



Books, Book Reviews, Extracts

Document ID:	SheepCRC_32_6
Title:	Australian Sheep Breeding Values (ASBVs) - A guide for ram breeders (Version 5)
Author:	Mark Ferguson (Department of Agriculture & Food, WA and Murdoch University)
Key words:	sheep; ram buyers; ASBVs;

The Sheep CRC acknowledges the major contribution to this publication by Serina Hancock. This booklet is intended as a guide only. Every effort has been made to ensure the information contained within is factual but this cannot be guaranteed. It should be cited as:

Mark Ferguson, Department of Agriculture & Food, WA and Murdoch University (2017) - *Australian Sheep Breeding Values (ASBVs) - A guide for ram breeders (Version 5)*

Australian Sheep Breeding Values

A guide for ram buyers

Version 5

October 2017



RamSelect
.com.au



Australian Sheep Breeding Values

A guide for ram buyers

Author: Mark Ferguson (Department of Agriculture & Food, WA and Murdoch University)

Editors: Lu Hogan (Keringal Pty Ltd) & Sam Gill & Hamish Chandler (Sheep Genetics)

Acknowledgement:

The Sheep CRC acknowledges the major contribution to this publication by Serina Hancock (Murdoch University)

Design & Layout: Rhonda Brooks (Sheep CRC Ltd)

Published: October 2017

Disclaimer:

This booklet is intended as a guide only. Every effort has been made to ensure the information contained within is factual but this cannot be guaranteed.

© Sheep CRC Ltd 2017

No part of this publication is to be reproduced without the permission of Sheep CRC Ltd.

SHEEP GENETICS



Contents

Buying the right rams	1
Australian Sheep Breeding Values (ASBVs)	2
Performance Pays	3
Physical fitness is also important.....	4
Environment	5

Growth..... 6

- Weight for age (WT)

Wool 8

- Greasy fleece weight (GFW)
- Clean fleece weight (CFW)
- Fibre diameter (FD)
- Staple strength (SS)
- CV of fibre diameter (FDCV)
- Staple length (SL).....

Carcase.....18

- Carcase muscling (EMD).....
- Carcase fatness (FAT).....
- Dressing Percentage (DRESS)
- Lean Meat Yield (LMY)

Eating Quality.....24

- Shearforce (SF)
- Intramuscular Fat (IMF).....

Reproduction26

- Number of lambs born (NLB) and weaned (NLW).....

Health28

- Resistance to worms (WEC)
- Breech wrinkle (EBWR)
- Scouring and dags (DAG).....
- Breech cover (BCOV)

Strategy.....34

- Which traits for me?
- Setting some targets
- Understanding indexes.....
- What is a good ASBV?
- Understanding percentile tables.....
- Understanding accuracy.....
- Reading the genes.....

That's a wrap..... 41



Buying the right rams

Ram buying is an important part of a sheep business. Often it is only done on one day per year, so it may seem difficult to justify investing too much time in picking your rams.

Your ram buying decisions have a large and lasting impact on the profitability and sustainability of your sheep enterprise.

This guide is provided to help you understand the complexities of breeding profitable yet functional sheep that are right for your business. It focuses on how to make genetic gain in your sheep flock by selecting rams with the right Australian Sheep Breeding Values (ASBVs).

RamSelect.com.au, a new web-based app developed by the Sheep CRC, makes it simpler to search for rams with the right balance of ASBVs for your business.

RamSelect
.com.au



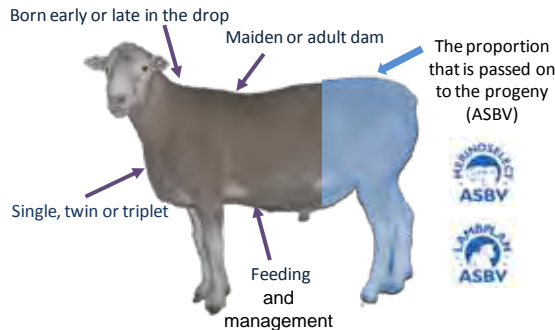
Australian Sheep Breeding Values (ASBVs)

ASBVs are available for all of the traits that matter to your back pocket.

70% of what a sheep looks like is what goes down its throat! That makes it a bit hard to work out which sheep are truly superior and will breed you the best lambs – ASBVs are a great tool to help work out which ram has the best genes to pass on to their progeny.

What you see isn't necessarily what is passed on to your lambs...

A ram's appearance is influenced by many factors:



The table below shows the effects that age of dam and birth type can have on lamb weaning weight in pure Merinos.

	Weight of lamb at weaning	
	Born as single	Born as twin
Maiden dam	29kg	25kg
Adult dam	32kg	27kg

That shows a 7kg difference in weaning weight between a single lamb from an adult ewe compared with a twin born lamb from a maiden ewe – that difference is largely due to the amount of milk that was available to each lamb. This is known as an environmental effect and it will not breed on to the progeny. ASBVs provide a measure of the animal's genetic potential independent of environmental influences that can affect the physical appearance.

Performance Pays

A real world example:

Two rams bought at auction and single sire mated to similar ewes:



ASBVs

PWT = +6.8kg
 YGFW = +10.8%
 YFD = +0.3 micron



ASBVs

PWT = +3.5kg
 YGFW = +3.8%
 YFD = +0.1 micron

Average performance of their 50 progeny		
	Ram 8500	Ram 8660
Weight at 7 months	48.8kg	43.7kg
Fleece weight at 12 months	5.0kg	4.6kg
Fibre diameter at 12 months	18.6 micron	18.4 micron
Fleece value (2011 prices)	\$56.10	\$52.85
Carcase value		
(44% dressing, \$5.50/kg)	\$118.10	\$105.75
Total value (per progeny)	\$174.20	\$158.60

An advantage of over \$15 per progeny between two apparently similar rams that cost about the same to buy. If a ram sires 300 lambs in its lifetime, that is an advantage of \$4500 just in performance to yearling age.

Add on the benefits over the lifetime of retained ewe progeny AND the genetic superiority that they will pass on to their progeny and the difference is huge.....

..... read on to find out how to make ram selection using ASBVs work for you.

See 'Proof of Profit' in 'Resources' on the Sheep Genetics website www.sheepgenetics.org.au



Physical fitness is also important

The purpose of any sheep breeding enterprise is to improve the productivity of the sheep. But, as any sheep breeder knows, there are other things that can impact on ram performance and sheep profitability.



Check list
<input checked="" type="checkbox"/> Sire: type of sheep you like
<input checked="" type="checkbox"/> Structure: legs, feet & shoulders
<input checked="" type="checkbox"/> Sound: 2 firm testicles
<input checked="" type="checkbox"/> Smile: teeth hitting the pad
<input checked="" type="checkbox"/> Suitable: right for your farm



A ram with the best figures in the world may be worth zero to you if it has a fault or is not the type of sheep that will suit your climate or enterprise. It is important to remember the fundamentals when selecting rams and make sure you buy rams with a balance of performance, confirmation and visually assessed traits. ASBVs and common sense are a perfect combination.

Environment

Does the sire suit?

Different environments put different pressures on sheep. These pressures result in the expression of genetic variability in sheep that may be masked by an environment where different pressures are applied. It is important to consider whether the environment a ram has been raised in, is sufficiently similar to your farm to allow expression of all traits that are likely to be important for you.

Wet equals worms

Wetter areas tend to be much more prone to high worm burdens. In the winter rainfall areas, these tend to be scour worms resulting in a higher likelihood of scouring and the resultant dags.

