Lecture 14: Optimising Paternal and Maternal Genetics

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Learning objectives
At the end of this topic you should:

- Demonstrate a thorough understanding of the factors that impact on selection of terminal sires for a prime lamb flock.
- Identify the factors that need to be considered when setting a breeding objective.
- Utilise Sheep Genetics (SG) and LAMBPLAN information to select a terminal sire for use in a given prime lamb production flock.

Key terms and concepts
Sheep Genetics (SG), LAMBPLAN, breeding value, Australian Sheep Breeding Value (ASBV), Flock Breeding Value (FBV), trait, heritability, index, Carcase Plus, Export Dollar Index, TradeDollar Index, production level, growth, fat, muscle, worm resistance, birth weight, progeny.

14.1 Defining the production system
It is important to define the lamb production system and the target market for products. The environment and infrastructure of the enterprise as well as financial and management constraints may limit some types of production. It is only then that the appropriate genetics can be selected for the production system. Some of the factors to consider include:

- Type of enterprise eg. self-replacing flock, crossbreeding
- Type of products eg. breeding store lambs for others to finish, breeding and finishing
- Lamb market eg. trade weight, heavy export
- Lambing season – ewes joined in spring and early summer need genes for out-of-season breeding

14.2 Objective measurement for ram selection
Objective measures provide information about the aspects of an animal that are not easily observed. For example consider Figure 14.1. What can you tell about the potential performance, in terms of growth rate, muscling, fat, worm resistance, reproduction and eating quality of the lambs sired by these rams? The short answer is that from just looking at these rams you can not estimate the performance of their progeny.

Figure 14.1: Visual inspection doesn’t provide reliable information about sire performance (Warner and Bull 2007).
To estimate the performance of their progeny you need to have an understanding of the genetic merit of the rams. That is, you need to have an understanding of the ram’s individual potential for producing offspring with higher potential for growth, less fat or greater muscling.

In order to do this a number of simple activities need to be carried out:

- measurements of growth rate, carcase fat, muscling, faecal egg counts and birth weight need to be taken on the live animal at standard times
- the animals pedigree needs to be recorded
- importantly the information needs to be collected in a central database which has the ability to compare rams across different flocks, and potentially across different breeds of sheep.

Sheep Genetics (SG) and LAMBPLAN have this ability. The technology of SG combined with the dedicated seedstock producers provides Australia’s commercial prime lamb industry with a world best system.

Table 14.1: Comparative performance of two animals (MLA 2004).

<table>
<thead>
<tr>
<th>Animal</th>
<th>Weight at 100 days (adjusted)</th>
<th>Likely genetic value for weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group mean EMD</td>
<td>31kg</td>
<td>Better genes than average for growth</td>
</tr>
<tr>
<td>Ram A</td>
<td>35kg</td>
<td>4kg above average</td>
</tr>
<tr>
<td>Ram B</td>
<td>27kg</td>
<td>4kg below average</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Poorer genes than average growth</td>
</tr>
</tbody>
</table>

14.3 Importance of the ewe flock

Productivity of the ewe flock has a major impact on lamb enterprise profitability and stocking rate. Income is from the sale of lambs (determined by the number produced, carcase weight and fat level), skins and ewe wool (weight and fibre diameter). Some additional income is from the sale of surplus cull sheep. The lambing rate of the ewes determines the number of lambs available for sale in an enterprise run at any given stocking rate. The ewe provides half the genes for growth and carcase merit of the lamb as well as all the maternal environment and nurturing. Potential productivity of the ewes for these traits is determined by their genetic merit. The current low sheep population in Australia with high demand for sheep meat is a further imperative to lift productivity of ewe flocks.

Crossbreeding is used effectively to maximise heterosis among commercial flocks of crossbred ewes that predominate in the specialist lamb sector. Genetic improvement can further raise the productivity of crossbred flocks with a wide range of genotypes and genetic technology now available to achieve more rapid genetic improvement.

