Understanding ASBVs & EBVs to improve enterprise profitability

Geoff Duddy

(Sheep Solutions)

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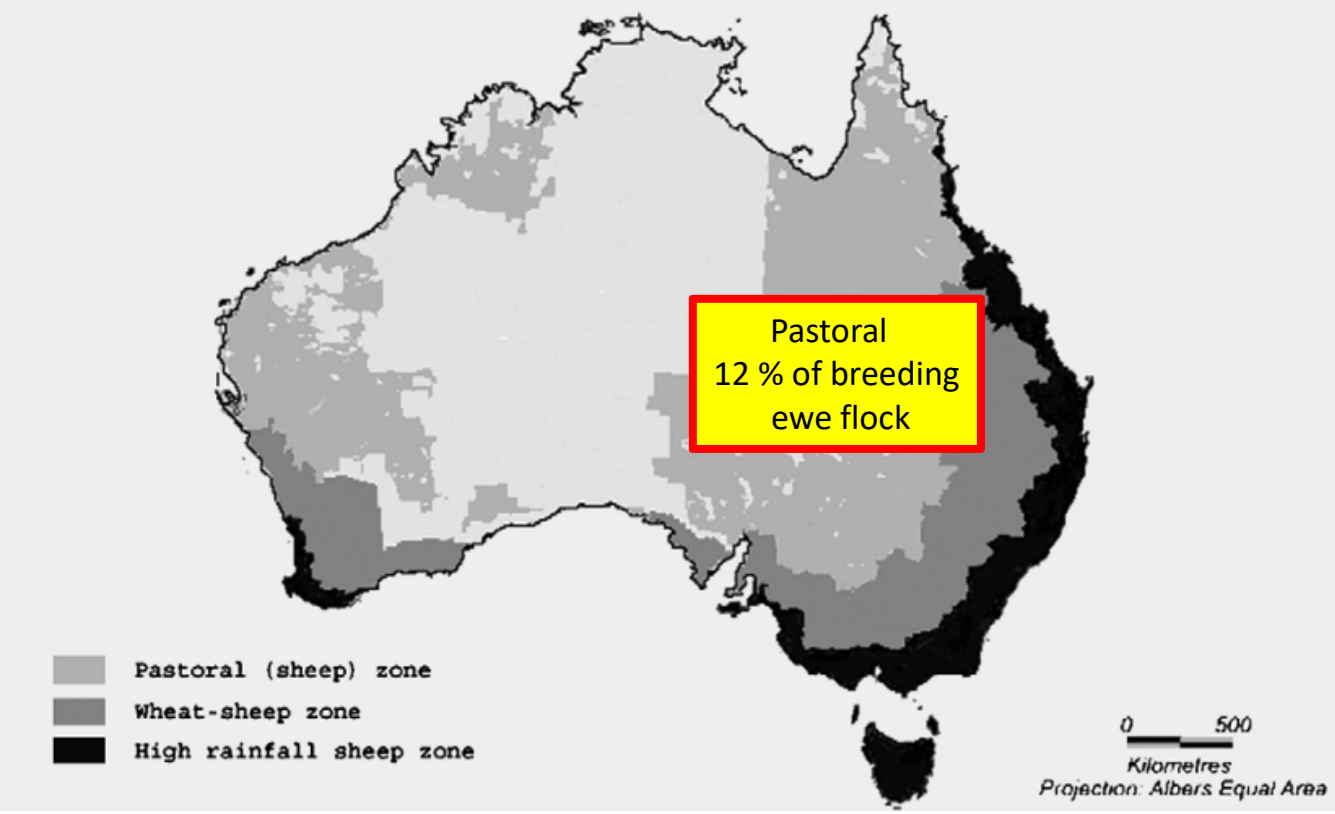

75 to 80% of the area dedicated to sheep and wool production falls within the Pastoral or Rangeland Areas.

The zone is a valuable replacement ewe, store lamb and wether resource.

Harle, K.J et al (2006)
The potential impact of climate change on the Australian wool industry by 2030

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Pastoral/Rangeland Areas

- There is an increasing likelihood of impacts on production due to climate change/variability
  - heat stress may impact on fertility and embryo/lamb survival,
  - there may be a reduction in growth rates due to appetite suppression and a reduced feed base feed value and/or availability.

- Genetics can play an increasingly important role in future years. There are tools available now for producers to mitigate many of the regions 'issues' and the effect of a changing climate.

What are EBV's/ASBV's

- An animal's breeding value is its genetic merit, half of which will be passed on to its progeny.
- The appearance and performance of an animal is a combination of its **genes** and the **environment** in which it is raised.

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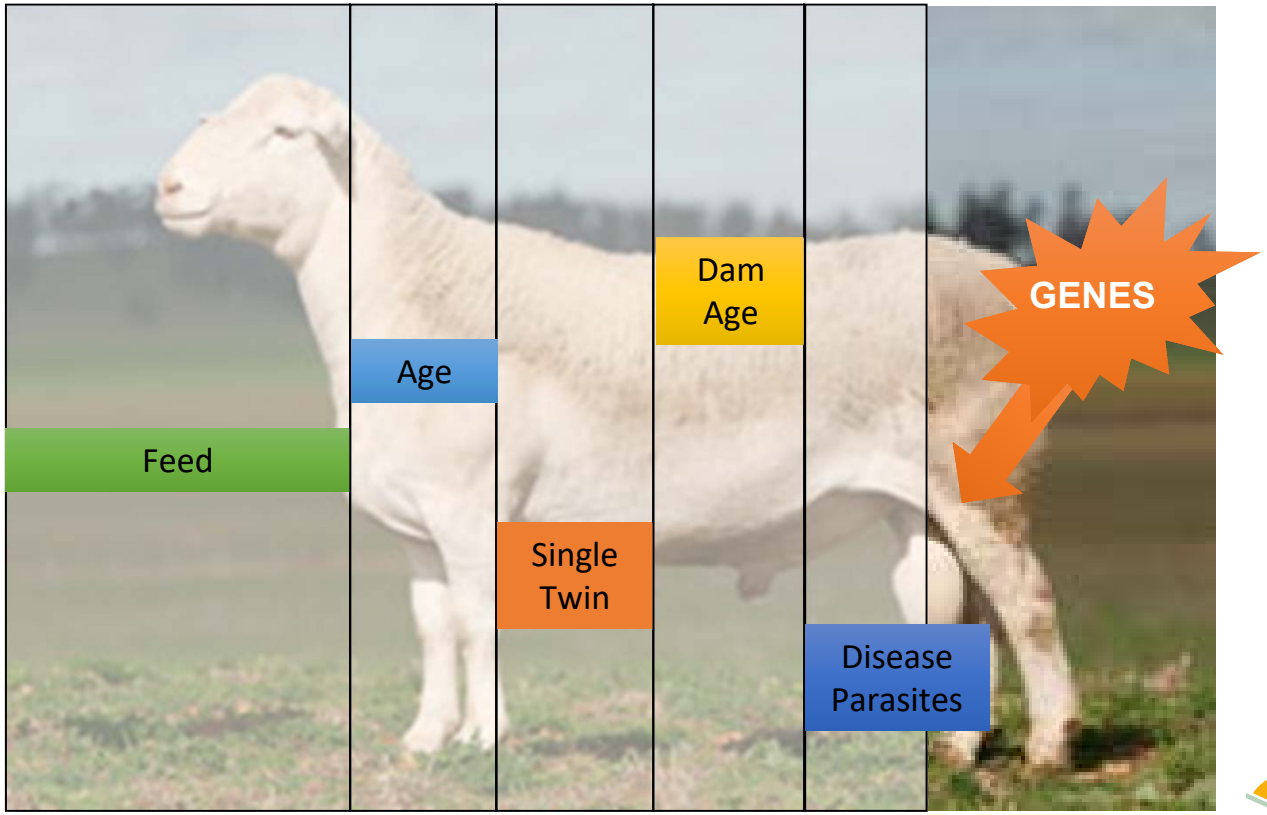
What influences an animals performance?



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What are EBV's/ASBV's

- **Estimated Breeding Values** (EBVs) and **Australian Sheep Breeding Values** (ASBV's) are generated from pedigree and performance data of a sire's progeny and family.
- Raw measurements on animals are adjusted for differences in environment (such as birth date and type, age of dam, sex, rearing type etc) and management groups.
- The aim is to determine how progeny would have performed if they had all been born as singles on the same day and raised in exactly the same way.

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Which would you buy?

