

SHEEP GENETICS AUSTRALIA

• **mia** • **australian wool innovation** •
MEAT & LIVESTOCK AUSTRALIA • limitec

Sheep Genetics

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Optimising Production

Specific Market Targets
 +
 Environment (Nutrition)
 +
 Genetics (Rams + Ewes)

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POOR GENETICS IS LIKE STARTING A JOURNEY WITHOUT A MAP ...

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The SHEEP Industry Issues and challenges

Now 15 years

2006 2020

SMEQ for all lamb and mutton
 Animal Welfare concerns
 SHEEP SNPs and CHIP
 First gene markers
 Resistance to drenches
 Phase out mulesing
 Sheep Environmental IMPACT
 OH&S Labour shortages

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The Impact of Sire Selection

Maternal Great - Grand Sires (12.5%)
 Maternal Grand Sires (25%)
 Sires (50%)

87% of genetic composition of flock (meat and wool) is determined by the sires used over the last 3 generations (10 years)

GENETIC Product pipeline

Basic '3' Applied '2' Demonstration '1' Delivery '0'

DNA sequencing
 Gene discovery
 Mutants
 New traits (Wool and Meat)
 Molecular breeding values
 Temperament and EQ
 Wether and ewe trials
 Selection Demonstration

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Background to SGA

- Genes sets the potential
- Genetic improvement needs to occur across:
 - wool, meat, reproduction, & disease resistance traits
- Breeding values allows variation to be characterised to facilitate genetic improvement
- The problem
 - Disparate breeding values in the Merino industry
 - Different language used in different sectors

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SGA development

- Strong industry involvement
- A single national approach to breeding value estimation
- One national language
- QA assurance to underpin the integrity of the system
- Linkage and accuracy standards

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SGA Core Principles

- Breeding values must be
 - accurate, credible, consistent and accessible
- A range of traits that suits market targets for the whole spectrum of the Australian Sheep Industry
- SGA must be a tool for the sheep industry to be used in context with other information and breeding practices

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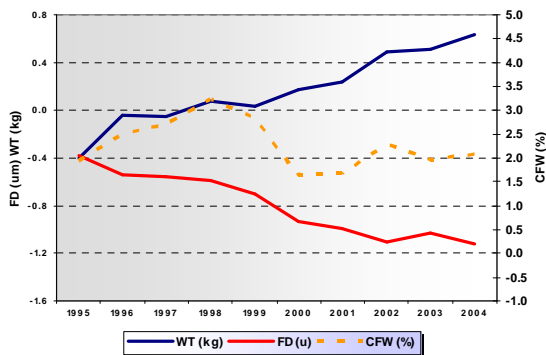
SGA brands

- LAMBPLAN
 - Terminal sire (across flock & breed)
 - Maternal (across flock within breed)
 - MERINOSELECT (across flock within Merino)
- Others breeds have the option to join SGA

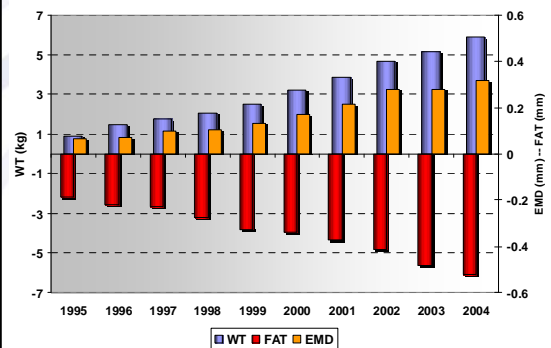


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MERINOSELECT Genetic Trends



LAMBPLAN Terminal Genetic Trends



SGA will evaluate 2.5M animals

- Terminal 1,134,000 sheep
- Maternal 327,000 sheep
- Merino 1,000,050 sheep

Merino data from

- Merino Genetic Services,
- Advanced Breeding Services
- Merino Benchmark
- Select Breeding Services
- Merino Superior Sires
- Private service providers

