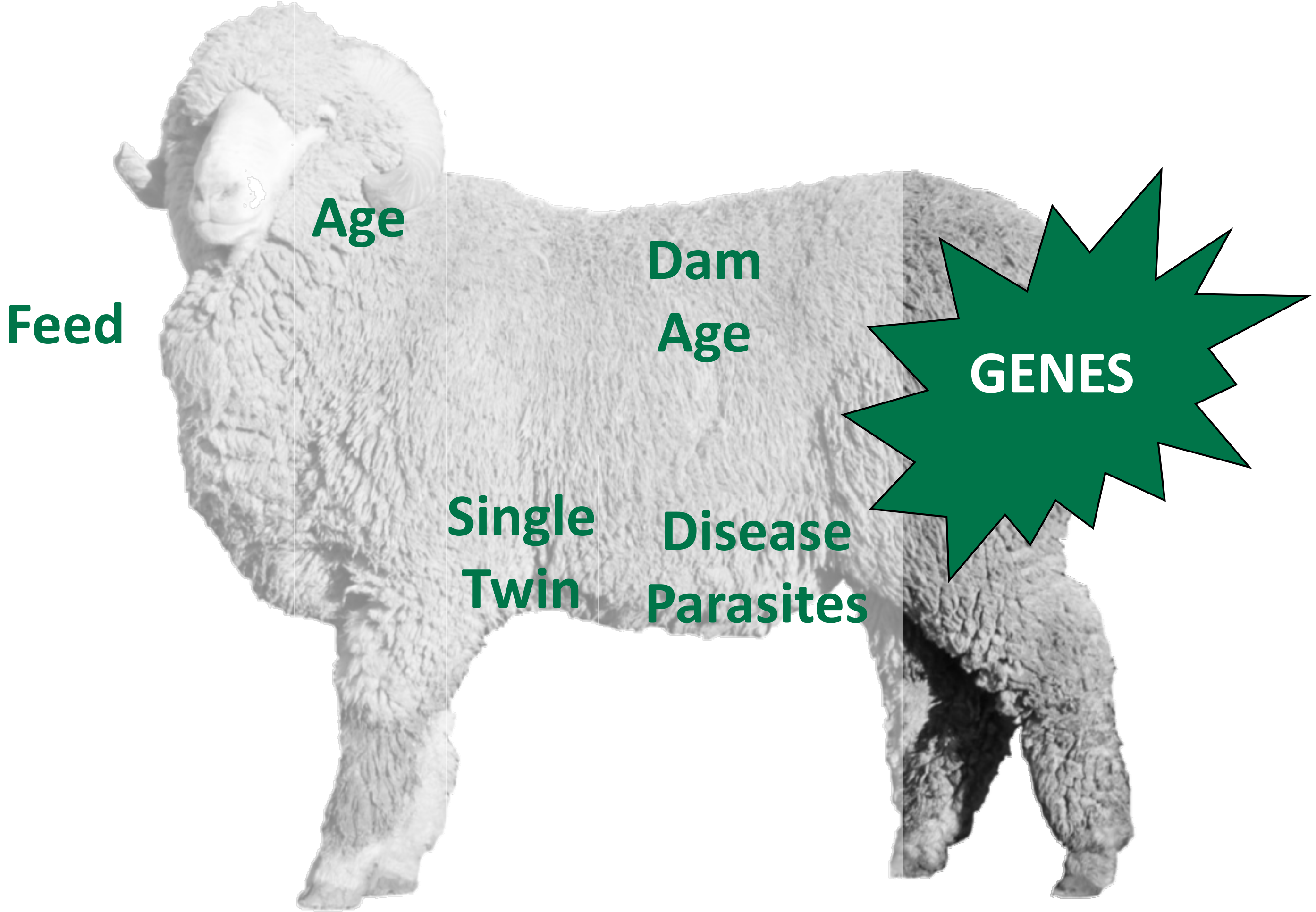
Australian Sheep Breeding Values (ASBV's)