Many prime lamb breeders currently make good use of Australian Sheep Breeding Values and indexes for terminal sires and have significantly lifted lamb carcase weights in response to export demand, while simultaneously reducing fat levels to meet consumer demands. However the terminal sire accounts for only half the genes contributing to lamb performance with the ewe contributing the other half of the genes.

To achieve increased reproduction rates and further increases in productivity, the prime lamb industry needs to improve the genetics and management of the maternal sector.

For the second cross lamb producer the genetics of the crossbred ewe flock has a major impact on the returns and profitability of the lamb enterprise. The Maternal Sire Central Progeny Test (MCPT) evaluated sires from several maternal breeds for the performance of their first cross (slaughter wethers and breeding ewes) and second cross progeny. The between breed and sire within breed variation in gross margin performance for the lamb production of the first cross daughters of the sires in MCPT has clearly demonstrated the influence of the ewe on the profitability of lamb production (Fogarty et al. 2005). The MCPT has shown a range in gross margin of $40/ewe/year between groups of first-cross ewes sired by different rams of the same breed (see Figure 14.2).

This means that a producer running 1000 crossbred ewes of superior genetic merit has the potential to achieve a gross margin that is $40,000 per year higher than that of a producer running 1000 ewes of inferior
genetic merit. Even if they use the same terminal sires. If you are breeding these ewes yourself, this does not include any extra income from the wether portion.

![Figure 14.2: Annual $ gross margin of first cross ewes by different Border Leicester and East Friesian sires (Fogarty, 2007).](image)

The strong message coming from the MCPT results is that the genetics of the crossbred ewe flock can have a major impact on productivity and profitability of the lamb enterprise. No single maternal breed cross is substantially superior and there is considerable variation between sires within all the maternal breed crosses. It is important to source crossbred ewes that are by sires with high genetic merit for the traits that are important to your enterprise profitability. Similarly, it is important that they be out of a high performance base ewe flock.

### 14.4 Breed and crossbreeding effects for growth traits

There is considerable genetic variation for growth of lambs. Extensive crossbreeding is used in the lamb industry. Meat rams, maternal (eg. Border Leicester) or terminal (eg. Poll Dorset) breed rams are mated to Merino ewes to produce first cross (1stX) lambs. The 1stX ewe progeny from the maternal breeds (eg. Border Leicester x Merino or BLxM) are generally retained or sold for breeding to a terminal sire ram to produce second cross (2ndX) lambs for slaughter. The 1stX lambs by terminal sire rams and the wether 1stX lambs by the maternal sire rams are slaughtered.

Generally 2ndX lambs have higher growth rates than 1stX lambs which are higher than Merino lambs when grown under the same management and nutrition. Results from research at Cowra (Fogarty et al. 2000) show the differences in post weaning weight that could be expected under good growth conditions between 2ndX, 1stX and medium wool Merino lambs (Figure 14.3). The heavier weight of the 1stX compared to the Merino lambs reflects the better genetics for growth of the meat rams compared to the Merino rams used, as all these lambs were from the same Merino ewes. The higher weight of the 2ndX compared to the 1stX lambs is due to two factors. Firstly, better genetics for growth passed on from the meat genes in the crossbred mother. Secondly, the better maternal environment for growth (milk production and nurturing etc) provided by the crossbred ewe.
There may also be differences in growth rate between breeds that reflect genetic variation for growth. Results from research at Cowra (Fogarty et al. 2000) show the differences in post weaning weight between 1stX and 2ndX lambs sired by Poll Dorset (D), Texel (T) and Border Leicester (BL) rams as well as Merino (M) rams. The average differences between breeds of the same type e.g. terminal sire, are generally small and not significant.