	Birth Wt	PwWT	Pfat	Pemd
Single	0.21	12.0	-0.5	1.8
Triplet	0.28	12.2	-0.9	1.8

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

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What are EBV's/ASBV's

- Traits are expressed as an abbreviation of the trait name
  - **Wt** = weight
  - **EMD** = eye muscle depth
  - **CFW** = clean fleece weight
- Trait EBV's/ASBVs are based around 0. This baseline represents the average of traits in 1990 and 2000 for Terminal and Merino/Dohne databases.
- ASBVs are expressed as either positive or negative deviations from an average. Negative ASBVs are not always bad

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What traits are available with EBV's/ASBV's

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- Birth Weight
- Weaning, Post Weaning, Yearling, Hogget and Adult Weights
- Maternal Weaning Weight
- Fat, Eye Muscle Depth
- LMY and IMF
- Dress and ShrF5
- Number of Lambs Born
- Number of Lambs Weaned
- Scrotal Circumference

- Fleece Weight (clean and greasy)
- Fibre Diameter
- Diameter CoV
- Staple Length
- Staple Strength
- Curvature
- Scouring and dags
- Breech wrinkle and cover
- Worm Egg Count

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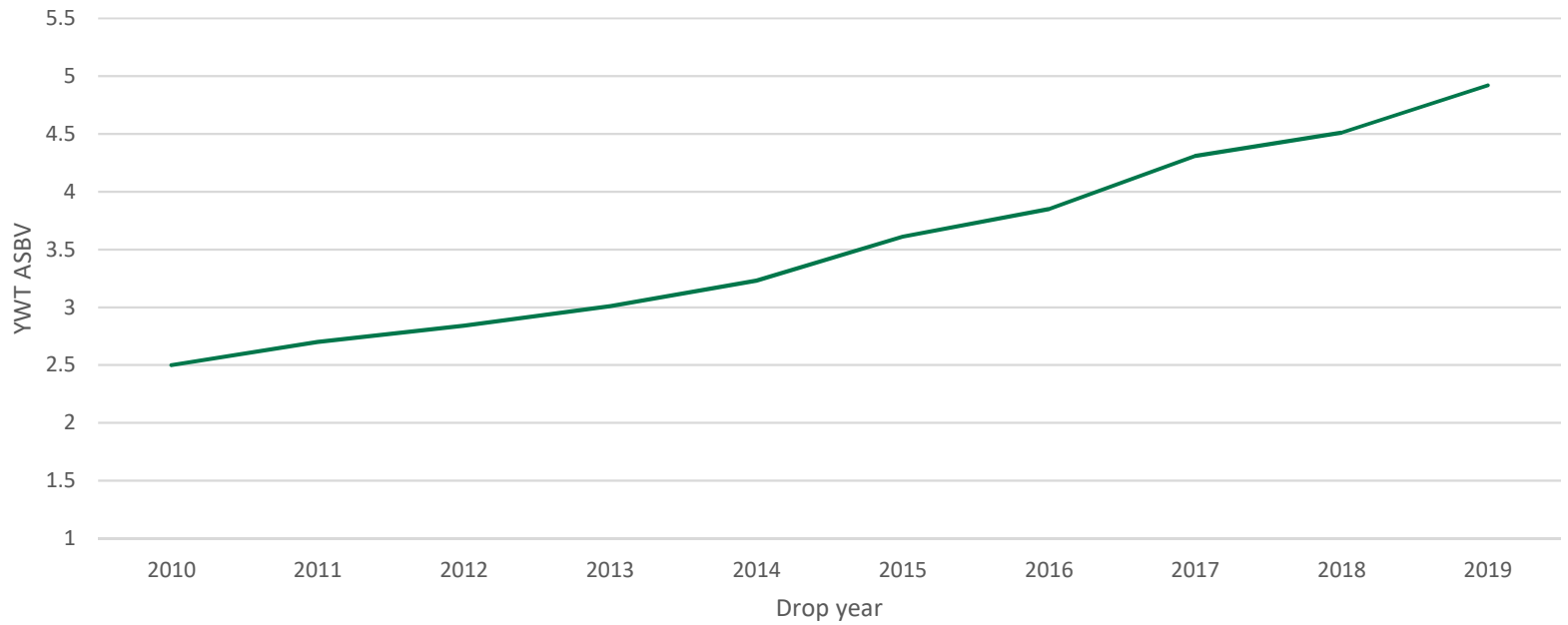
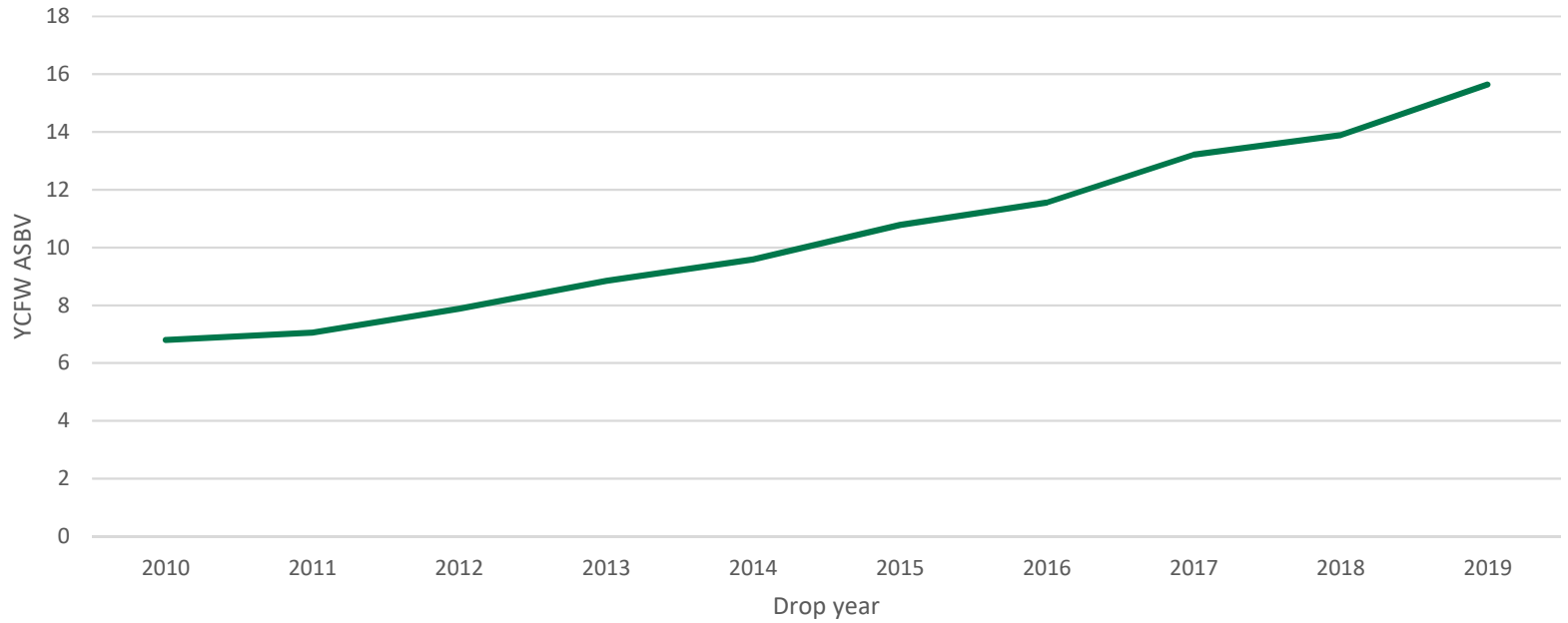
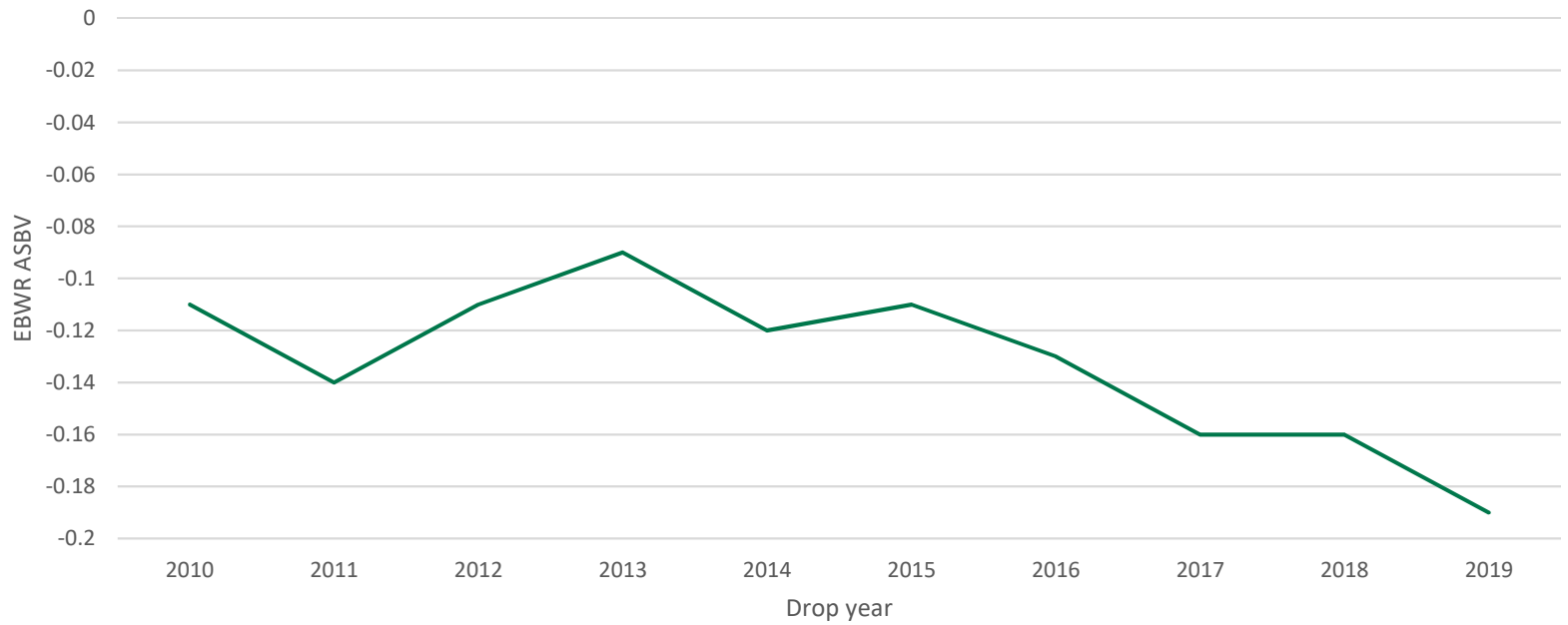
Yearling weight (YWT) - MERINOSELECT