Wet equals fleece rot

Wetter areas also tend to put much more pressure on any wool sheep that are prone to fleece rot. Sheep in these high rainfall areas need to be very white and resistant to fleece rot.

RamSelect
.com.au

Is this known as GxE?

No, the fact that some sheep get worms or fleece rot in some environments but not in others is the result of some traits only being expressed when environmental conditions are sufficiently challenging. The true definition of GxE (or genetics by environment interaction) is when animals re-rank for a production trait (for example: growth to weaning) in two different environments.

Care and correlated traits

When buying rams, it is important to carefully consider whether the sheep will perform in YOUR environment. In some circumstances, even though a ram hasn't been tested in your environment, it may have ASBVs for traits that are useful in your environment and can assist with selection, such as worm egg count or fat.

RamSelect.com.au

The app allows you to rank rams for their ASBVs prior to the sale. On sale day you can focus your attention on assessing the visual traits of the rams that ranked well on your RamSelect search.

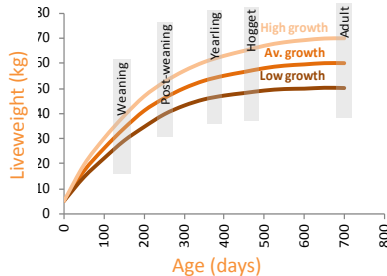


Weight for age (WT)

What to look for?

Genetic differences in liveweight reflect the growth potential of an animal to key times when animals are typically marketed. Weight is generally quoted at one of five time periods (not including birth weight BWT):

1. Weaning (WWT)
2. Post-weaning (PWT)
3. Yearling (YWT)
4. Hogget (HWT)
5. Adult (AWT)



How is this measured?

Animals are weighed by ram breeders at one or more of the time periods. Because of the relatively close correlation between weights at different ages, ASBVs for other weights can be calculated from one or two weights. For improved accuracy of the estimation of an animal's weight across the ages, animals should be weighed at as many of the key times as possible.

What do the numbers mean?

Weights are measured in kilograms and ASBVs are quoted in kilograms. ASBVs are deviations from the average of animals in the database in the 1990 drop. So, an animal with a PWT ASBV of +6kg will be 6kg heavier at post-weaning age than the average in 1990. A ram with a PWT ASBV of +6kg will pass half of this benefit onto his lambs, that is +3kg.

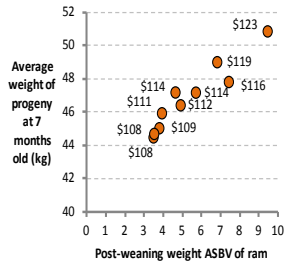
Can I see it?

The bigger sheep will tend to be the high growth sheep. But remember, birth type, age of dam and nutrition have big impacts on growth and it is easy to overlook a twin born lamb, particularly one from a maiden dam.

What's in it for me?

The main reason to select for higher growth potential is so that lambs reach heavier weights at younger ages. This allows lambs to be either marketed sooner (at the same weight) or be marketed at heavier weights (at the same age) compared with low growth lambs.

Real example, Pingelly, WA:



A group of rams were single sire mated to similar ewes. The higher PWT rams had higher liveweight progeny at seven months and higher estimated carcass value (44% dressing, \$5.50/kg). Their dollar values are shown on the graph.

Alternatively, if lambs are to be marketed at the same liveweight, growth gets them out the gate quicker. Each 1kg increase in PWT ASBV results in around eight less days to reach 45kg.

Ewes with higher weight breeding values also have more lambs. A kg increase in YWT ASBV will result in around two more lambs born per 100 ewes mated.

What else changes if I just selected for growth?

These are what we call correlations—generally if growth goes up:

The free lunches	Things to watch
Marketable at earlier ages	Fibre diameter goes up
Higher reproductive output	Mature weight goes up (increasing ewe maintenance costs)
Higher fleece weight	Lamb birthweight goes up (potential dystochia problems)
Higher lean meat yield	

BUT remember, you can manage these correlations by selecting animals based on indexes or a balance of traits that you are interested in (see index section).

Greasy fleece weight (GFW)

What to look for?

Greasy fleece weight is quoted at three ages:

1. Yearling (YGFW)
2. Hogget (HGFW)
3. Adult (AGFW)



What do the numbers mean?

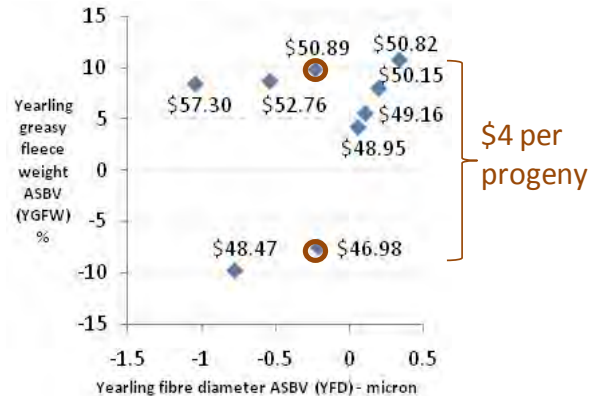
Fleece weight ASBVs are quoted in percentages. ASBVs are deviations from the average of animals in the database in the 1990 drop. An ASBV of +20% means the animal will cut 20% more wool than the average in 1990. A ram with an ASBV of +20% will pass half of this benefit onto his lambs, that is +10%.

How is it measured?

Fleeces are weighed by ram breeders at an animal's first or second shearing. For data to be eligible, wool growth must be a minimum of six months and the animal must be ten months of age when shorn.

What's in it for me?

Each dot represents the YGFW and YFD breeding values of an individual sire, the average fleece value of their progeny at their first shearing is shown. There is a \$4 per progeny difference between high and low fleece weight rams (at the same micron).



Clean fleece weight (CFW)

What to look for?

Clean fleece weight is quoted at three ages:

1. Yearling (YCFW)
2. Hogget (HCFW)
3. Adult (ACFW)



How is clean fleece weight calculated?

Clean fleece weight is calculated by multiplying the greasy fleece weight by the washing yield of a sample taken from the mid-side of the animal.

Should I select on greasy or clean fleece weight?

Ideally you should select on clean fleece weight because that is what you get paid for. However, clean and greasy fleece weight are closely correlated so selecting on greasy fleece weight is also suitable.

What else changes if I just selected for fleece weight?

These are what we call correlations—generally if fleece weight goes up:

The free lunches	Things to watch
Body weight and growth go up	Higher fibre diameter (micron)
Staple length goes up	Wrinkle score goes up
	Coefficient of variation of fibre diameter gets higher
	Fat goes down
	Reproduction goes down

BUT remember, you can manage these correlations by selecting animals based on indexes or a balance of traits that you are interested in (see index section).

Wool



Fibre diameter (FD)

What to look for?

Wool fibre diameter or micron is usually measured at an animal's first or second shearing. Fibre diameter is quoted at three ages:

1. Yearling (YFD)
2. Hogget (HFD)
3. Adult (AFD)

What do the numbers mean?

Fibre diameter ASBVs are quoted in microns and are expressed as the deviation from the average of animals in the database in the 1990 drop. The more negative the number the finer the animal. An ASBV of -1.6 means the animal will produce wool that is 1.6 micron finer than the average in 1990. A ram with an ASBV for FD of -1.6 will pass half of this benefit onto his lambs, that is -0.8.

How is it measured?

Breeders collect a representative sample of wool from the mid-side of each animal and submit it to an accredited wool testing laboratory for testing.



