

# Precision Livestock Management: Sheep Trait Correlation

## Setting goals and objectives for your sheep enterprise

When planning to improve your sheep flock performance and profitability, your business goals and objectives will influence the traits you select for (e.g. improved fleece weight in ewes, improved growth weight in prime lambs).

Before considering ram selection, develop a plan of what you are trying to achieve within your breeding program – often referred to as breeding objectives or breeding goals (these form part of your overall business goals and objectives). A breeding objective describes the 'ideal' animal you aim to breed, with consideration of your production system and markets. For more information on setting breeding objectives and selection – see [MLA \(https://www.mla.com.au/research-and-development/Genetics-and-breeding/breeding-objectives-and-selection\)](https://www.mla.com.au/research-and-development/Genetics-and-breeding/breeding-objectives-and-selection).

The performance of any one animal is a combination of their genes (genetic potential) and the rearing /growing environment (grazing management, feed, age).

### Performance = Genes + Environment

To realise a gain from genetics, it is important to consider the following steps:

1. Identify the key production traits that drive your sheep enterprise profit.
2. Identify the genetic opportunities to improve key production traits.
3. Select the best genetics for your business – see [www.makingmorefromsheep.com.au/gain-from-genetics/](http://www.makingmorefromsheep.com.au/gain-from-genetics/)

## Traits

Animal traits (or characteristics) are inherited from their parents but are also influenced by their environment. In sheep, these traits include:

- growth traits, e.g. growth rate, mature size
- carcass traits, e.g. eye muscle depth, fat depth
- health traits, e.g. worm egg count (WEC), dags
- wool traits, e.g. fleece weight, fibre diameter, staple length
- reproduction traits, e.g. number of lambs born and weaned.

## Trait correlation

Different traits may be correlated, or linked, and selecting for one trait may impact other aspects of production. By selecting animals based on one trait, you may see an increase in another trait (positive correlation), or a decrease (negative correlation).

## Key production traits and their correlations

The following table shows the impact on production outcomes when selecting a single trait. You can manage these correlations by selecting animals based on indexes or a balance of traits you are interested in. It is often the animals that go against these correlations that we select (i.e. low fibre diameter and high fleece weight).

I'm selecting for	Bonus	Things to watch
<b>Growth Traits</b>		
Increased growth	<ul style="list-style-type: none"><li>✓ Marketable at an early age</li><li>✓ Higher reproductive output</li><li>✓ Higher fleece weight</li><li>✓ Higher lean meat yield</li></ul>	<ul style="list-style-type: none"><li>✗ Fibre diameter increases</li><li>✗ Mature weight goes up (increasing ewe maintenance costs)</li><li>✗ Lamb birthweight goes up (potential dystocia problems)</li></ul>
<b>Carcass Traits</b>		
Increased eye muscle depth	<ul style="list-style-type: none"><li>✓ Higher lean meat yield</li><li>✓ Shifts lean meat from the fore-quarter to loin</li><li>✓ Increases dressing percentage</li><li>✓ Higher reproductive rate in ewes</li><li>✓ Higher worm resistance</li></ul>	<ul style="list-style-type: none"><li>✗ Can result in lower growth</li><li>✗ When extreme and combined with low fat can reduce eating quality</li></ul>
Increased fat depth	<ul style="list-style-type: none"><li>✓ Related to improved reproductive rate</li><li>✓ Coefficient of variation of fibre diameter goes down</li><li>✓ Intramuscular fat (marbling) improves</li><li>✓ Eating quality improves</li></ul>	<ul style="list-style-type: none"><li>✗ Carcass fatness increases</li><li>✗ Reduced fleece weight</li></ul>
<b>Health Traits</b>		
Lower worm egg count (WEC)	<ul style="list-style-type: none"><li>✓ Higher muscling</li><li>✓ Higher staple strength</li></ul>	
Lower wrinkle	<ul style="list-style-type: none"><li>✓ Higher reproduction</li><li>✓ Less fly strike</li><li>✓ Higher staple length</li></ul>	<ul style="list-style-type: none"><li>✗ Reduced fleece weight</li></ul>
Lower dags	<ul style="list-style-type: none"><li>✓ Less fly strike</li><li>✓ More fleece wool</li><li>✓ Less crutching</li></ul>	
Lower breech cover	<ul style="list-style-type: none"><li>✓ Higher reproduction</li><li>✓ Less fly strike</li></ul>	<ul style="list-style-type: none"><li>✗ Reduced fleece weight</li></ul>