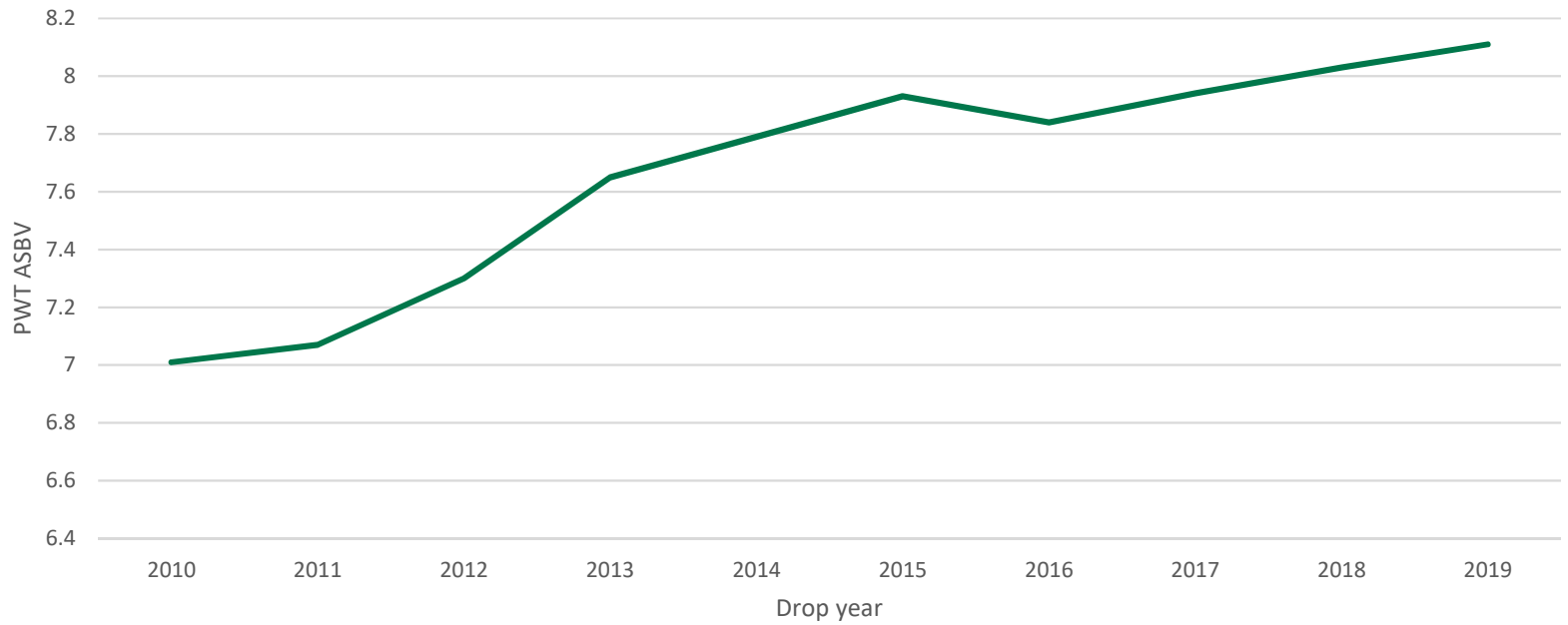
Yearling clean fleece weight (YCFW) - MERINOSELECT



Early breech wrinkle (EBWR) - MERINOSELECT



Postweaning weight (PWT) – Terminal Shedders



What traits are available with EBV's/ASBV's

- Calving Ease Direct
- Calving Ease Daughters
- Birth Weight
- Gestation Length
- Scrotal Size
- Days to Calving
- 200 Day Growth
- 400 Day Weight
- 600 Day Weight
- Mature Cow Weight
- Milk

- Carcase Weight
- Eye Muscle Area
- Rib Fat
- Rump Fat
- Retail Beef Yield
- Intramuscular Fat
- Net Feed Intake (Feedlot)
- Soundness
- Claw Set
- Foot Angle
- Docility

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What traits are available with EBV's/ASBV's

- Birth Weight
- Weaning, Post Weaning, Yearling, Hogget and Adult Weights
- Maternal Weaning Weight
- Fat, Eye Muscle Depth
- LMY and IMF
- Dress and ShrF5

- Number of Kids Born
- Number of Kids Weaned
- Scrotal Circumference
- Worm Egg Count
- Angora's
  - Fleece Weight (clean and greasy)
  - Fibre Diameter
  - Staple Length
  - Staple Strength

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Background:

- **Sheep Genetics Australia** (SGA) is the national genetic information and evaluation service for the meat (Lambplan), wool (Merinoselect, Dohne) and goat (Kidplan) sectors.

- **Breedplan** was developed by the UNE's Animal Genetics & Breeding Unit (AGBU) and is managed by the Agricultural Business Research Institute (ABRI).

- Neither Breedplan nor Kidplan can be used to compare between breeds due to limited across-breed linkages.

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Understanding the 'terms'

Age based prefixes

- **B**irth
- **W**eaning (6-16 weeks)
- **P**ost-weaning (7-10 months)
- **Y**earling (10-13 months)
- **H**ogget (13-18 months)
- **A**dult (>18 months)
- **E**arly or **L**ate

BWt	= Birth Weight
PFat	= Post-weaning fat depth
YCfw	= Yearling clean fleece weight
EBWr	= Early Breech wrinkle

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Percentile Bands

- Percentile bands show the range of ASBVs across all animals in the current year drop.

- This allows you to see where an animal ranks for that trait within the breed or analysis group.

- For example, if an animal's trait EBV/ASBV
  - is in the **1st percentile** it is one of the highest performing animals for that trait,
  - if in the **50th percentile** it is around average