Can I see or feel it?

Yes, feeling the softness of the wool can be used to compare animals with some success but measurement is much more accurate. Traditionally, finer crimping wool was generally finer but bold crimping yet fine sheep are now relatively common.



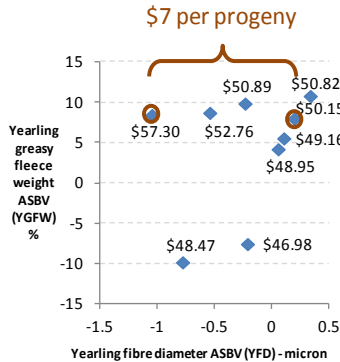
The mid-side site is known to reflect the average fibre diameter of the fleece.

What's in it for me?

Fibre diameter is a key driver of greasy wool price. Each dot represents the YGFW and YFD breeding values of an individual sire. The average fleece value of their progeny at their first shearing is shown. There is a \$7 per progeny increase in wool value from the genetically finer ram (at the same fleece weight).

Is micron all about how you feed them?

Like all traits, there is a large impact of nutrition on fibre diameter. Importantly, ASBVs can separate the genetic part from the nutritional part.



What else changes if I just selected for fibre diameter?

These are what we call correlations—generally if fibre diameter goes down:

The free lunches	Things to watch
Comfort factor improves	Lower fleece weight
	Lower bodyweight and growth
	Staple length goes down
	FDCV goes up
	Staple strength goes down

BUT remember, you can manage these correlations by selecting animals based on indexes or a balance of traits that you are interested in (see index section)

Wool

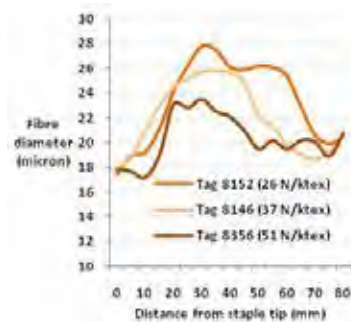


Staple strength (SS)

What to look for?

Staple strength is quoted at three ages:

1. Yearling (YSS)
2. Hogget (HSS)
3. Adult (ASS)



What do the numbers mean?

Staple strength ASBVs are quoted in newtons per kilotex (N/ktex) and are deviations from the average of the database in the 1990 drop. An ASBV of +5 means the animal will produce wool that has a staple strength 5 N/ktex higher than the average in 1990. A ram with an ASBV of +5 will pass half of this benefit onto his lambs, that is +2.5.

How is it measured?

Staple strength is measured by a machine that holds the staple at the base and tip and measures the maximum force required to break the staple. This is measured in Newtons (N). Staple thickness is then determined from the weight and length of the staple. This thickness is measured in kilotex (ktex). The force required to break the staple divided by the thickness of the staple provides the staple strength value (N/ktex).

Can I tell if a ram is likely to have low staple strength?

It is almost impossible to visually differentiate rams on their genetics for staple strength.

What's in it for me?

Staple strength is an important component of greasy wool price as it accounts for around 20% of the price received for finer wool types. Having sheep that are genetically superior for staple strength will improve wool price.



Isn't staple strength all about when I shear and how I feed them?

Like all traits there is a large impact of nutrition on staple strength because of the impact that fibre diameter profile has on staple strength. Shearing time also has a major impact and shearing close to the point of lowest fibre diameter improves staple strength. However, within sheep all managed the same way and shorn at the same time, there is large genetic variation in staple strength. Importantly, ASBVs can separate the genetic part from the management part.

What else changes if I just selected for staple strength?

These are what we call correlations—generally if staple strength goes up:

The free lunches	Things to watch
Muscling improves	Higher fibre diameter
Resistance to worms improves	
Fatness improves	
Lower FDCV	
Higher fleece weight	

BUT remember, you can manage these correlations by selecting animals based on indexes or a balance of traits that you are interested in (see index section)

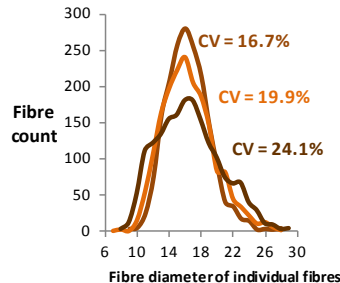


CV of fibre diameter (FDCV)

What to look for?

The coefficient of variation of fibre diameter (CV) is quoted at three ages:

1. Yearling (YFDCV)
2. Hogget (HFDCV)
3. Adult (AFDCV)



How is it measured?

Coefficient of variation of fibre diameter is a measure of the amount of variation there is between individual wool fibres within a fleece. It is measured on the same sample as fibre diameter

What do the numbers mean?

ASBVs for FDCV are quoted in percentages and are deviations from the average of animals in the database in the 1990 drop. The larger the variation in fibres in the fleece, the higher the FDCV will be and the higher the ASBV for FDCV will be. An ASBV

of -2% means the animal will produce wool that has FDCV that is 2% less than the average in 1990. A ram with an ASBV of -2% for FDCV will pass half of this benefit onto his progeny, that is -1%.

Can I see or feel it?

Low FDCV wools tend to feel softer so you may be able to subjectively tell the difference between extreme wools. However, the subtle differences that exist between animals within a flock will generally not be picked up subjectively.



What's in it for me?

Processors tend to favour wools of low FDCV because of improvements in processing and improved wearability of garments made.



The on-farm benefits of sheep with low FDCV are more likely to come through reducing the likelihood of fleece rot and therefore body strike.

Research in the 1980s showed that sheep with low FDCV are less likely to get fleece rot and fly strike.

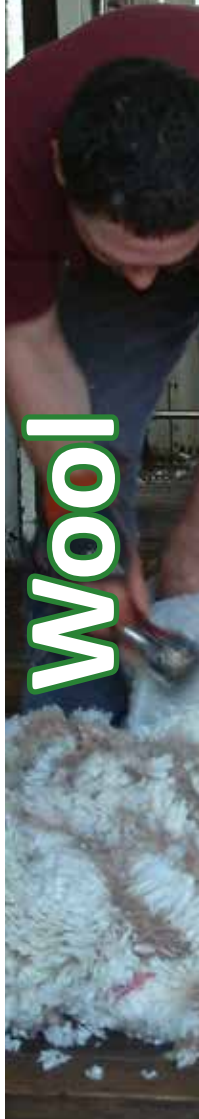
There is also emerging evidence that sheep with a lower FDCV are genetically better able to cope with restricted nutrition over summer and therefore lose less liveweight.

What else changes if I just selected for CV?

These are what we call correlations—generally if FDCV goes down:

The free lunches	Things to watch
Muscling improves	Lower fleece weight
Resistance to worms improves	
Higher fatness	
Higher staple strength	
Higher growth	
Less fleece rot/body strike	

BUT remember, you can manage these correlations by selecting animals based on indexes or a balance of traits that you are interested in (see index section)



Staple length (SL)

What to look for?

Staple length is quoted at three ages:

1. Yearling (YSL)
2. Hogget (HSL)
3. Adult (ASL)

How is it measured?

Staple length is measured using the same sample as staple strength. It is measured on a minimum of ten staples selected from a sample. Staple length can either be measured manually or by an automated machine. In both cases, the process is carried out in an accredited laboratory and the staples are measured in a relaxed state after being held straight and in a standard environment for 24 hours.

What do the numbers mean?