Differences between the progeny of individual rams are considerably greater than the average differences between breeds of the same type. This is illustrated from the same research at Cowra in Figure 14.4 where the average post weaning weights of progeny of individual rams show considerable overlap between the Poll Dorset and Texel sires. You should also note the consistent ranking of the same Dorset and Texel sires when they produced 1stX and 2ndX lambs. These and many other research results have all shown that there are very large differences between sires within breeds or breed type for lamb growth of their progeny. This means it is important to identify and select rams with genetics for superior growth.
14.5 Genetic variation for carcase traits
There is considerable genetic variation for fat and muscle traits measured on the carcase. Fat depth is measured as total tissue depth over the 12\textsuperscript{th} rib at a point 110mm from the midline of the carcase and is referred to as GR. Fat depth may also be measured as the depth over the eye muscle (\textit{M. longissimus lumborum}) at a point 45mm from the midline over the 12\textsuperscript{th} rib of the carcase (C site). Muscle dimensions and area are measured on the cross-section of the eye muscle at the 12/13 rib. Research has shown that these measurements are good indicators of total fat and muscle respectively in the carcase. Fat depth at the C site and muscle depth can also be measured accurately on live animals by experienced operators using real time ultrasound scanning.

A lot of the variation in fat and muscle measurements between carcases is due to differences in carcase weight. Heavier carcases will generally have larger fat and muscle measurements. Generally 2ndX lambs have higher fat depth than 1stX terminal sire lambs which are higher than Merino lambs when grown under the same management and nutrition and compared at the same carcase weight. Therefore comparisons for genetic evaluation need to be made at the same carcase weight.

Tables 14.2 and 14.3 show the current genetic differences in Post Weaning Fat and Post Weaning Eye Muscle depth ASBVs in the 2010 drop. As fat depth has got to a level now where further reductions for some may results in problems with eating quality animals are not ranked from leanest to heaviest fat as previously done.

<table>
<thead>
<tr>
<th>Leanest animals</th>
<th>Terminals</th>
<th>Border Leicesters</th>
<th>Coopworths</th>
<th>Merinos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat depth (mm)</td>
<td>-1.1</td>
<td>-0.8</td>
<td>-0.8</td>
<td>+0.8</td>
</tr>
<tr>
<td>Fattest animals</td>
<td>+1.1</td>
<td>+1.3</td>
<td>0.8</td>
<td>-0.8</td>
</tr>
<tr>
<td>Variation (mm)</td>
<td>2.2</td>
<td>2.1</td>
<td>1.6</td>
<td>1.6</td>
</tr>
</tbody>
</table>

**Table 14.2:** Genetic variation for Post Weaning Fat Depth (mm) in the 2010 drop (Sheep Genetics 2011).

<table>
<thead>
<tr>
<th>Best Performing animals</th>
<th>Terminals</th>
<th>Border Leicesters</th>
<th>Coopworths</th>
<th>Merinos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye muscle depth (mm)</td>
<td>+5.4</td>
<td>+3.3</td>
<td>+4.7</td>
<td>+4.1</td>
</tr>
<tr>
<td>Worst Performing animals</td>
<td>-4.2</td>
<td>-1.9</td>
<td>-3.4</td>
<td>-3.0</td>
</tr>
<tr>
<td>Variation (mm)</td>
<td>9.6</td>
<td>5.2</td>
<td>8.1</td>
<td>7.1</td>
</tr>
</tbody>
</table>

**Table 14.3:** Genetic variation for Post Weaning Eye Muscle depth (mm) in the 2010 drop (Sheep Genetics 2011).

14.6 What ASBVs are important when selecting a sire?
The following traits are available for all animals that are in LAMBPLAN’s national database. The emphasis placed on each of the traits will vary depending on the purpose for which the animal is selected.