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Australian Sheep Breeding Values (ASBVs)

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Calculating Breeding Values



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Environmental (non-genetic) effects

- management group
- sex
- birth date
- birth type
- rearing type
- age of dam

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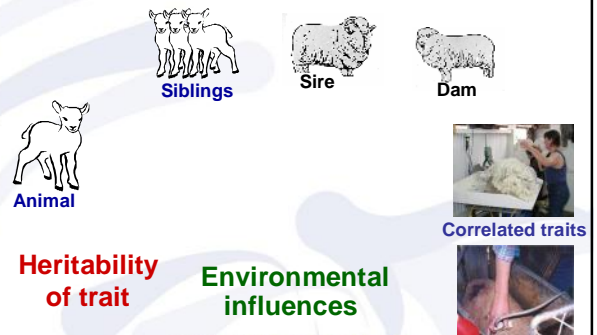
Single versus Triplet



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Calculating Breeding Values



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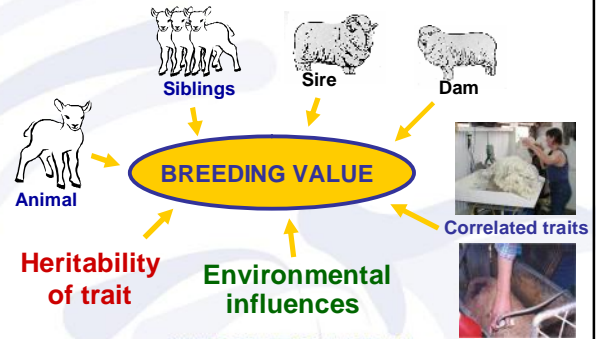
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Higher heritability = more progress

Trait	Heritability
Fleece weight	+++
Fibre diameter	+++
Staple Strength	++
Growth	++
Carcase traits	++
FEC	++
Reproduction	+

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Calculating Breeding Values



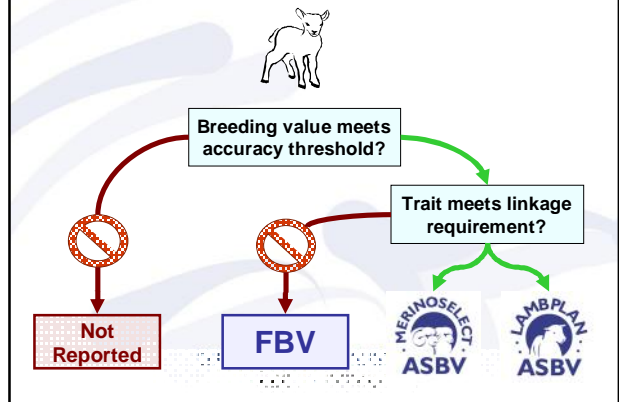
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SGA describes many genes needed

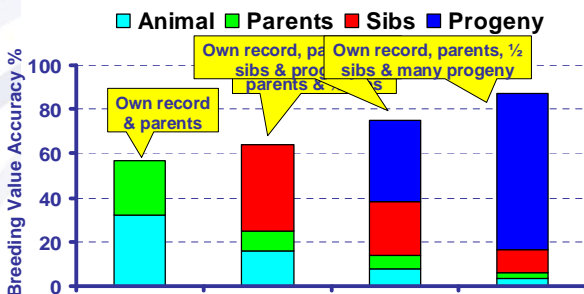
AGE	CARCASE		WOOL		HEALTH	REPRODUCTION	
	Weight	FAT & EMD	Weight	Quality	FEC	Scrotal Circ.	Lambs born & weaned
Birth	ū						
Weaning	ū				ū		
Post Weaning	ū	ū			ū	ū	
Yearling	ū	ū	ū	ū	ū	ū	
Hogget	ū	ū	ū	ū	ū	ū	
Adult	ū		ū	ū			ū

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ASBV or FBV ?