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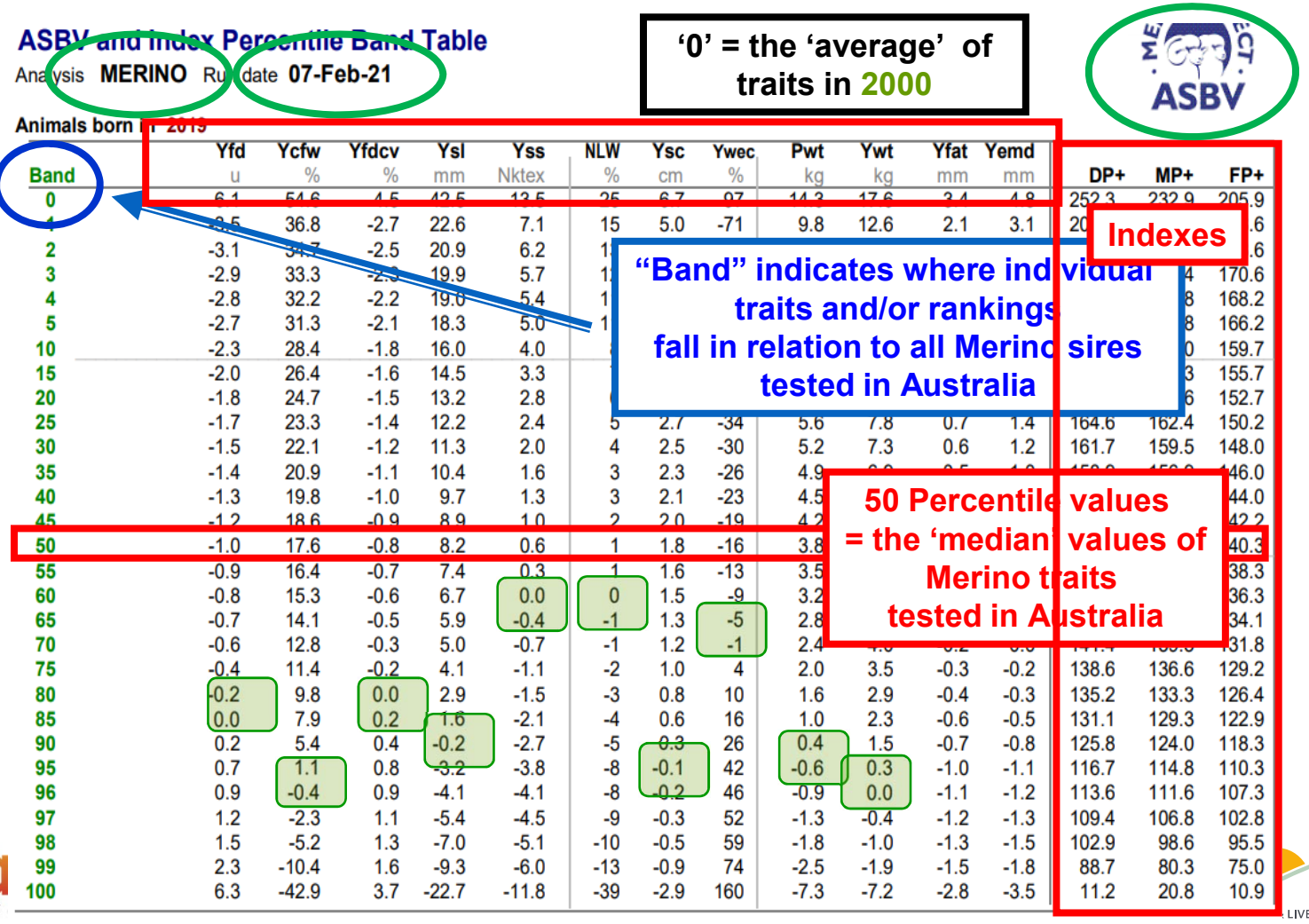

Band	Yfd	Ycfw	Yfdcv	Ysl	Yss	NLW	Ysc	Ywec	Pwt	Ywt	Yfat	Yemd	DP+	MP+	FP+
	u	%	%	mm	Nktex	%	cm	%	kg	kg	mm	mm			
0	6.1	54.6	4.5	42.5	13.5	25	6.7	97	14.3	17.6	3.4	4.8	252.3	232.9	205.9
1	3.5	36.8	-2.7	22.6	7.1	15	5.0	-71	9.8	12.6	2.1	3.1	20		.6
2	-3.1	34.7	-2.5	20.9	6.2	1									.6
3	-2.9	33.3	-2.3	19.9	5.7	1								4	170.6
4	-2.8	32.2	-2.2	19.0	5.4	1								8	168.2
5	-2.7	31.3	-2.1	18.3	5.0	1								8	166.2
10	-2.3	28.4	-1.8	16.0	4.0									0	159.7
15	-2.0	26.4	-1.6	14.5	3.3									3	155.7
20	-1.8	24.7	-1.5	13.2	2.8									6	152.7
25	-1.7	23.3	-1.4	12.2	2.4	5	2.7	-34	5.6	7.8	0.7	1.4	164.6	162.4	150.2
30	-1.5	22.1	-1.2	11.3	2.0	4	2.5	-30	5.2	7.3	0.6	1.2	161.7	159.5	148.0
35	-1.4	20.9	-1.1	10.4	1.6	3	2.3	-26	4.9						146.0
40	-1.3	19.8	-1.0	9.7	1.3	3	2.1	-23	4.5						144.0
45	-1.2	18.6	-0.9	8.9	1.0	2	2.0	-19	4.2						142.2
50	-1.0	17.6	-0.8	8.2	0.6	1	1.8	-16	3.8						140.3
55	-0.9	16.4	-0.7	7.4	0.3	1	1.6	-13	3.5						138.3
60	-0.8	15.3	-0.6	6.7	0.0	0	1.5	-9	3.2						136.3
65	-0.7	14.1	-0.5	5.9	-0.4	-1	1.3	-5	2.8						134.1
70	-0.6	12.8	-0.3	5.0	-0.7	-1	1.2	-1	2.4						131.8
75	-0.4	11.4	-0.2	4.1	-1.1	-2	1.0	4	2.0	3.5	-0.3	-0.2	138.6	136.6	129.2
80	-0.2	9.8	0.0	2.9	-1.5	-3	0.8	10	1.6	2.9	-0.4	-0.3	135.2	133.3	126.4
85	0.0	7.9	0.2	1.6	-2.1	-4	0.6	16	1.0	2.3	-0.6	-0.5	131.1	129.3	122.9
90	0.2	5.4	0.4	-0.2	-2.7	-5	0.3	26	0.4	1.5	-0.7	-0.8	125.8	124.0	118.3
95	0.7	1.1	0.8	-3.2	-3.8	-8	-0.1	42	-0.6	0.3	-1.0	-1.1	116.7	114.8	110.3
96	0.9	-0.4	0.9	-4.1	-4.1	-8	-0.2	46	-0.9	0.0	-1.1	-1.2	113.6	111.6	107.3
97	1.2	-2.3	1.1	-5.4	-4.5	-9	-0.3	52	-1.3	-0.4	-1.2	-1.3	109.4	106.8	102.8
98	1.5	-5.2	1.3	-7.0	-5.1	-10	-0.5	59	-1.8	-1.0	-1.3	-1.5	102.9	98.6	95.5
99	2.3	-10.4	1.6	-9.3	-6.0	-13	-0.9	74	-2.5	-1.9	-1.5	-1.8	88.7	80.3	75.0
100	6.3	-42.9	3.7	-22.7	-11.8	-39	-2.9	160	-7.3	-7.2	-2.8	-3.5	11.2	20.8	10.9

What is an Index?

- Combines the ASBVs for several traits into one value
- Available to suit a range of different breeding programs
- Quick selection guide to narrow down which sires to look at
- While indexes are useful tools, it is important to always consider individual trait ASBVs to ensure they are 'balanced' and will meet your breeding objective goals

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ASBV and Index Percentile Band Table