ASBVs for staple length are quoted in millimetres (mm) and are deviations from the average of animals in the database in the 1990 drop. The longer the staple the higher the ASBV for SL will be. An ASBV of +10 means the animal will produce wool staples that



are 10mm longer than the average in 1990. A ram with an ASBV of +10mm will pass half of this benefit onto his lambs, that is +5mm.

Can I see it?

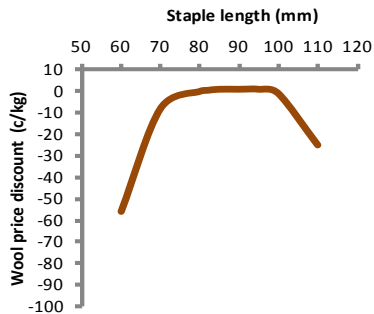
In sheep in the same mob, that have been on the same nutrition, you can visually pick those with much higher staple length. However, picking subtle differences between most of the animals is quite difficult to detect visually and much better done by machine.

What's in it for me?

There tends to be an optimum staple length at which wool price is maximised. Wool both shorter and longer than the optimum will be discounted. This is generally because processing equipment is set up to handle wool around 80 to 90mm long. However, the finer the wool, the shorter it is expected to be.

Why should I worry about staple length?

Increasing staple length is one of the key ways that fleece weights can be maintained or increased while the amount of wrinkle is reduced. Staple length can also increase fleece value at a lamb shearing, particularly if it results in the wool being combed length. It will therefore remain a priority for some producers. In addition, research in the last decade has shown that there are processing efficiencies to be gained by processing longer staple wools. Eventually growers may receive a price premium for longer staple wools. By careful management and flexible shearing times, producers are able to capitalise on the benefits of long-stapled sheep without suffering over-length discounts.



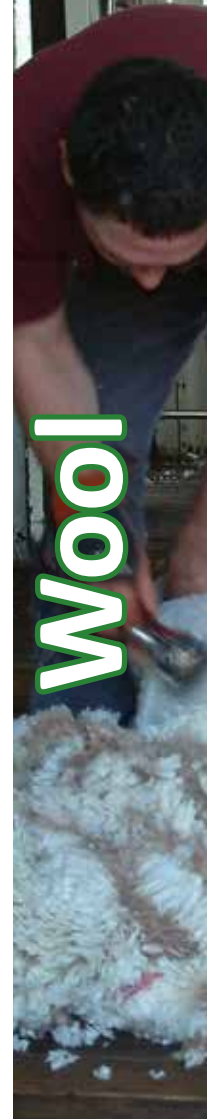
What else changes if I just selected for staple length?

These are what we call correlations—generally if staple length goes up:

The free lunches	Things to watch
Fleece weight improves	Reproduction goes down
Washing yield goes up	Fibre diameter goes up
Lower FDCV	
Higher growth	
Less fleece rot	

BUT remember, you can manage these correlations by selecting animals based on indexes or a balance of traits that you are interested in (see index section)

Wool



Carcase muscling (EMD)

What to look for?

Carcase muscling is reflected in eye muscle depth (EMD). It is quoted at one of four ages:

1. Weaning (WEMD)
2. Post-weaning (PEMD)
3. Yearling (YEMD)
4. Hogget (HEMD)



How is it measured?

The depth of the eye muscle or backstrap is measured between the 12th and 13th long ribs. The measurement is on live animals using an ultrasound. Accredited scanners undertake the work at one of the ages listed above.

What do the numbers mean?

Muscling ASBVs are measured and quoted in millimetres. As with all ASBVs, there are deviations from the average of animals in the database in 1990. So, an animal with a PEMD of +1.2 will genetically have an eye muscle 1.2mm deeper than the average in 1990. A ram with an ASBV of +1.2mm

for EMD will pass half of this benefit onto his lamb, that is +0.6mm.

Can I see or feel it?

You can see and feel differences in the muscularity between animals, but the changes associated with the EMD ASBVs are subtle and very difficult to detect. Importantly, both management and nutrition change EMD but EMD ASBVs tell you the genetics of an animal for muscling.

What's in it for me?

The main reason to select for improved muscling is to improve the value of the carcass through increasing the amount of lean meat it contains.

But there are other benefits in terminal, maternal and Merino breeding.

Higher value carcasses in lambs

More lean meat across entire carcass



More weight in the high value loin area



Less weight in the low value forequarter



Higher muscling is favourably related to reproductive rate, however the response is variable between flocks and seasons.

Higher reproductive rate in adult ewes



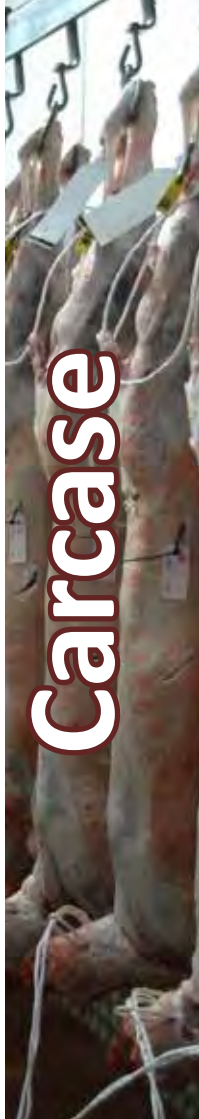
What else changes if I just selected for muscling?

These are what we call correlations—generally if eye muscle depth goes up:

The free lunches	Things to watch
Lean meat yield increases	Can result in lower growth
Shifts lean meat from the forequarter to the loin	When extreme and combined with low fat can reduce eating quality
Increases dressing percentage	
Related to improved reproductive rate	
Higher worm resistance	

BUT remember, you can manage these correlations by selecting animals based on indexes or a balance of traits that you are interested in (see index section)

Carcasse



Carcase fatness (FAT)

What to look for?

Carcase fatness is reflected by the depth of fat between the eye muscle and the skin, it is quoted at three ages:

1. Post-weaning (PFAT)
2. Yearling (YFAT)
3. Hogget (HFAT)



How is it measured?

Fat depth is measured at the same time as eye muscle, between the 12th and 13th long ribs. The measurement is on live animals using an ultrasound. Accredited scanners undertake the work at one of the ages listed above.

What do the numbers mean?

Fatness ASBVs are measured and quoted in millimetres. As with all ASBVs, there are deviations from the average of animals in the database in the 1990 drop. So, an animal with a PFAT of +0.6 will genetically have 0.6mm more subcutaneous fat than the average in 1990. A ram with an ASBV of +0.6 for PFAT will pass half of this benefit onto his lambs, that is +0.3mm.

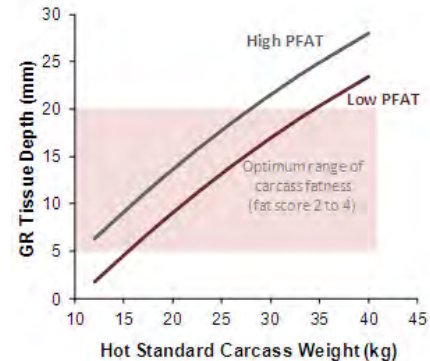
Can I see or feel it?

You can feel differences in the fatness between animals, but the changes associated with the FAT ASBVs are subtle and very difficult to detect. Importantly, management and nutrition changes FAT considerably – ASBVs tell you the genetics of an animal for fatness.

What's in it for me?

For prime lambs

Fatness is one of the few traits that has an intermediate optimum. It is possible for carcasses to be both too lean and too fat for efficient processing and different markets have different requirements.