Relative contribution to an ASBV

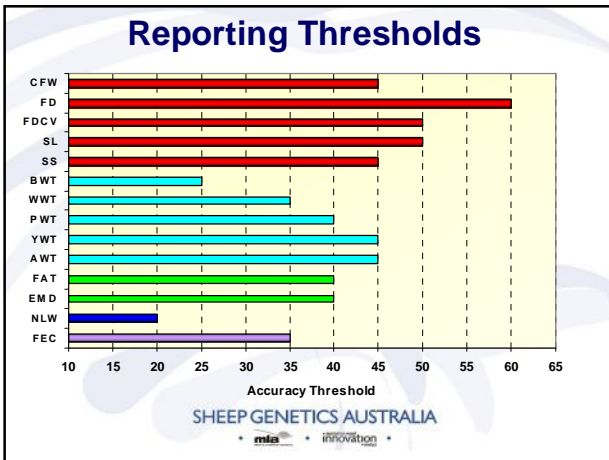


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Accuracy is influenced by

- heritability of the trait
- size of the group in which the animal is compared
- number sires in the group
- correlation between the trait reported and other records available
- accuracy of parents ASBVs
- amount of performance information available on the animal itself and its relatives

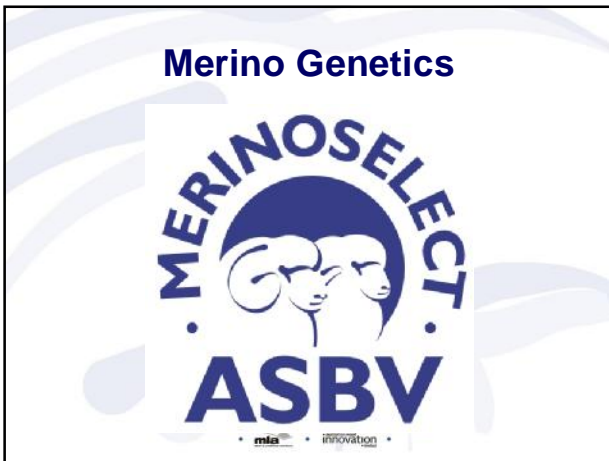
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Percentile Band Table

A quick reference to where a ram ranks

Percentile	BWT	PWWT	PFAT	PEMD	PFEC	Carcase +	Trade
Top Value	-0.8	17.1	-2.6	4.2	-1.89	227	114.2
Top 5%	-0.2	10	-1	1.4	-0.35	177	108.6
Top 10%	-0.1	9.1	-0.9	1.1	-0.21	169	107.8
Top 20%	-0.1	7.9	-0.7	0.8	-0.1	159	106.8
Top 30%	0	7	-0.6	0.6	-0.05	152	106
Top 40%	0	6.2	-0.4	0.4	-0.01	146	105.3
Top 50%	0	5.4	-0.3	0.2	-0.02	140	104.6
Top 60%	0.1	4.6	-0.2	0	0.05	135	103.9
Top 70%	0.1	3.7	-0.1	-0.1	0.09	128	103.2
Top 80%	0.2	2.7	0	-0.3	0.14	121	102.3
Top 90%	0.2	1.3	0.2	-0.6	0.21	111	101.1
Bottom	1	-8.5	2	-3.1	2.64	55	92.1



The perception was that

Merinos were genetically;

- Less fertile
- Poorer milk and maternal ability
- Slower growing
- Less heavily muscled
- Less subcutaneous fat