Liveweight traits
Weight breeding values describe the animal’s genetic merit for growth rate. The higher the ASBV, the greater the potential of that animal to grow quickly. This will mean that animals with a higher ASBV will be heavier at a constant age. Measurements are calculated for animals at: birth, weaning, post-weaning, yearling, hogget and adult weights. The reason that measurements are taken at different times is that it allows producers to select the measurement that best reflects the age that they are selling lambs.
Birth weight (kg) BWT
Lamb weights are collected within 24 hours of birth. Moderate birth weights are desirable, as high or low weights may compromise survival of either the lamb or ewe.

Weaning weight (kg) WWT
Weaning weight estimates the genetic difference between animals in live weight at 100 days of age. For producers looking to turnoff young lambs, the rate of growth to this point is very important.

Post-weaning weight (kg) PWWT
Post-weaning weight is generally measured when the animals are 5 – 8 months (usually 225 days) old. This measurement is usually taken at the same time as scanning and is the most commonly reported measurement on sale catalogues. It is used in the calculation of the Carcase Plus index.

Yearling weight (kg) YWT
Data is recorded at about 300 days from birth. Yearling weight ASBVs provide valuable information for producers growing lambs out to extra heavy weights, or in areas where lambs may take additional time to finish.

Carcase traits
These describe the animal’s genetic merit for leanness and muscle. The lower the ASBV value for fat the leaner the animal is. The greater the ASBV for muscle, the more muscle the animal has.

Fat depth ASBVs
Fat depth ASBVs estimate the genetic difference between animals in fat depth at the GR site. The lower or ‘more negative’ the ASBV, the leaner the animal is at a given weight. Accredited LAMBPLAN scanners take the measurements using ultrasound technology, at the C site. The results are then converted to a fat depth measurement (mm) at the GR site for post-weaning (PFAT) at 45kg live weight, yearlings (YFAT) at 60kg live weight and hoggets (HFAT) at 70kg live weight.

Eye muscle depth ASBVs
Eye muscle depth ASBVs estimate the genetic difference in eye muscle depth at the C site. A positive ASBV means a genetically thicker muscled animal, and one that will have slightly more of its lean tissue in higher priced cuts. Measurements are taken by accredited LAMBPLAN scanners using ultrasound technology and are measured in millimetres for post-weaning (PEMD) at 45kg liveweight, yearlings (YEMD) at 60kg live weight and hoggets (HEMD) at 70kg live weight.

Worm resistance
Increasingly worm resistance is becoming important. This is the result of producers seeking out alternative worm control measures to drenching. As part of the control measures producers are seeking to breed sheep that are more resistant to the effects of worms.

Worm egg count (WEC)
Worm egg count ASBVs describe the value of animals’ genes for carrying worm burdens – a combination of being genetically less predisposed to pick up worms and being able to cope immunologically with the worm burden. Worm egg counts can be taken around 100 days for weaners (WWEC), 225 days for post-weaning (PWEC) or 360 days for yearlings (YWEC). The best time to take worm egg counts (WEC) will depend on local climatic conditions and worm burden patterns. Lambs being sampled need to have been weaned for long enough to ensure their own immunity is assessed, rather than that of their dams. ASBVs for WEC are expressed as a percentage. Those with more negative percentages are more resistant to worms than those with positive percentage figures.

14.7 Sire selection for maternal traits
Many factors can affect the profitability of the prime lamb enterprise, with three key factors being: production, price and costs.
Most of the production traits are influenced by both management and genetics. The important traits to consider are:
• Reproduction - drives weaning percentage and the number of lambs turned-off
• Growth - influences time to turnoff, carcase weight and possible joining age of ewes
• Carcase traits - influence carcase weight, fat cover and lean meat yield which can affect the price received
• Parasite resistance - influences production costs eg resistance to worms and flystrike

ASBVs have three traits that describe reproductive performance. They are the number of lambs born (NLB) and the number of lambs weaned (NLW), expressed as the ratios to the number of the ewe’s lambing opportunities. Scrotal circumference (SC) in the ram is also an indicator of reproductive performance of female relatives and ASBVs may also be reported. The NLB and NLW per lambing opportunity are female reproduction traits, but information from male animals can contribute to the ASBVs. Male animals have genes for female reproduction traits, which they pass on to their daughters.