For breeding ewes

Fat increases the ability of breeding ewes to maintain weight and condition in “tough” times. It is also favourably related to reproductive rate but the response is variable between flocks and seasons.



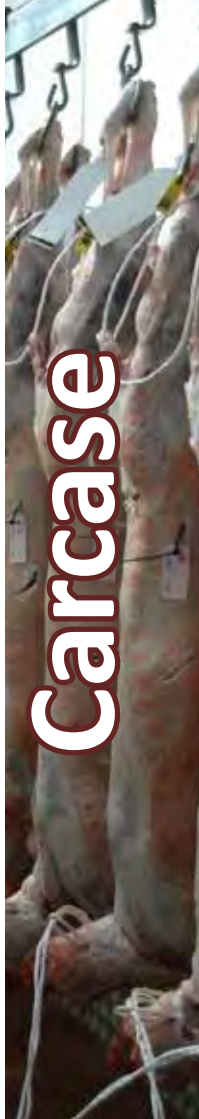
What else changes if I just selected for fatness?

These are what we call correlations—generally if fat depth goes up:

The free lunches	Things to watch
CV of fibre diameter goes down	Carcase fatness goes up
Intramuscular fat (marbling) improves	Fleece weight goes down
Eating quality improves	
Related to improved reproductive rate	

BUT remember, you can manage these correlations by selecting animals based on indexes or a combination of traits that you are interested in (see index section)

Carcase



Dressing Percentage (DRESS)

Dressing Percentage is an estimate of the carcass weight as a proportion of liveweight at slaughter. It is an important determinant of returns from lamb and sheepmeat production. ASBVs for DRESS are expressed in percentages—they are deviations from the average of animals in the database in the 2015 drop.

An animal with a DRESS ASBV of 2% will have a 2% higher dressing percentage than the average for the drop in 2015. A ram with an ASBV of 2% for DRESS will pass on half this benefit to his progeny, that is 1%.



The free lunches	Things to watch
Growth increases	Birthweight increases
Carcass weight increases	Shearforce increases
Worm resistance increases slightly	

BUT remember, you can manage these correlations by selecting animals based on indexes or a combination of traits that you are interested in (see index section)



Lean Meat Yield (LMY)

Lean Meat Yield is an estimate of the weight of lean meat in a carcass as a proportion of carcass weight. It is an important determinant of processor returns from lamb and sheepmeat. Some processors are now working towards payment systems based on measurement of LMY in the abattoir. ASBVs for LMY are expressed in percentages, they are deviations from the average of animals in the database in the 2015 drop.



An animal with a LMY ASBV of 4% will have a 4% higher dressing percentage than the average for the drop in 2015. A ram with an ASBV of 4% for DRESS will pass on half this benefit to his progeny, that is 2%.

The free lunches	Things to watch
Growth increases	Intramuscular fat decreases
Carcass weight increases	Shear force increases
	Birthweight increases

BUT remember, you can manage these correlations by selecting animals based on indexes or a combination of traits that you are interested in (see index section)

Carcass

Shearforce (SF)

Shearforce is an estimate of the force required to cut a piece of meat. The measurement is designed to simulate chewing. The more negative the shearforce measurement the more tender the meat. High quality, tender lamb products will be important in the future to maintain consumer satisfaction and willingness to pay for lamb.

ASBVs for SF are expressed in kg of force, they are deviations from the average of animals in the database in 2015. A ram with an ASBV of -1.0 requires 1.0 kg less force to cut than the average for the drop in 2015. A ram with an ASBV of -1.0 for SF will pass half this benefit on to his progeny, that is -0.5.



Measurement of shear force on cooked meat.



The free lunches	Things to watch
Birthweight decreases	Growth decreases
Intramuscular fat increases	Dressing percentage decreases
Eye muscle depth increases	Worm resistance decreases

BUT remember, you can manage these correlations by selecting animals based on indexes or a combination of traits that you are interested in (see index section)

Intramuscular Fat (IMF)

Intramuscular fat is an estimate of the chemical fat percentage in the loin muscle. It is equivalent to marbling in beef. IMF is an important determinant of lamb flavor and eating experience. Higher IMF values are associated with better flavor, juiciness, tenderness and overall liking of lamb. High quality lamb products will be important in the future to maintain consumer satisfaction and willingness to pay for lamb.

ASBVs for IMF are expressed in percentages, they are deviations from the average of animals in the database in 2015. A ram with an ASBV of 0.5 will have 0.5% more IMF than the average for the drop in 2015. A ram with an ASBV of 0.5 for SF will pass half this benefit on to his progeny, that is 0.25.



High levels of IMF - the fat in the muscle



The free lunches	Things to watch
Birthweight decreases	Growth decreases
Shearforce decreases	Carcase fat increases
Eye muscle depth increases	Dressing percentage decreases

BUT remember, you can manage these correlations by selecting animals based on indexes or a combination of traits that you are interested in (see index section)

Eating Quality

Number of lambs born (NLB) and weaned (NLW)

The reproductive rate of breeding ewes is recorded across a ewe's lifetime, with each lambing opportunity adding further information to the ASBVs for reproductive rate.

The two ASBVs used are not age specific, they are:

1. Number of lambs born (NLB)
2. Number of lambs weaned (NLW)



How is it measured?

Each time a ewe is put to the ram it is classed as a lambing opportunity. Breeders record whether each ewe became pregnant and if so, how many lambs were conceived. The number of lambs the ewe gave birth to and weaned is also recorded. So, the number of lambs born (NLB) is the number of lambs a ewe gives birth to and the number of lambs weaned (NLW) is the number of live lambs at weaning. ASBVs on rams are mainly calculated from records of their female relatives.

Should I select on NLB or NLW?

Generally, select for number of lambs weaned, as this emphasises higher lamb survival as well as the total number of lambs.

What do the numbers mean?

Number of lambs weaned ASBVs are quoted in percentages. An ASBV of +20% means that a ram will have daughters that wean 10% (because a ram only contributes half of the genetics) more lambs than the average of animals in the database in the 1990 drop.

What to look for?

Look for the highest positive values. Currently, the range in Merinos is about +31% to -17%. There is a similar range in all breeds. The higher the NLW breeding value of a ram the better reproduction you can expect from its daughters.

What's in it for me?

Reproductive performance can have a big impact on the profitability of a ewe flock, particularly when meat prices are high. The maternal central progeny test demonstrated the large variation in the profitability of sires based on the reproductive performance. The graph below demonstrates the range in gross margin in daughters from sires from just two of the breeds. Around 80% of the difference in profitability between sire groups was the effect of reproduction.



What else changes if I just selected for the Number of Lambs?

These are what we call correlations—generally if the number of lambs goes up:

The free lunches	Things to watch
Body weight goes up	Lower fleece weight
Growth goes up	Lower staple length
Wrinkle score goes down	

BUT remember, you can manage these correlations by selecting animals based on indexes or a balance of traits that you are interested in (see index section)

Reproduction



Resistance to worms (WEC)

What to look for?

Resistance to internal parasites is defined by the genetic differences in faecal worm egg count (WEC). It is quoted at four ages:

1. Weaning (WVEC)
2. Post-weaning (PWEC)
3. Yearling (YWEC)
4. Hogget (HWEC)

How is it measured?

Adult female worms inside the sheep produce eggs which pass out in the faeces. A faecal worm egg count (WEC) is a measure of the number of worm eggs in one gram of faeces. In order to get useable data for WEC, it is necessary to test individuals when the mob average WEC is high enough to be able to measure differences between individuals (>300 eggs per gram and less than 10% of samples with a zero value). Once the mob average is high enough, breeders collect individual faecal samples from all sheep in the mob. These samples are then submitted to an accredited laboratory for individual testing.