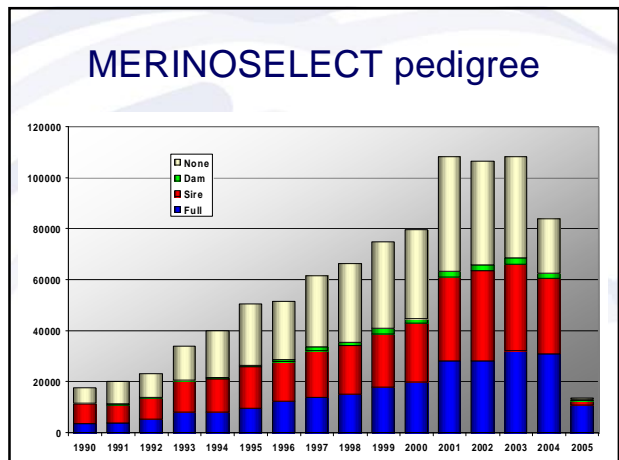
Can we enhance these traits ?

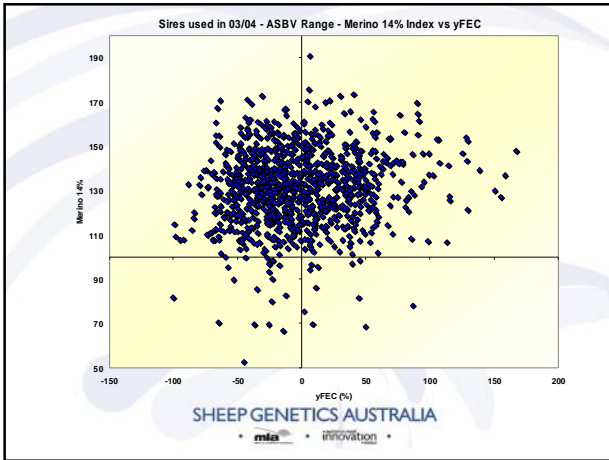
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MERINOSELECT Correlations

	yFD	yCFW	yWT	yEMD
yFD	0.60	0.20	0.20	0.00
yCFW	0.27	0.35	0.25	0.00
yWT	0.21	0.31	0.40	0.17
yEMD	-0.02	0.02	0.40	0.30

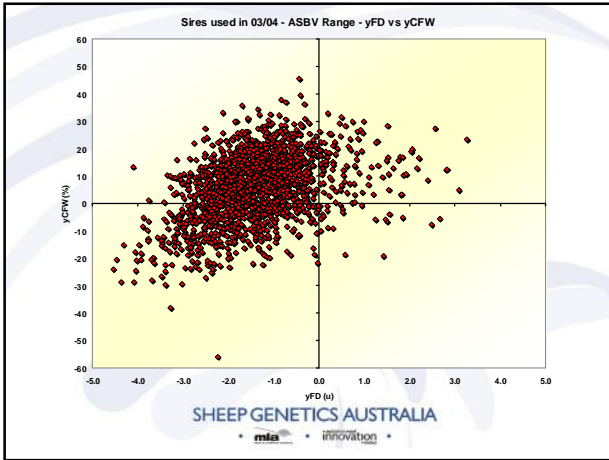
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MERINOSELECT 2004 drop ASBV range (132,720 Merinos)

Trait	Range
yWT	27.3 kg
yFAT	5.7 mm
yEMD	6.5 mm
ySC	9.8 cm
NLW	44%
yFEC	270 %
yFD	7.7 u
yCFW	74 %
yFDCV	8.7 %
ySL	46 mm
ySS	23.5 N/ktex