The ability of the ewe to provide genes for milk production and maternal nurturing is expressed by the ASBV for maternal weaning weight (MWWT), separate from the genes passed on for direct growth. For the growth traits (or weights at different ages) we know that the performance of the lamb is affected by the value of its own genes for growth and how much milk the mother provides and how good a mother she is. The mothers’ maternal ability affected by how good or bad the genes of the mother are for producing milk and for her general maternal performance. So, there are two sets of genes affecting the growth of the lamb.

• direct genes for growth - the genes of the lamb itself for taking in food and converting that food to body tissues.
• maternal genes for growth - the genes of the dam for providing milk and generally assisting the lamb to grow.

Where records are available for weaning weights and the sire and dam pedigree, the growth of the lamb to weaning can be split into its ‘direct’ and ‘maternal’ components – providing both direct and maternal weaning weight ASBVs. This separation between direct and maternal genes for growth means breeders can:

• Identify animals with the best genes for early growth – those with superior direct weaning weight ASBVs.
• Identify dams that will give their lambs the better start – higher milk and better mothering or maternal performance – those with superior maternal weaning weight ASBVs.

Animals with better than average maternal weaning weight ASBVs will breed daughters that rear heavier progeny. While animals with poorer than average maternal weaning weight ASBVs will breed daughters that rear lighter progeny. Selecting for high milking or mothering alone would seriously limit improvement in other traits. This is because the correlation between maternal weaning weight, and weaning weight direct, is negative, so both traits need to be included in an index.

14.8 What are indexes and how should you use them?
In addition to ASBVs for individual traits, LAMBPLAN produces indexes. An index is calculated by combining a number of ASBVs based on their relative economic value to rank animals based on that combined criteria. The most common terminal sire indexes available are Carcase Plus, Trade $ Index and Export$ index.

How are ASBVs incorporated into indexes?
To select a superior sire, you will normally need to look at several traits. Traits can be combined in a selection index. A selection index combines the ASBVs for several traits to give the best overall basis for selecting breeding stock to achieve breeding goals. A selection index is produced by weighting ASBVs by the relative importance of each trait.
The three steps that SGA use in producing a selection index are:

1. Calculating the ASBVs for each trait
2. Determining the relative importance (RI) of each trait
3. Multiplying the ASBV by its RI and adding for all traits

A selection index for terminal sires would look like the following:

\[
\text{INDEX} = [\text{ASBV(GROWTH)} \times \text{RI(GROWTH)} + \text{ASBV(FAT)} \times \text{RI(FAT)} + \text{ASBV(EMD)} \times \text{RI(EMD)}] + 100
\]

**Important point**

Selection indexes should not be used as a sole method for selecting a ram. They are a useful tool to use to screen out a large percentage of potentially suitable rams. As a given selection index can be reached through a number of different ASBV combinations, you should always look at the individual ASBVs that make up that index. It is possible to have two rams with identical indexes but very different ASBVs that make up that index.

The rams in Table 14.4 are very different rams. Ram A has extremely high growth with moderate fat and muscle. Ram B has High growth, is slightly leaner than A, but has extremely high muscle. Ram A would suit a producer who needed very quick growth and had less concerns about muscle. Ram B would suit a producer who had a longer period to grow the lambs out and who was trying to increase the muscle of lambs produced.