I'm selecting for	Bonus	Things to watch
<b>Wool Traits</b>		
Increased fleece weight	<ul style="list-style-type: none"> <li>✓ Body weight and growth goes up</li> <li>✓ Staple length goes up</li> </ul>	<ul style="list-style-type: none"> <li>✗ Higher fibre diameter (micron)</li> <li>✗ Wrinkle score goes up</li> <li>✗ Coefficient of variation of fibre diameter gets higher</li> <li>✗ Fat goes down</li> <li>✗ Reproduction goes down</li> </ul>
Reduced fibre diameter	<ul style="list-style-type: none"> <li>✓ Comfort factor improves</li> </ul>	<ul style="list-style-type: none"> <li>✗ Lower fleece weight</li> <li>✗ Lower body weight and growth</li> <li>✗ Staple length goes down</li> <li>✗ Fibre diameter coefficient of variation goes up</li> <li>✗ Staple strength goes down</li> </ul>
Increased staple strength	<ul style="list-style-type: none"> <li>✓ Muscling improves</li> <li>✓ Resistance to worms improves</li> <li>✓ Fatness improves</li> <li>✓ Lower Coefficient of variation of fibre diameter</li> <li>✓ Higher fleece weight</li> </ul>	<ul style="list-style-type: none"> <li>✗ Higher fibre diameter</li> </ul>
Reduced coefficient of variation of fibre diameter	<ul style="list-style-type: none"> <li>✓ Muscling improves</li> <li>✓ Resistance to worms improves</li> <li>✓ Higher fatness</li> <li>✓ Higher staple strength</li> <li>✓ Higher growth</li> <li>✓ Less fleece rot/body strike</li> </ul>	<ul style="list-style-type: none"> <li>✗ Lower fleece weight</li> </ul>
Increased staple length	<ul style="list-style-type: none"> <li>✓ Fleece weight improves</li> <li>✓ Washing yield goes up</li> <li>✓ Lower Coefficient of variation of fibre diameter</li> <li>✓ Higher growth</li> <li>✓ Less fleece rot</li> </ul>	<ul style="list-style-type: none"> <li>✗ Reproduction decreases</li> <li>✗ Fibre diameter increases</li> </ul>
<b>Reproduction Traits</b>		
Increased number of lambs born and weaned	<ul style="list-style-type: none"> <li>✓ Body weight goes up</li> <li>✓ Growth goes up</li> <li>✓ Wrinkle score goes down</li> </ul>	<ul style="list-style-type: none"> <li>✗ Lower fleece weight</li> <li>✗ Lower staple length</li> </ul>

Correlations adapted from [Sheep Genetics fact sheets](http://www.sheepgenetics.org.au/Resources/Brochures-and-fact-sheets)  
<http://www.sheepgenetics.org.au/Resources/Brochures-and-fact-sheets>)

Selecting animals involves balancing the traits which influence profitability and productivity of the commercial flock. To make selection easier, traits can be combined into a selection index – a selection index combines ASBVs for different traits to give a single value on which animals can be ranked. The relative emphasis given to each trait reflects the breeding objectives of the particular index.

## More information

Sheep Genetics – [ASBVS and Indexes explained](http://www.sheepgenetics.org.au/Getting-started/ASBVs-and-Indexes) (<http://www.sheepgenetics.org.au/Getting-started/ASBVs-and-Indexes>)

[Sheep Genetics website](http://www.sheepgenetics.org.au/Home) (<http://www.sheepgenetics.org.au/Home>)

[Making More from Sheep program](http://www.makingmorefromsheep.com.au) (<http://www.makingmorefromsheep.com.au>)

## Acknowledgements

Thanks to Michelle Cousins and Hamish Dickson for their contributions and review of the fact sheet.

This fact sheet is an initiative of the Red Meat and Wool Growth Program of The Department of Primary Industries and Regions, supported by Meat and Livestock Australia, SA Sheep and Cattle Industry Funds and SheepConnect SA.

## Contact

Website: [pir.sa.gov.au/redmeatandwool](http://pir.sa.gov.au/redmeatandwool)

Phone: 1300 364 322

Email: [redmeatandwool@sa.gov.au](mailto:redmeatandwool@sa.gov.au)