What do the numbers mean?

ASBVs for WEC are quoted in percentages, they are deviations from the average of animals in the database in the 1990 drop. So, an animal with a WEC ASBV of -25% will have a 25% lower worm egg count than the average in 1990. A ram with an ASBV of -25% for WEC will pass half of this benefit onto his lambs, that is -12.5%.

The more negative the WEC ASBV the more resistant to worms the animal will be.

Is there any other way of picking the wormy ones?

No, it is impossible to predict which animals are genetically more resistant to internal parasites. The only way to do it is using ASBVs.

What's in it for me?

There is resistance to all but the newest families of drenches on Australian sheep farms, and at some point worm resistance to these new families will also develop. It is therefore imperative to develop more permanent options to deal with worm outbreaks, particularly in areas that have significant worm problems.

In higher rainfall areas, where treating for worms and losses in production are major costs to the sheep enterprise, having animals that are genetically less likely to get a high worm burden can be invaluable.

There are a wide range of benefits including:

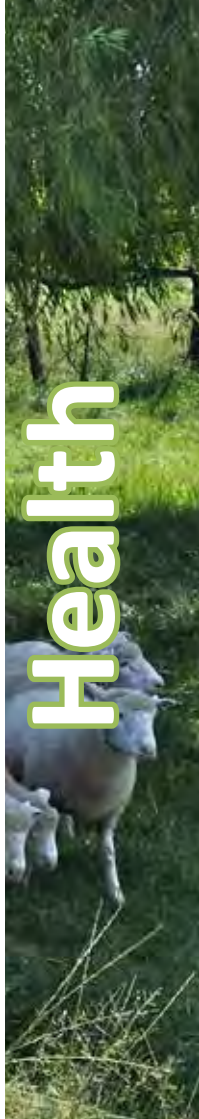
- Less drenching
 - less labour
 - less chemical usage
 - lower chance of drench resistance
- Lower losses in production from worm outbreaks
- Lower contamination of paddocks with worm eggs
 - lower challenge for young stock
 - less worms in the following season

What else changes if I just selected for lower WEC?

The free lunches	Things to watch
Higher muscling	
Higher staple strength	

BUT remember, you can manage these correlations by selecting animals based on indexes or a balance of traits that you are interested in (see index section)

Health



Breec wrinkle (EBWR)

What to look for?

Breec wrinkle is relatively consistent across ages and the only ASBV available is the early breec wrinkle trait:

1. Early birth weight (EBWR)

How is it measured?

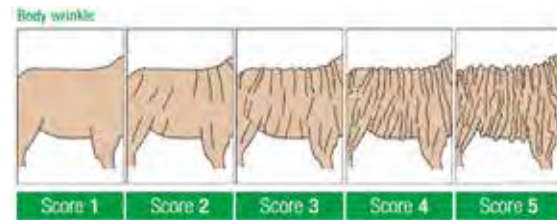
Breec wrinkle is scored by breeders either in the marking cradle on non-mulesed lambs, or off shears after weaner or yearling shearing using body wrinkle (if mulesed). Breec wrinkle is scored on a scale of 1 to 5, with 1 being an animal with no wrinkle and a 5 being an animal with excessive wrinkle.



What about body wrinkle?

There is a very strong correlation (90%) between breec wrinkle and body wrinkle. An animal with a

low EBWR will be less wrinkly over the body as well as the breec area.



What do the numbers mean?

Wrinkle ASBVs are quoted in scores and they are deviations from the average of animals in the database in the 2000 drop. So, an animal with an EBWR of -1.0 will be genetically one wrinkle score less wrinkly than the average in 2000. A ram with an ASBV of -1.0 for wrinkle will pass half of this benefit onto his lambs, that is -0.5.

Can't I just tell from looking at them?

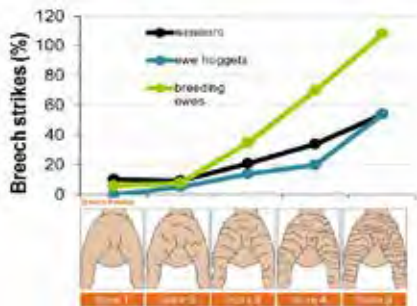
Wrinkles are obviously easy to see in animals off shears, but rams are generally sold in four to eight months of wool, making it difficult to pick the less wrinkly ones. Further complicating the issue, is the fact that skin wrinkle is on average 0.3 to 0.5 of a score higher in single born lambs than twin born lambs. It is 0.2 to 0.3 of a score higher in lambs from

adult ewes than maidens, and is 0.5 to 1.0 score higher in lambs from ewes that were fed well during pregnancy than those fed less well.

What's in it for me?

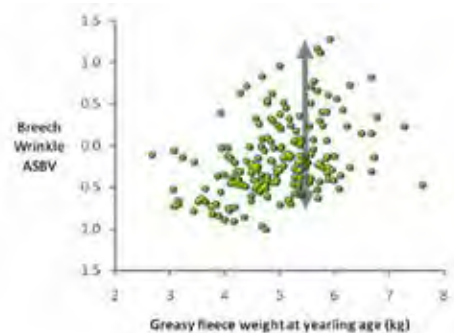
There are a few key reasons why selecting sheep with less wrinkle is a good idea. Sheep with less breech wrinkle have a lower susceptibility to fly strike. As a result sheep with lower wrinkle scores are much easier to manage in systems where surgical mulesing has ceased.

Wrinkly sheep also have lower lifetime reproductive output than plainer sheep.



What about wool cut?

In general, wrinkly sheep cut more wool but with balanced selection it is possible to select heavy cutting yet low wrinkle sheep.



What else changes if I just selected for lower wrinkle?

The free lunches	Things to watch
Higher reproduction	Lower fleece weight
Less fly strike	
Higher staple length	

Health



Scouring and dags (DAG)

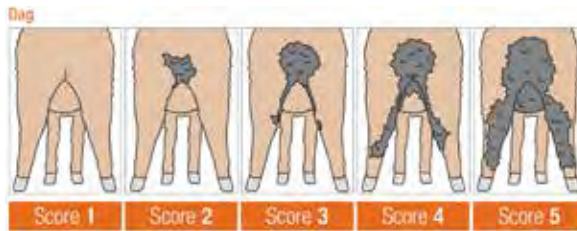
What to look for?

Sheep accumulate dags when seasonal and parasite conditions cause scouring. This can occur at any age and the ASBV that is available is the late dag trait.

1. Late dag (LDAG)

How is it measured?

Dags are scored by breeders on a scale of 1 to 5, with 1 being no dags and a 5 being an animal with excessive dags.



What do the numbers mean?

DAG ASBVs are quoted in scores and they are deviations from the average of animals in the database in the 2000 drop. So, an animal with an LDAG ASBV of -1.0 will be genetically one score less

daggy than the average in 2000. A ram with an ASBV of -1.0 for dag will pass half of this benefit onto his lambs, that is -0.5.

What's in it for me?

In winter rainfall areas the accumulation of dags can be costly. Not only is the contaminated wool of little or no value, paying contractors to remove it also costs money.

When dags are combined with the environmental conditions that suit blowflies, they are the major cause of breech strike, resulting in a large production loss as well as requiring considerable labour inputs to identify and treat sheep.

What else changes if I just selected for lower dags?