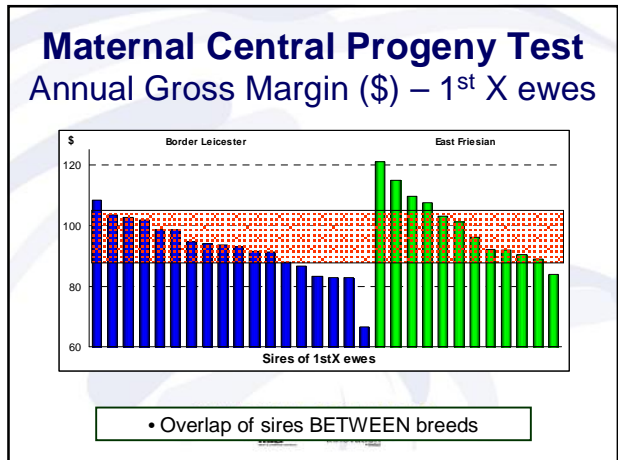


Maternal (Sire of Dam) Genetics

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The Maternal EWE BLUEPRINT

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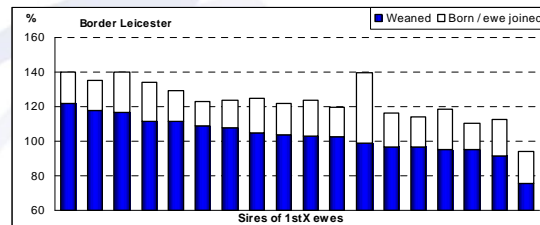
What is a top maternal sire worth?

Top BL vs Average of 91 Sires

Gross Margin / 1stX ewe / yr	+\$20	(+20%)
Lambs Weaned (1stX NLW)	+18 %	
Lamb growth (2ndX PWWT)	+2.2 kg	(+5%)
Carcase fat (2ndX PFAT)	-0.7mm	(-4%)
Wool weight (1stX YCFW)	+0.1kg	(+3%)

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Fertility - Lambs born & weaned – 1st X ewes

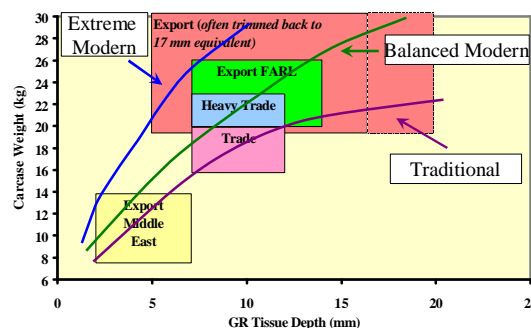


- Range of >40% weaned - sires within breeds
- Overlap of sires between breeds
- Survival rates differ between sires

Terminal (Prime Lamb) Genetics



The challenge of using the right ram



Terminal sire traits that drive prime lamb production

1. Growth
2. Fat depth
3. Eye muscle depth
4. Other
 1. Birth weight
 2. Lambing ease
 3. Faecal egg count

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Key traits for prime lamb production

- pWT – Post weaning weight
– Growth at 7.5 months of age
- High growth rate means more weight for age or earlier turn-off at target weight
- High growth rate lambs are more feed efficient

More growth is better, but watch birth weight

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Key traits for prime lamb production

- **pFAT – Post weaning fat depth**
 - Genetic difference in fat depth in a 45kg live weight animal
- **Use pFAT ASBVs to tailor fat depth for your market**
 - Beware of extremes of fatness or leanness
- **Excess fat is inefficient use of feed**
 - It takes 4 times more energy to produce 1kg of fat than it does to produce 1kg of muscle

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Key traits for prime lamb production

- **pEMD – Post weaning eye muscle depth**
 - Genetic difference in eye muscle depth in a 45kg live weight animal
- **EMD is positively related to loin weight and the proportion of muscle in the loin and hind-quarter of the carcass**
- **Positive muscle with negative fat is even better for feed efficiency in growing lambs**
- **Variation in expression remains constant across environments**

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Indexes

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Standard index options

- **SGA will produce standard indexes**
 - Merino
 - 14% MP, 7% MP and 3% Dual Purpose
 - Terminal
 - Carcase Plus, Trade \$ and Export \$
 - Maternal
 - Breed specific \$ indexes

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Indexes

You get top ranked sires when you buy high index ranked rams

but is this the right ram for YOU ?

Index	PWWT	PFAT	PEMD
169	+8.1	-1.1	+0.3
169	+8.2	+0.1	+2.1

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We love our Lamb