Analysis **MERINO** Run date **07-Apr-21**

Animals born in 2019

Check ASBV's

For example – which of these rams best suits your production objectives

Band	Yfd (u)	Ycfw (%)	Yfdcv (%)	Ysl (mm)	Yss (Nktex)	NLW (%)	Ysc (cm)	Ywec (%)	Pwt (kg)	Ywt (kg)	Yfat (mm)	Yemd (mm)	DP+	MP+	FP+
0	-6.7	55.3	-4.4	42.6	13.7	26	6.6	-97	14.4	17.9	3.3	4.9	259.1	239.0	204.6
1	-3.4	36.8	-2.7	22.3	7.0	15	4.8	-71	9.7	12.6	2.1	3.1	201.8	194.8	179.0
2	-3.0	34.6	-2.5	20.6	6.2	14	4.5	-66	9.1	11.9	1.9	2.9	195.6	189.7	174.3
3	-2.8	33.3	-2.3	19.6	5.7	13	4.3	-62	8.7	11.4	1.7	2.7	191.4	186.3	171.2
4	-2.7	32.2	-2.2	18.7	5.3	12	4.1	-59	8.3	11.0	1.6	2.5	188.5	183.7	168.9
5	-2.6	31.3	-2.1	18.0	5.0	11	3.9	-56	8.1	10.7	1.5	2.4	186.2	181.6	167.0
10	-2.2	28.3	-1.8	15.7	4.0	9	3.3	-48	7.1	9.6	1.2	2.0	178.1	174.6	160.4
15	-2.0	26.3	-1.7	14.2	3.3	7	3.0	-42	6.5	8.9	1.0	1.8	172.8	169.8	156.2
20	-1.8	24.7	-1.5	13.0	2.8	6	2.7	-37	6.0	8.3	0.9	1.5	168.6	166.1	153.2
25	-1.6	23.3	-1.4	12.0	2.4	5	2.5	-34	5.6	7.7	0.7	1.3	165.1	163.0	150.7
30	-1.5	22.1	-1.3	11.1	2.0	4	2.3	-30	5.2	7.3	0.6	1.2	162.0	160.1	148.5
[illegible]	-1.3	20.9	-1.1	10.3	1.6	4	2.1	-26	4.8	6.9	0.5	1.0	159.2	157.4	146.4
[illegible]	-1.2	19.7	-1.0	9.5	1.3	3	2.0	-23	4.5	6.4	0.4	0.8	156.5	154.8	144.5
45	-1.1	18.6	-0.9	8.7	1.0	2	1.8	-19	4.1	6.0	0.3	0.7	154.0	152.4	142.6
50	-1.0	17.5	-0.8	7.9	0.6	1	1.6	-15	3.8	5.6	0.2	0.5	151.5	149.8	140.7
55	-0.9	16.4	-0.7	7.2	0.3	1	1.5	-12	3.5	5.2	0.1	0.4	149.1	147.4	138.7
60	-0.8	15.2	-0.6	6.4	0.0	0	1.3	-9	3.1	4.8	0.0	0.2	146.5	144.8	136.6
65	-0.7	14.0	-0.5	5.5	-0.3	-1	1.2	-5	2.8	4.4	-0.1	0.1	144.0	142.2	134.4
[illegible]	-0.5	12.8	-0.3	4.6	-0.7	-1	1.0	-1	2.4	3.9	-0.2	0.0	141.4	139.5	132.0
[illegible]	-0.4	11.4	-0.2	3.6	-1.1	-2	0.9	4	1.9	3.4	-0.3	-0.2	138.6	136.5	129.4
80	-0.2	9.8	0.0	2.5	-1.5	-3	0.7	10	1.5	2.8	-0.4	-0.4	135.3	133.1	126.5
85	0.0	7.9	0.2	1.1	-2.0	-4	0.5	17	0.9	2.2	-0.6	-0.6	131.3	129.1	122.9
90	0.2	5.3	[illegible]	[illegible]	-2.7	-5	0.2	26	0.2	1.4	-0.8	-0.8	125.9	123.8	118.2
95	0.7	1.0	[illegible]	[illegible]	-3.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	116.8	114.7	110.1
96	0.9	-0.4	[illegible]	[illegible]	-4.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	113.6	111.5	107.1
97	1.1	-2.4	[illegible]	[illegible]	-4.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	109.4	106.6	102.7
98	1.6	-5.2	[illegible]	[illegible]	-5.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	102.9	99.7	95.3
99	2.4	-10.5	[illegible]	[illegible]	-5.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	89.6	83.8	75.3
100	6.3	-43.0	[illegible]	[illegible]	13.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24.1	20.7	10.9

20.9 micron

17.7 micron

2 Rams

DP Index

(141)

Tag	Ywt	Yfat	Yemd	Ycfw	Micron
12	6.5	0.0	0.3	15.3	- 1.3
115	6.4	- 0.6	- 0.4	25.1	- 0.4

Correlated Traits

- Selecting for a particular genetic trait may result in changes in other traits. This is said to be a genetic correlation between the traits

- Genetic correlations can be positive or negative

- If the correlation is positive, then there is an improvement in both traits. If the correlation is negative, 1 trait shows improvement while the other deteriorates.

Correlations

GROWTH

LEANNESS

REPRODUCTION

LEAN MEAT YIELD

FLEECE WT

REDUCED MEQ

FIBRE DIAMETER

BIRTH WEIGHT

ADULT WT

FAT

IMF

FERTILITY

BIRTH WEIGHTS

No. LAMBS WEANED

FEED EFFICIENCY

INCREASE BODY FAT

LOW FLEECE WEIGHT

MUSCLE

LEANNESS

REPRODUCTION

LEAN MEAT YIELD

FLEECE WT

REDUCED MEQ

FIBRE DIAMETER

BIRTH WEIGHT

MATURE ADULT WT

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Do EBV's/ASBV's work?

- The short answer is '**YES**'.
- A summary of 'Proof of Profit' research and on-farm trials can be found at Sheep Genetics Australia website. 'Actual' outcomes generally exceed 'predicted' or 'expected' outcomes!

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"Proof of Profit"

Producers:

Dennis & Geoff Hogan, Glen Innes NSW

Objective:

Investigate the difference in value of lambs sired by rams with breeding values in the **top 10%** PWWt (growth) versus industry **average** PWWt

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Average EBV's for each sire group

Sire Group	Birthweight BWT	Growth PWWT	Post weaning fat	
HIGH PWWT	0.36	14.2	-0.15	1.4
AVE PWWT	0.22	7.7	-0.73	0.95

Current Industry Average is 14.7

Expected Response ??

- (14.2 - 7.7) = 6.50 kg
- (6.5)/2 = 3.25 kg

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Average liveweight of lambs at 3 different growth points

Sire Group	Weaning 1st week of Jan '11	1st week of Feb	Selling 2nd week of March
			57.1
			52.0

Expected Response = 3.25 kg

Actual Response = 5.1 kg

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High PWWt sired lambs :

- 5.1kg heavier = 2.5kg extra carcass weight (48% dress)
- Lambs sold for $6.20/kg = extra $15.50 per lamb
- Hogan's averaged 100 lambs per ram joined
- They returned an extra $1,550 per ram in the first year

If you average 70 lambs per ram at $7.50/kg you would generate an extra $1312.50 per ram extra in one year OR $5250 per ram more over its lifetime when compared to industry average for PWWt

Good Genetics Pays !!!

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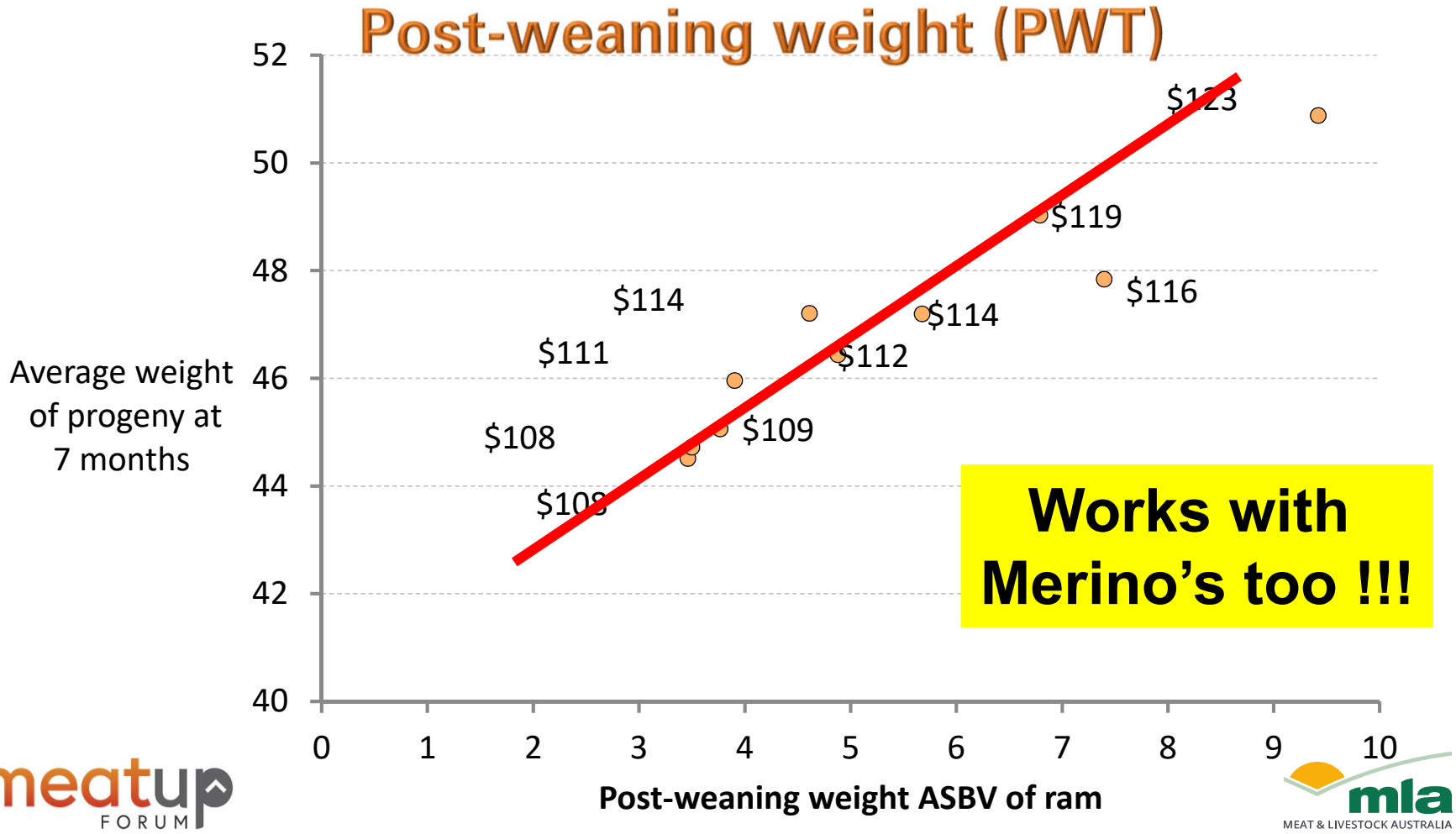

