameter over 10 years.

For the purpose of this exercise, I have assumed a wool price of 900c/kg clean, an average clean fleece weight in the flock of 3.85kg (5.5kg greasy @ 70% yield) and a micron premium of 15%. These figures result in a net fleece value of \$31.89 (assuming we achieve 92% of the market indicator). I have also assumed a nucleus of 500 ewes, which breed rams for a commercial flock of 5000 ewes.

In 10 years time, the value of the genetic improvement will be \$6.25 per sheep (hogget stud/nucleus sheep only). The real benefits accrue when the nucleus bred rams spread their benefit through the flock and the number of improved fleeces is significantly multiplied. This results in an overall flock benefit of over \$100,000 accumulated over the 10 years of the program from the measurement program. Note: this figure is not discounted back to current values.

By collecting and properly using the additional information, the genetic improvement of the sheep after 10 years of selection will result in an increased fleece value of \$11.42 per sheep, with an overall flock benefit of \$182,000 accumulated over the ten years.



Prepared by
Mackinnon Project
University of Melbourne

The \$80,000 difference is large and it seems that yes, you should go out and collect this information. However, we must properly account for the costs of collecting this extra information. With the current cost of DNA profiling at \$18 per sheep, the costs of collecting pedigree information will effectively double the cost of the ram breeding program. Full pedigree recording the progeny from 500 ewes, using DNA profiling will cost around \$15,750 in the first year, when both dams, sires and progeny will need to be tested. In subsequent years, the cost will be \$18 per progeny born, plus the added cost of newly introduced flock ewes into the nucleus. With a weaning rate of 75%, and the introduction of about 60 flock ewes into the nucleus each year, the annual cost is likely to be \$7830 in addition to your measurement costs. Accumulated over 10 years, this equates to a total cost of \$94,050, which is greater than the extra value that you will derive from collecting the extra information (compare \$100,000 base gain with \$180,000 gain with additional information).

Of course, DNA profiling offers the most expensive form of collecting

pedigree information. The costs can be reduced by manually collecting the information yourself, if additional (low cost) labour is available for this activity.

These predicted gains also assume that the pedigree information you are collecting is used to calculate EBVs for the traits for which you are selecting. In my experience, many ram breeders are collecting a large amount of information about their animals and are not using it properly to achieve their optimal genetic progress.

Advice for ram buyers

If your stud is making the high rates of genetic progress indicated here, this means that each year, their genetic gain will be reflected in the progeny of these rams. That is, the rams' progeny will be improving in their fleece value, at an accumulated annual rate of around \$0.41 per fleece, resulting in extra value to you of around \$5.00 per progeny after 12-14 years, depending on your ram flock structure. That results in rams whose progeny will return an extra \$375 after this time, compared with rams selected using simple measurements only. In the early stages, the differences are quite

small, and will justify a small (about \$30-\$50) extra investment to purchase rams from this type of stud. However, as these gains are cumulative, the value of the genetic progress becomes larger over time.

A word of warning

There are many factors influencing the results I have presented here, which could change the outcome. The case I have presented is a "break-even" situation. In many cases, collecting full pedigree information could become quite profitable. This would occur if your estimate of future wool values were higher than those I have used, or that your costs of collecting the information are lower than those presented here, or that your ram breeding flock is supplying more than 10 times the number of ewes in the nucleus.

For ram sellers, higher rates of genetic progress will act as a marketing advantage for the future.

For more information, have a look at the article on which most of these figures are based. It is located on the Sheep CRC website at: http://www.sheepcrc.org.au/images/pdfs/selection_accuracy.pdf.

Key points:

- *Full pedigree recording increases your rate of genetic gain.*
- *If you can reduce the cost of full pedigree recording to less than \$18 per animal, it is likely to be of benefit in ram breeding flocks, with a large commercial flock.*
- *For ram buyers, purchasing rams from flocks which are collecting and using full pedigree information will justify a (small) increased cost.*