The free lunches	Things to watch
Less fly strike	
More fleece wool	
Less crutching	

Breech cover (BCOV)

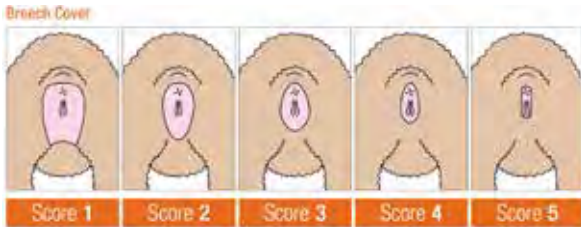
What to look for?

Some animals naturally produce less wool around the breech area (are bare breached). Breech cover can be assessed at any age but only on non-mulesed sheep.

1. Breech cover (BCOV)

How is it measured?

Breech cover is scored by breeders on a scale of 1 to 5, with 1 being a large bare area around the anus and a 5 being an animal with complete wool coverage around the anus.



What do the numbers mean?

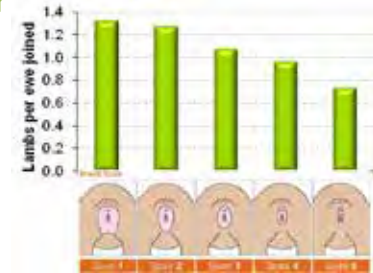
BCOV ASBVs are quoted in scores and they are deviations from the average of animals in the database in the 2000 drop. So, an animal with a BCOV ASBV of -1.0 will be genetically one breech cover score less than the average in 2000. A ram with

an ASBV of -1.0 for breech cover will pass half of this benefit onto his lambs, that is -0.5.

What's in it for me?

Breech cover is one of the indicator traits for susceptibility to fly strike. It is another string in your bow for the fight against fly strike.

Combining low wrinkle and low breech cover ASBVs can significantly reduce fly strike and reduce the reliance on surgical mulesing.



Source: Johan Greeff – AWI breech strike flocks

What else changes if I just selected for lower breech cover?

The free lunches	Things to watch
Higher reproduction	Fleece weight
Less fly strike	

Health





Which traits for me?

Which are the key traits I should focus on?

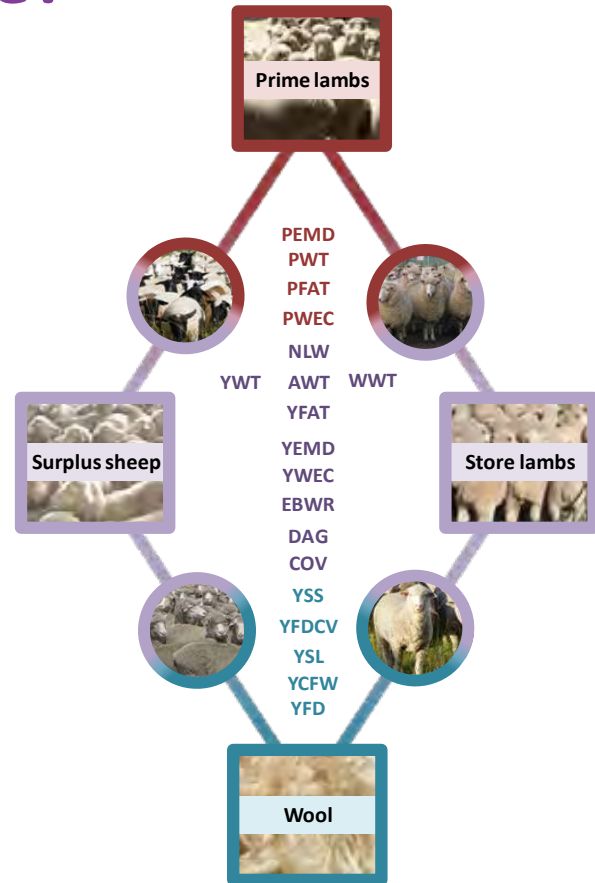
Unfortunately the answer is – that depends! That depends on your type of sheep, your production system and your target markets. Think about which traits have the potential to **MAKE** you money and also those that will **SAVE** you money.

If your production system is focused on turning off finished lambs, you will need emphasis on growth and carcass traits. Reproduction is also likely to be a profit driver.

If your production system is focused on turning off store lambs, reproduction and early growth are likely to be key traits to focus on.

If your system is focused on producing wool and some surplus sheep, wool quality and quantity should receive some emphasis.

Whatever your target production, breeding sheep that require less labour and remain healthier is important. Which traits will save time and money at your place?



Setting some targets

1. Pick your traits

Focus on the traits that are most likely to **MAKE** you money or **SAVE** you money. **REMEMBER**, you are breeding a sheep for future markets not those that prevail today. So be mindful of likely price trends and production scenarios in the future.

2. Determine where you are now

What is the current performance of your sheep? Against all the traits that you think are important, estimate your **CURRENT** level of performance. If you find yourself scratching your head, invest some time in working it out. It is pretty hard to know if things are improving if you don't know what the base line is.

3. Where do you want to be?

For each of your important traits, determine where you would like your sheep to be in ten years. It is important that these goals are specific and measurable. You will be tempted to write things down like "fast growing" or "heavy cutting", but if you don't put a number on it you have no way of measuring success. In geneticist speak this is called a breeding objective. Call it whatever you like but just make sure you do the thinking. It helps to clarify your ram buying decisions.

An example

What do I do?	Produce 19 micron wool, Merino store lambs and surplus sheep (cull ewes)					
Pick your traits	YFD	YCFW	YWT	YFAT	EBWR	YWEC
Where are you?	19	5.4kg	54kg	OK	3 score	Poor
Where do you want to be?	19	5.5kg	60kg	Sire av +1mm	1.5 score	Sire av -30%

4. Benchmark your current rams for ASBVs and set targets to reach your goal

RamSelect.com.au allows you to benchmark the current ram team ASBVs and ewe base using DNA Flock Profiling (Merino only). These benchmarks will set criteria for future ram purchases. The app allows you to search rams for sale according to your breeding objective plus ASBV criteria.

RamSelect
.com.au

Strategy



Understanding indexes

What is a selection Index?

A selection index is the combination of two or more ASBVs into a single value. Each ASBV is weighted to reflect the traits' emphasis in the breeding objective. Selection indexes are available for Merino, Dohne, maternal, and terminal production systems. An example is outlined below.

Which index is right for you?

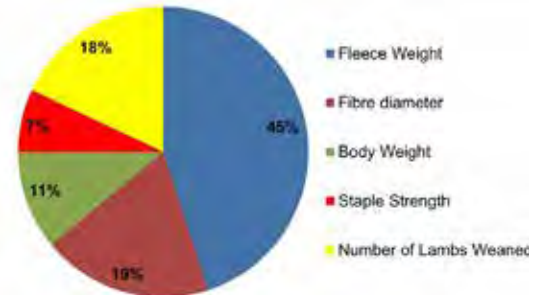
When using an index, it is important to ensure that the traits that make up the index are the desired traits for YOUR breeding objective, and that the effects on those traits are moving in the desired direction (upward or downward pressure). It is important to look at the traits in an index and the likely genetic response to the index to determine if it is well matched to your breeding direction.

What are the benefits of an index over individual traits?

The right index can be very useful in making ram buying decisions because it reduces the amount of information you need to process. It basically provides

one value for the overall breeding value of the ram. Importantly, an index also takes into account the correlations between traits and enables you to make progress on a range of traits even though there may be an unfavourable correlation between some of them.