**Table 14.4:** Comparing the Carcase plus indexes of two rams (Warner and Bull 2007).

<table>
<thead>
<tr>
<th>Ram</th>
<th>PWWT</th>
<th>PFAT</th>
<th>PEMD</th>
<th>Carcase Plus Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>+13.7</td>
<td>-0.66</td>
<td>+0.58</td>
<td>180</td>
</tr>
<tr>
<td>B</td>
<td>+9.6</td>
<td>-0.84</td>
<td>+2.02</td>
<td>180</td>
</tr>
</tbody>
</table>

**Carcase plus index**

The Carcase Plus index places 65% of emphasis on growth, 30% on muscle and 5% on fat. The Carcase Plus index is calculated using post-weaning information as this is the age where most lambs are turned off. The selection index rates animals on their ability to breed heavy, lean and well-muscled progeny suitable for export weight and fat specifications. The base of the Carcase Plus index (as with all LAMBPLAN indexes) is set at 100, which is the mean index figure for 2000.

Dollar indexes - Trade $ index and export $ index

Two “Dollar Index’s” exist for use by commercial lamb producers to select rams for use. The “Trade $ Index” and the “Export $ Index. Dollar indexes attempt to show the relative value of a ram expressed as dollars return per ewe joined per year. Currently both indexes assume 100% weaning and a lamb value of $3.50 per kg carcase weight at slaughter.

The trade $ Index is designed to target production of 22kg carcase weight lambs. It combines post-weaning age ASBVs for growth, fat and eye muscle depth into a $ index value. The Trade $ Index is expressed as dollars/ewe joined/year/ In estimating the dollar variation the index assumes a weaning rate of 100% and lamb at $3.50 cwt. The Trade $ Index rewards animals with a post-weaning (PWWT) +6 or greater. The greater the PWWT ASBV is above 6, the more points allocated to the index.

Production of trade weight lambs requires appropriate leanness. But excessive leanness is undesirable due to difficulties in finishing lambs at this weight. For this reason the Trade $ Index optimises the Post-Weaning (PFAT) ASBV at -0.5. The further an animals PFAT ASBV is from -0.5, the fewer points allocated. The index also rewards animals with more positive post weaning eye muscle depth ASBVs, which are desirable for carcase conformation and yield. The more positive the PEMD ASBV, the more points awarded in the index.
Table 14.5: Comparison of Trade $ Index and Export $ Index (Warner and Bull 2007).

<table>
<thead>
<tr>
<th>Index</th>
<th>Target market for lambs</th>
<th>Emphasis placed upon each trait</th>
<th>Muscle (PEMD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade $</td>
<td>22kg carcase at 7.5 months of age</td>
<td>Rewards animals with a PWWT ASBV of +6 or greater</td>
<td>Optimises fat (PFAT) at -0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The higher the PWWT is above +6 the more points that are allocated to the index</td>
<td>The further an animal is from -0.5 the less points are allocated towards the index</td>
</tr>
<tr>
<td>Export $</td>
<td>24kg carcase at 7.5 months of age</td>
<td>Rewards animals with a PWWT of +10 or greater</td>
<td>Optimises PFAT at -1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The higher the PWWT is above +10 the more points that are allocated to the index</td>
<td>The further an animal is from -1.0 the less points are allocated towards the index</td>
</tr>
</tbody>
</table>

14.9 Maternal sire selection using an index

As mentioned earlier in this paper an index may be used as an aid for selection and are produced by weighting ASBVs by the relative importance of each trait. For the purposes of maternal sire selection the Maternal $ Index and Dual Purpose (DP) $ Index are available. The Maternal $ Index is intended for the specific maternal breeds such as Border and Coopworth, while the DP $ Index is suited to use by dual purpose breeders such as Corriedale, SAMM and Dohne. The relative weightings for each trait for the two indexes are shown below in Table 14.4. The key difference between the two being the dual purpose breeders recognition of value in improved fleece traits.

More information on understanding maternal ASBVs and indexes can be found on the Sheep Genetics website [www.sheepgenetics.org.au](http://www.sheepgenetics.org.au) > LAMBPLAN > Getting Started > ASBVs and Indexes

Table 14.6: Relative selection emphasis and predicted changes over 10 years for the Maternal $ and Dual Purpose $ indexes (Sheep Genetics 2011).