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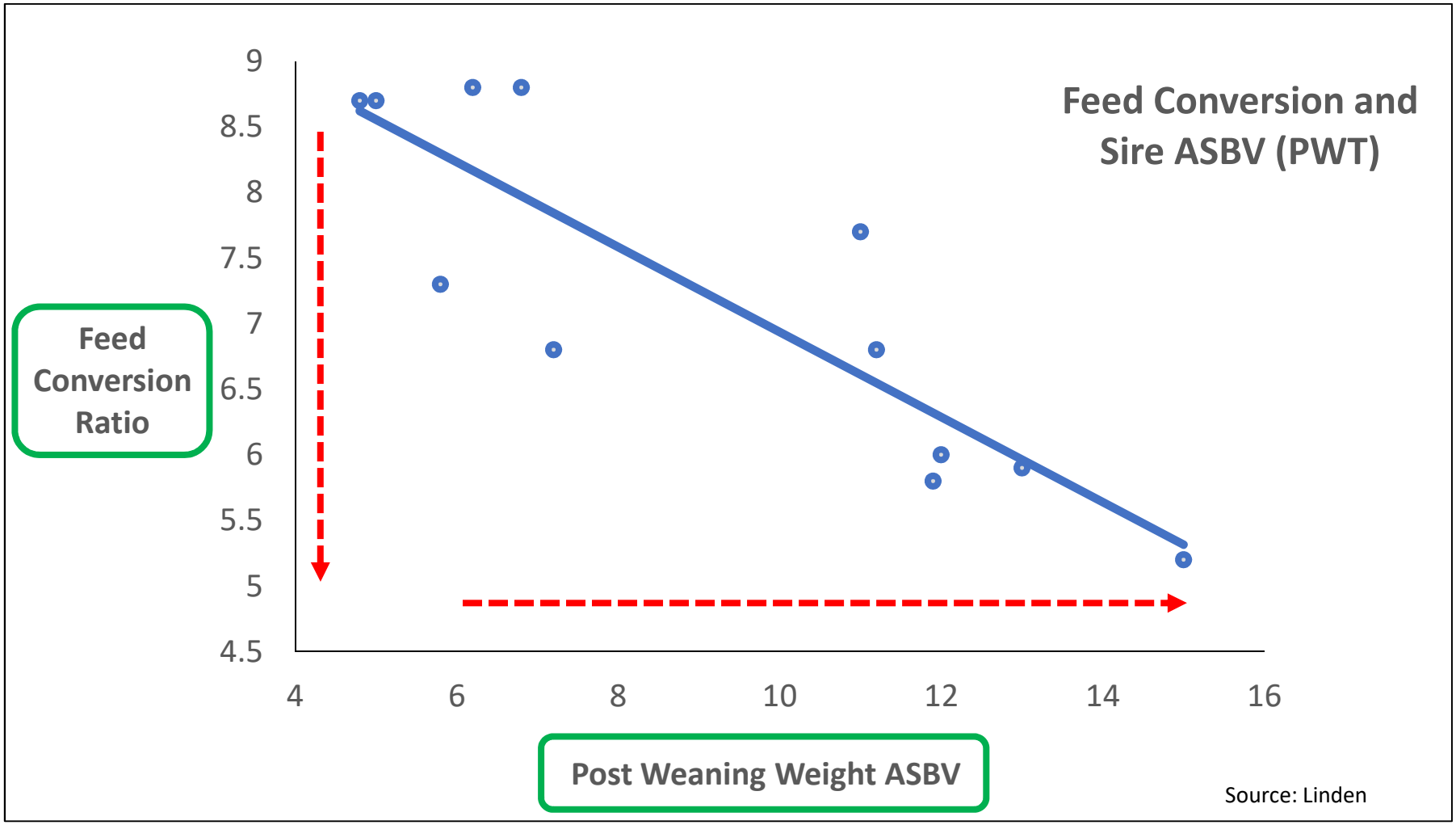
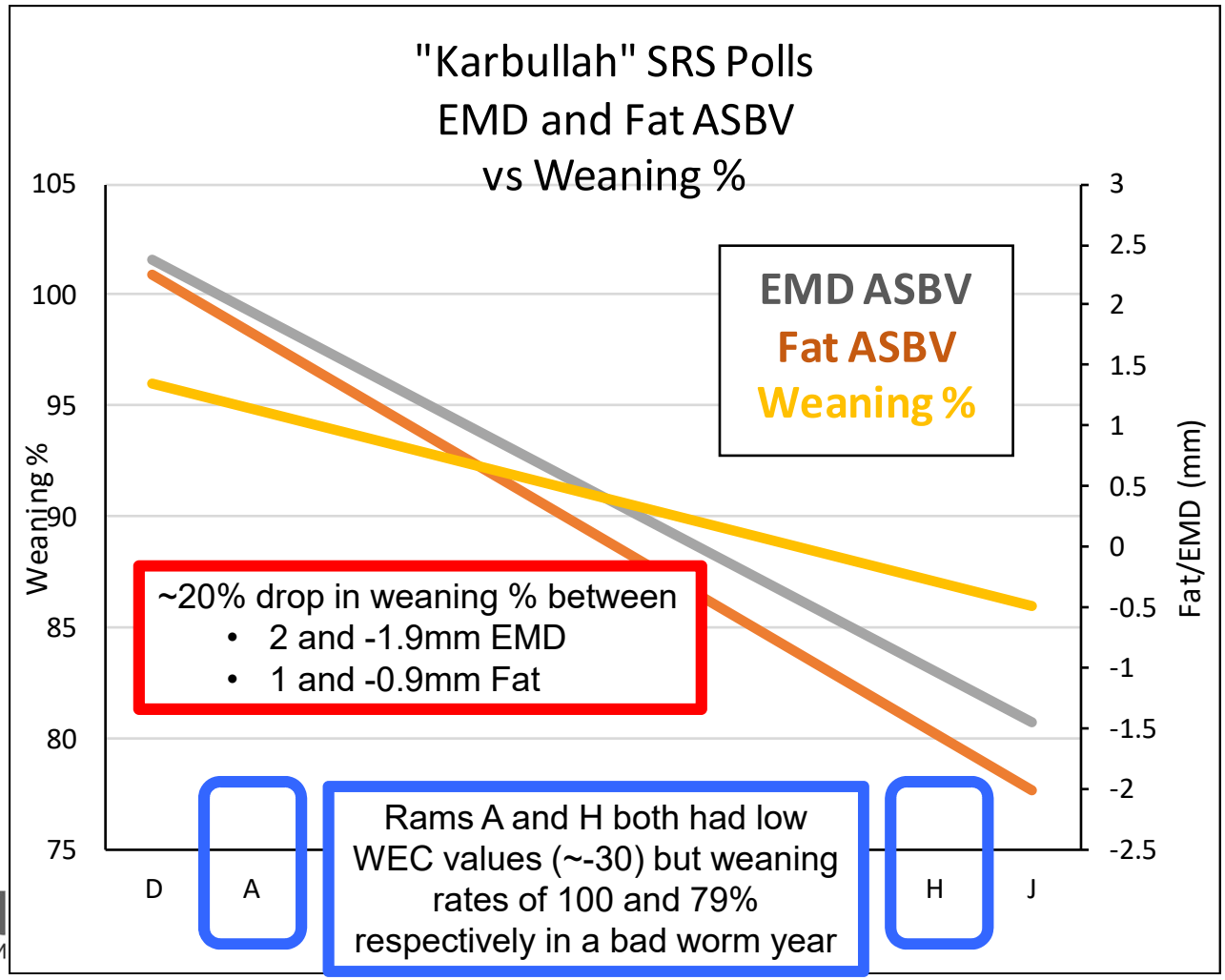

Feed Conversion and Sire ASBV (PWT)
Feed Conversion Ratio
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
6
8
10
12
14
16
Post Weaning Weight ASBV
Source: Linden



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What is a ram worth?

- Sires have a significant and extended impact on your system particularly if a self-replacing operation.

- They cost you little in terms of their 'cost' per lamb produced.

- A $1500 ram that produces 70 lambs per joining over 4 joining's 'costs' $**5.36** per live lamb ($1500/280 lambs).

- A ewe, valued at $250, may produce 6 lambs over her lifetime. This equates to a gross cost per lamb attributed to the ewes of $**41.67** ($250/6)

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What is a ram worth?