A Merino example: the MP+ Index



RamSelect.com.au

RamSelect.com.au allows you to select a standard industry index as a starting point. You can then adjust emphasis on traits according to your needs.

For more information on indexes see 'Resources' on the Sheep Genetics website www.sheepgenetics.org.au

What is a good ASBV? – Understanding percentile tables

What is a good ASBV?

When buying rams it is important to know your target ASBV values. For example, should I only buy rams that are greater than 10% for YCFW? The right targets will depend on your individual enterprise, the performance of the rams already at home and the direction that you wish to move the flock's performance. The percentile band table shows you the spread of performance across industry for each trait and allows you to benchmark individual rams.

Percentile band tables

Percentile band tables are regularly published by SHEEP GENETICS and can be downloaded from their website. They provide a snap shot of the genetic variability within the current drop for all of the key production traits. They enable you to see the range of ASBVs for each trait across industry. They allow you to make judgement on the genetic merit of the animals in the sale catalogue for your breeding objective.

It is important to note that a percentile band table only allows for comparison of sheep among their breed or breed groups.

An example of a percentile band table is given below for Merino production systems. The circle around the YCFW value at 16.9% shows that the top 20% of animals in the data base are above 16.9% for YCFW.

	YCFW	YFD	YSS	MP+
Top 10%	20.3	-2.1	3.1	156
Top 20%	16.9	-1.7	2	148
Top 30%	14.4	-1.4	1.2	142
Top 40%	12.1	-1.2	0.6	137
Average	10	-1	-0.1	133
Bottom 10%	-4	0.1	-3.5	114

RamSelect.com.au graphically benchmarks rams for sale and your current ram team against the relevant percentile band table.

Strategy

Understanding accuracy

What is accuracy?

All ASBVs are quoted with an accuracy. The accuracy of an ASBV is a measure of how sure you can be that the ASBV reflects the true breeding value of the animal. The more information available on an animal, its progeny and its relatives, the closer the ASBV will reflect the true breeding value and the higher the accuracy will be.

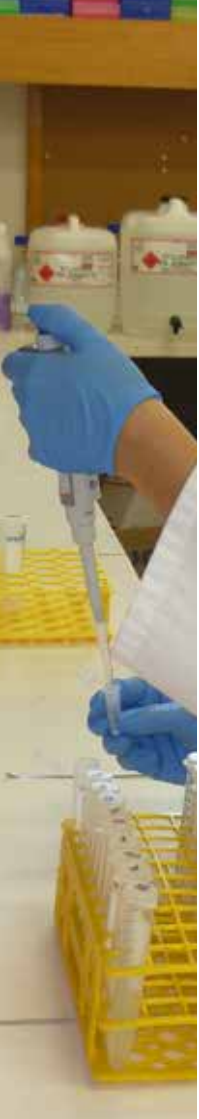
What do the numbers mean?

Accuracy is quoted as percentage, an accuracy of 100% would mean that the ASBV is the same as the true breeding value of an animal. The lower the accuracy quoted, the wider the range is around the ASBV where the true breeding value may sit.

The potential difference (either higher or lower) that the true breeding value MAY be from the ASBV across a range of accuracies and traits.

Accuracy level	PWT (kg)	YWT (kg)	YFAT (mm)	YEMD (mm)	NLW (per 100 ewes)	YGFW (%)
40%	2.6	2.9	1.2	1.0	13	0.35
50%	2.5	2.8	1.1	0.9	12	0.33
60%	2.3	2.6	1.0	0.8	11	0.30
70%	2.0	2.3	0.9	0.7	10	0.27
80%	1.7	1.9	0.8	0.6	9	0.23
90%	1.2	1.4	0.6	0.5	6	0.16

So, an animal with a YWT ASBV of 6kg and an accuracy of 70% would have a true breeding value between $6 - 2.3$ and $6 + 2.3$, i.e. 3.7 & 8.3kg.



What is accuracy influenced by?

The more information available on an animal, the higher the accuracy. Some of the key factors that influence accuracy are:

- Amount of performance information available on the animal
- Number of progeny and other relatives that have performance information
- Accuracy of the parents' ASBVs
- Correlations between the trait reported and other measurements
- Heritability of the trait.

So, an animal with a lot of pedigree information and a good history of measurement will have ASBVs with higher accuracy than an animal with sire only pedigree. Once animals have progeny on the ground, accuracy is greatly improved.

Does accuracy matter?

If the accuracy of the ASBV does not meet Sheep Genetics thresholds, then the ASBV will not be published.

Finding rams with high accuracy needs to be balanced with finding rams with higher genetic merit. It is generally advisable to use young sires with lower accuracy but higher genetic merit to ensure genetic gain. The higher the number of sires in a team, the higher the likelihood they will breed to their average ASBV (because each ram is equally likely to move up or down) and accuracy will be less important.

For commercial ram buyers, you can be confident that published ASBVs have adequate accuracy for selecting a team of rams.

Reading the genes

The genomic era is well and truly upon us, and with it the ability to predict a sheep's performance from DNA testing.



The ovine 50K SNP chip

How will DNA testing help?

Animals can be tested at a young age and the information combined with pedigree and measured information to increase the accuracy of ASBVs and indexes. This allows:

- More accurate selection (particularly on hard to measure traits or those that only occur later in life)
- A shorter generation interval (because animals can be selected accurately and used at a young age)
- Faster rates of genetic gain in the stud.

What do ram breeders have to do?

To do a genomic test all the ram breeder needs to do is to take a drop of blood or a tissue sample from each animal. This sample is then sent for testing. The results from this test are then returned to Sheep Genetics and combined with other data to enhance the quality of ASBVs.



How will I use them?

For ram buyers, the process of identifying the right rams remains unchanged. The genomic information provided from the SNP chip test will be sitting in behind the ASBVs for an individual animal. The information is essentially an enhancement of normal ASBVs leading to faster rates of genetic gain within the stud.

That's a wrap.....

Breeding sheep isn't that complicated but consistently breeding profitable ones isn't that easy!

Successful commercial sheep producers have a simple strategy and stick to it. Buying genetically superior rams that fit the breeding objective is part of the strategy.

In Australia, we are very fortunate to have the world's leading genetic evaluation systems for sheep in DOHNE, LAMBPLAN and MERINOSELECT. The ASBV data generated is used in the RamSelect.com.au app to make selecting the right rams easier.

However, it is important to keep in mind that ASBVs are a tool for breeding sheep, they do not provide all of the answers. There is still a need for good sheep people that can cull sheep that will not be functional in a commercial production system regardless of how good the ASBVs are.

Breeding functional but profitable sheep is all about common sense, it is about using a good balance of:

1. Performance figures
2. Resilience to disease
3. Functional traits that can only be seen in the classing race.

Missing out on any one of these three criteria will result in a less desirable outcome for commercial sheep producers.

Decide on what you want to produce and select the rams that will deliver.

**Remember ASBVs
and common sense
are the perfect
combination!**





RamSelect

.com.au

SHEEP GENETICS



PO Box U254
University of New England
Armidale NSW 2351
Phone: + 61 2 6773 2948
Fax: + 61 2 6773 2707

Website: www.sheepgenetics.org.au



SHEEP CRC

W47, CJ Hawkins Homestead
University of New England
Armidale NSW 2351
Phone: + 61 2 6773 1317
Fax: + 61 2 6773 1400

Website: www.sheepcrc.org.au



Australian Government
Department of Industry,
Innovation and Science

Business
Cooperative Research
Centres Programme