<table>
<thead>
<tr>
<th>Trait</th>
<th>Maternal $ Index</th>
<th>DP $ Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Relative Emphasis</td>
<td>Gain over 10 years</td>
</tr>
<tr>
<td>BWT (kg)</td>
<td>11%</td>
<td>0.2</td>
</tr>
<tr>
<td>WWT (kg)</td>
<td>23%</td>
<td>2.7</td>
</tr>
<tr>
<td>MWWT (kg)</td>
<td>5%</td>
<td>0.4</td>
</tr>
<tr>
<td>PWT (kg)</td>
<td>25%</td>
<td>4.0</td>
</tr>
<tr>
<td>PFAT (mm)</td>
<td>4%</td>
<td>0.1</td>
</tr>
<tr>
<td>PEMD (mm)</td>
<td>5%</td>
<td>0.3</td>
</tr>
<tr>
<td>NLW (%)</td>
<td>16%</td>
<td>10</td>
</tr>
<tr>
<td>PWEC (%)</td>
<td>8%</td>
<td>-24</td>
</tr>
<tr>
<td>YGFW (%)</td>
<td>3%</td>
<td>0</td>
</tr>
<tr>
<td>YFD (µ)</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
14.10 Estimating ram value – dollars and sense
It's possible to perform a quick analysis of two rams that shows the value of extra growth by comparing the ASBVs for PWWT for two rams. An example is given below.

<table>
<thead>
<tr>
<th>ID</th>
<th>PWWT</th>
<th>PFAT</th>
<th>PEMD</th>
<th>Carcase Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12.3</td>
<td>-0.7</td>
<td>0.8</td>
<td>182</td>
</tr>
<tr>
<td>B</td>
<td>8.2</td>
<td>-0.4</td>
<td>0.2</td>
<td>152</td>
</tr>
</tbody>
</table>

**How much more can you afford to pay for Ram A?**
Ram A's ASBV post-weaning weight (PWWT) = 12.3kg
Ram B's ASBV post-weaning weight (PWWT) = 8.2kg

Difference in post-weaning weight = +4.1kg

Predicted difference in the actual weight of progeny at time of sale (half the difference in post-weaning weight (PWT) ASBV) ie 4.1 ÷ 2 = +2.05kg

Predicted difference in actual carcase (CWT) weight at 46% dressing ie 0.46 x 2.05 = +0.94kg

Assume your rams are joined at 2%, producing a 100% lambing rate each year for four years. Use these example figures to calculate the total number of lambs produced using the following formula:

i) 50 ewes joined /year x 100% lambing x 4 years of service: 50 x (100 ÷100) x 4 =200 lambs

ii) No. of lambs produced by the predicted difference in CWT at 46% dressing (200 x 0.94)

iii) Total predicted gain in carcase weight (CWT) = 188kg

iv) Average price received (¢/kg cwt) = 300¢/kg

Finally, multiply the average price received by the total predicted gain in CWT (3.00 x 188):

v) Value of total predicted gain in carcase weight = $565

Thus, Ram A will provide an additional 188kg carcase weight if joined to 50 ewes with a conception rate of 100%. If you use Ram A for four years and receive on average 300¢/kg CWT, you will gain an additional $565 in value compared to Ram B.

14.11 Selecting rams
Ram selection involves:

1. Identifying your breeding objective
2. Identifying a stud using the Sheep Genetics and LAMBPLAN technology
3. Working with the seed stock producer to select rams that will provide the right genetics to meet your breeding objective.

The following four step process outlines key areas for consideration when setting your breeding objective, monitoring the affect of the rams that you purchase and importantly re-evaluating the objective.

Step 1 – List the factors of economic importance to your lamb production business
Step 2 – Assess current performance
Step 3 – Benchmark against the potential performance
Step 4 – List future production targets and desired changes

The process outlined above sets the breeding objective.
Table 14.7: An example of the ram selection process.