- It is possible to estimate a ram's value against
  - an individual stud's 'average' commercial ram price OR
  - the 'average' price for ram's with ASBV's at or near the 50 percentile trait values

- What you select will be based on structural soundness, the sire's suitability for your environment, production system and production objectives

- Pay for predicted performance !

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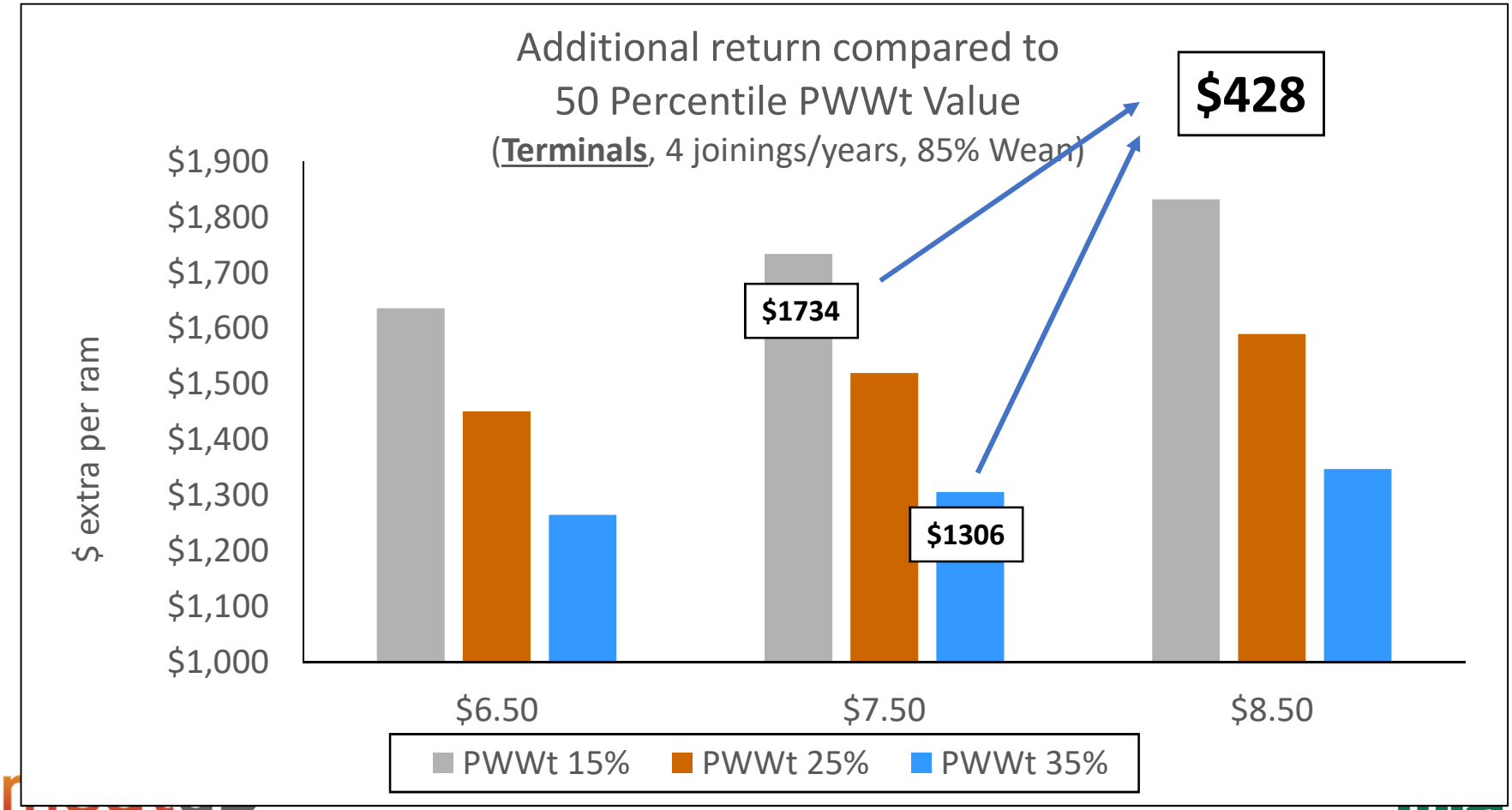
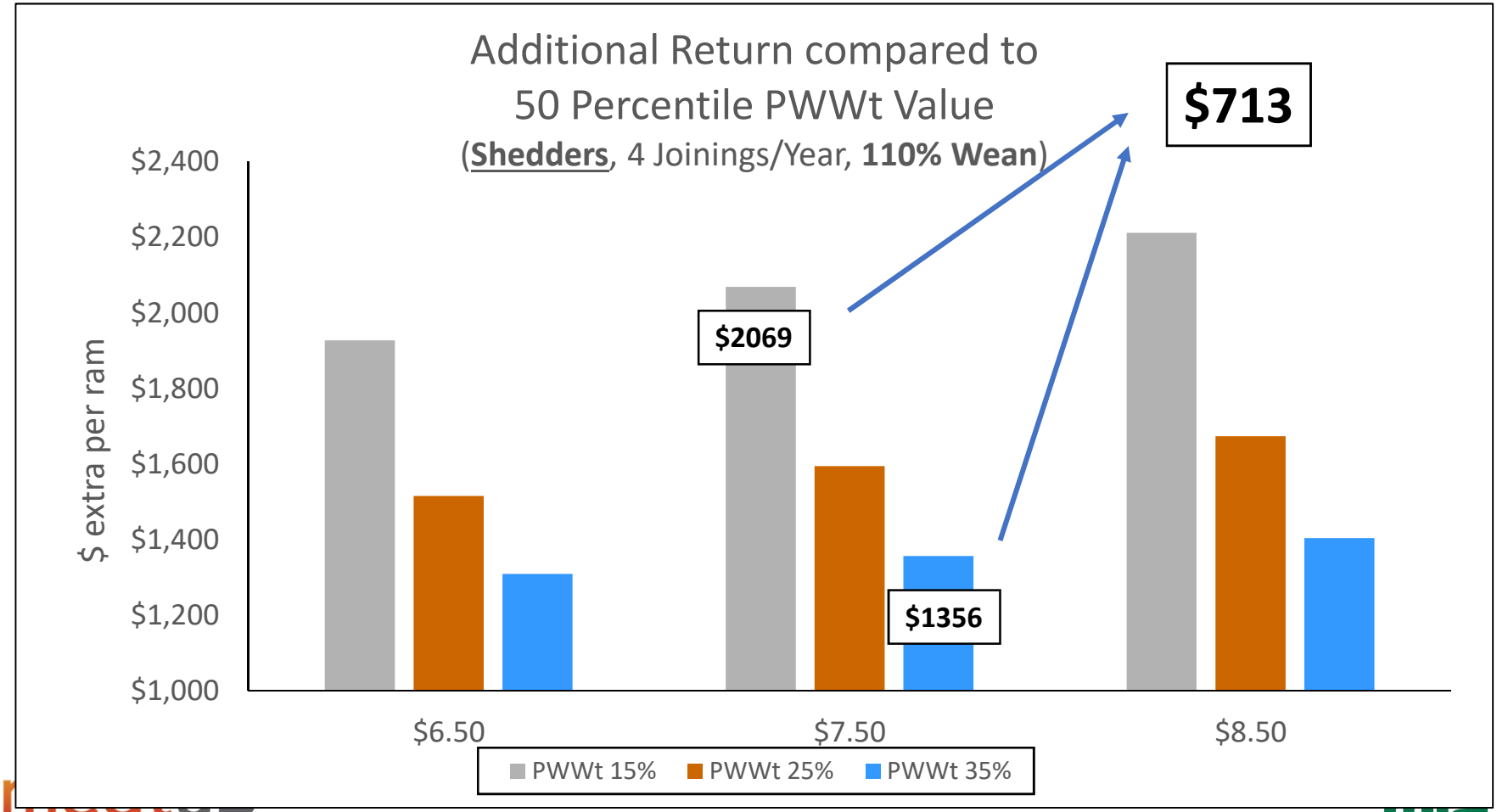
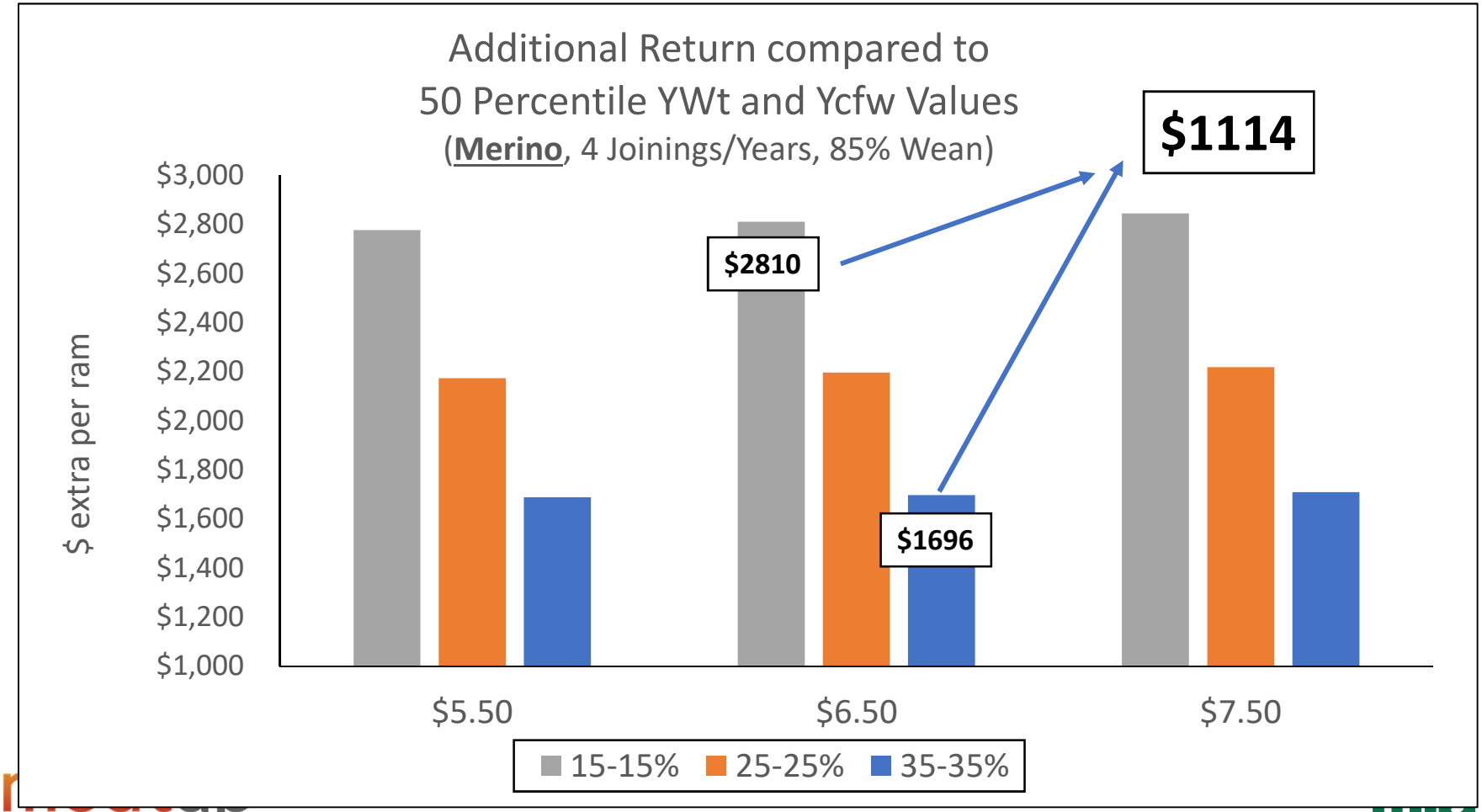