<table>
<thead>
<tr>
<th>Trait of economic importance</th>
<th>Current performance</th>
<th>Potential performance</th>
<th>Desired changes – production targets</th>
<th>Selection criteria</th>
<th>Strategy</th>
<th>Barriers to achieving goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth rate of lambs</td>
<td>22kg HSCW (hot standard carcase weight) by 7 months of age</td>
<td>28kg HSCW by 7 months of age</td>
<td>Increase average carcase weight to greater than 24kg</td>
<td>Increase emphasis on PWWT and YWWT</td>
<td>Select rams in top 10% of the drop for PWWT and YWWT</td>
<td>Ewe flock may be holding back potential growth – investigate potential new sources of ewes.</td>
</tr>
</tbody>
</table>

14.12 LAMBPLAN recommendations

LAMBPLAN make the recommendations outlined in Table 14.8. It should be noted that these are simply recommendations and rams that fall outside of these may still be suitable. For example a ram that has a PFAT of < -1.0 may still be suitable for producing 18-22kg carcase weight lambs if a lamb producer has continual feedback that his lambs are over fat at slaughter. On the other hand a ram that has a PFAT of +0.5 may also be suitable for producing 18-22kg cwt lambs if the lamb producer is finding it difficult to ‘finish’ lambs at those carcase weights.

Generally speaking the rams for joining to Merino ewes to produce first cross lambs should have slightly higher growth and slightly more fat than those rams selected for joining to first cross ewes. This reflects the poorer growth and leaner carcase of the Merino ewe. Emphasis on muscling in rams being selected to join to Merino ewes should be moderate to high, again reflecting the poor muscling in general of the Merino ewe.

When selecting rams to produce heavier export lambs more emphasis should be placed on growth, fat and muscle. This reflects the fact that faster growing animals tend to lay down more fat and therefore it's necessary to select leaner rams to negate this. Also at higher carcase sizes the market demands better muscling confirmation and therefore greater muscling is required in the rams selected.

Table 14.8: LAMBPLAN recommendations (Sheep Genetics 2010).

<table>
<thead>
<tr>
<th>Lamb carcase weight</th>
<th>Ewe type</th>
<th>General ASBV Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PWT (kg)</td>
</tr>
<tr>
<td>18 - 22kg (Trade)</td>
<td>X-bred</td>
<td>&gt;8</td>
</tr>
<tr>
<td></td>
<td>Merino</td>
<td>&gt;8</td>
</tr>
<tr>
<td>24kg + (Export)</td>
<td>X-bred</td>
<td>&gt;10</td>
</tr>
<tr>
<td></td>
<td>Merino</td>
<td>&gt;10</td>
</tr>
</tbody>
</table>

- Be cautious with extreme values, especially:
  - Muscle (PEMD) > +3.5mm
  - Fat (PFAT) < -1.5mm
- Aim for birth weight (BWT) between 0.0 and 0.5 kg
14.13 Conclusion
ASBVs and selection Indexes, as provided by Sheep Genetics, can be used as useful tools for the selection of sires and the management of a lamb producer's ewe flock. The MCPT has shown the extent of genetic variation within maternal sires and their progeny. This variation allows producers to select for improved maternal traits that when managed correctly within the ewe flock can result in a true increase in dollar return. It is important to select for traits that will maximise returns given the individual production system, for example a first cross lamb producer will need to focus selection differently to that of a self-replacing flock breeder. The effects of heterosis must also be considered when crossing breeds.

The ewe provides half the genetic makeup of it's lamb as well as the maternal environment and nurturing, with appropriate selection pressure for improved maternal traits, production gains and increased profitability can be achieved.

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Readings
The following readings are provided on web learning management systems.


References


Sheep Genetics (SG) Data supplied courtesy of SG. Meat and Livestock Australia (MLA) and Australian Wool Innovation Ltd (AWI).