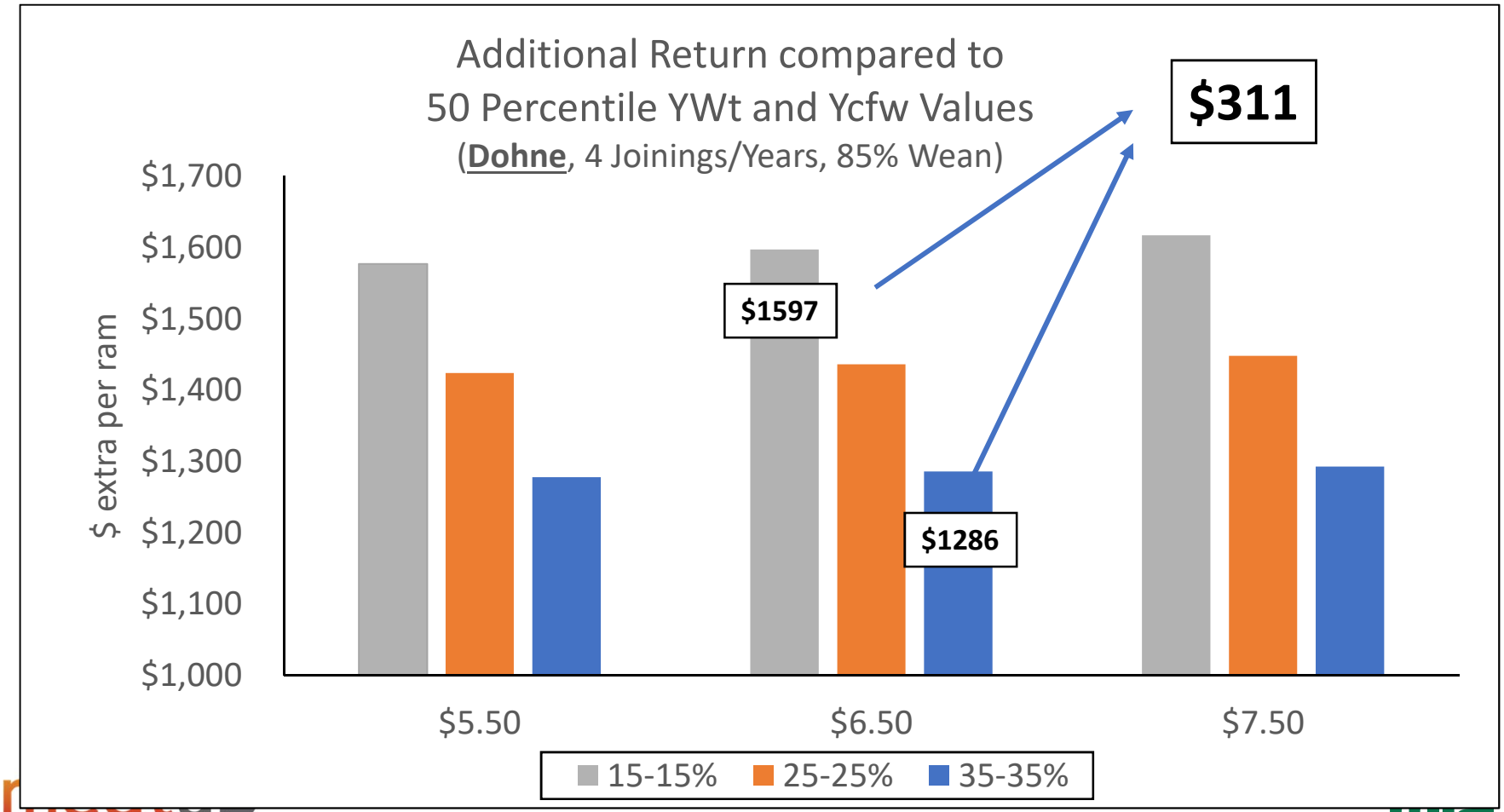
'Average' or 50 percentile rams valued @ $1000



'Average' or 50 percentile rams valued @ $1000



'Average' or 50 percentile rams valued @ $1000; Cut 5.0 kg, 19 micron @ 1350c/kg clean



'Average' or 50 percentile rams valued @ $1000; Cut 3.5 kg, 20 micron @ 1250c/kg clean

In Summary:

- There are opportunities to improve your bottom line through using EBV's and ASBV's within Pastoral areas.
- A changing climate may see a reduction in the length of the growing season, palatability and nutritional value of available pasture within pastoral areas.

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In Summary:

- Strategic use of carcase trait EBV's/ASBV's for example may see an
  - increase in birthweights (and survival),
  - reduced turn-off time for sale stock,
  - improvements in dressing percentages and IMF and MEQ
  - replacement progeny reaching mature weights earlier leading to an
  - improvement in conception rates and improvements in feed conversion

  producing more resilient breeders and progeny.

- The key is 'balance' – identify what your primary profit drivers are, define your breeding goals and use EBV's/ASBV's to meet both!

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Take home messages

- Have a clear, measurable breeding objective
- Select replacement sires on both structural and genetic ‘merit’
- Place emphasis on those traits that are important to your
  - flock/herd breeding and production objectives;
  - targeted market(s) and
  - environment

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Tools and resources

- BreedPlan
- Future Beef website https://futurebeef.com.au/knowledge-centre/breedplan-ebvs/
- MLA's Genetic Hub https://genetics.mla.com.au/
- NSW DPI "Using EBVs and selection indexes to meet your Merino breeding objective"
- Sheep Genetics Australia
  - Brochures and Factsheets
  - A Pocket Guide to ASBV's (Australian Sheep Breeding Values) ASBV's and Indexes Explained
  - Introduction to Kidplan
  - Kidplan EBV Definitions

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Thanks – and good luck !!

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