The Long and Short of Farm Production

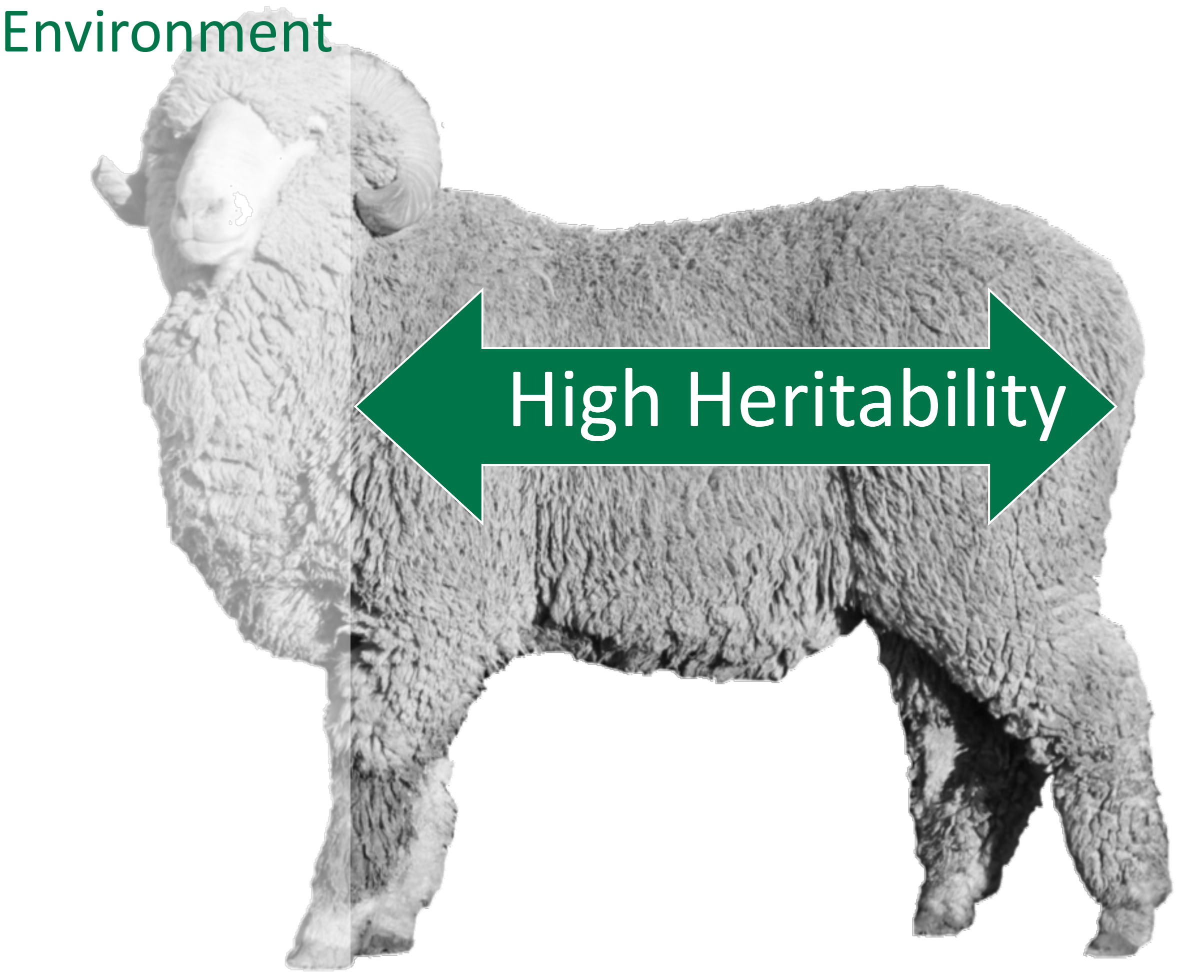
- Farm Production is an Interaction of Genetics and Environment

$$Performance = Environment \times Genetics$$

What Impacts a Sheep's Performance



What Impacts a Sheep's Performance



Example;
Fleece Traits

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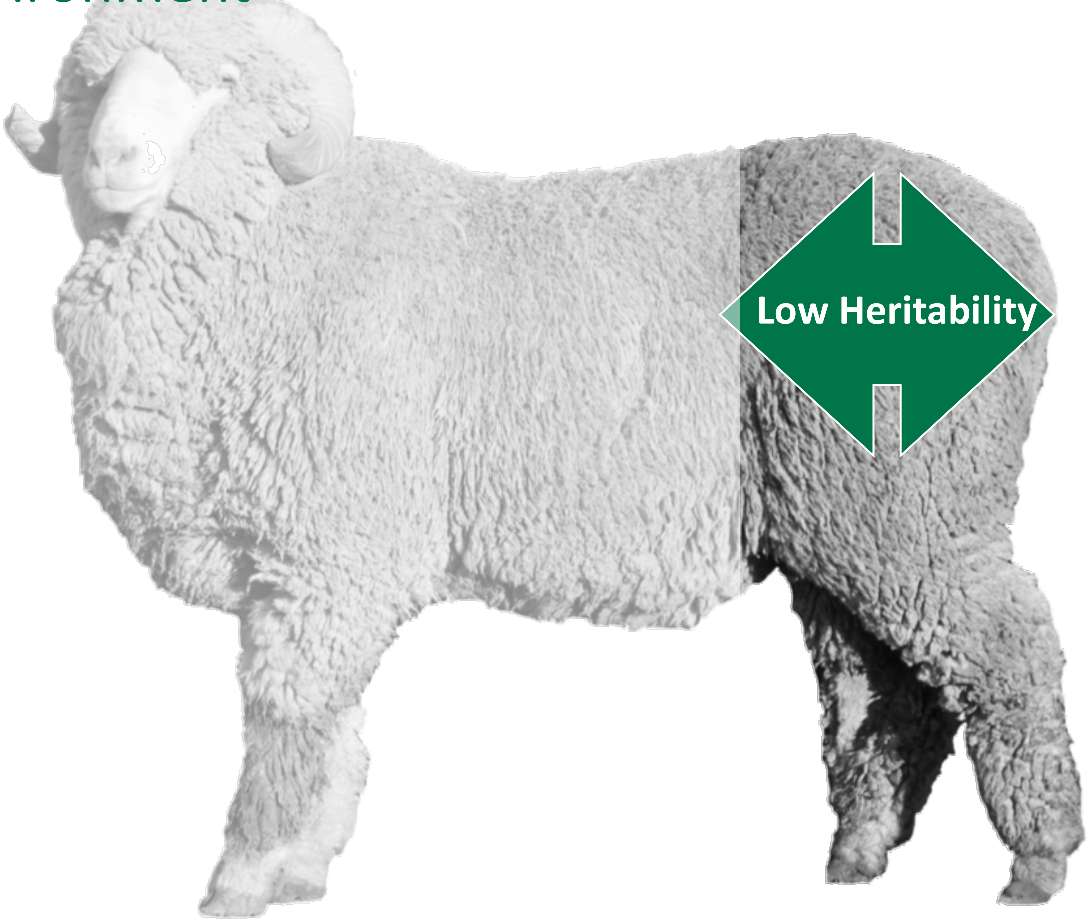
What Impacts a Sheep's Performance

Environment



Example; Fertility

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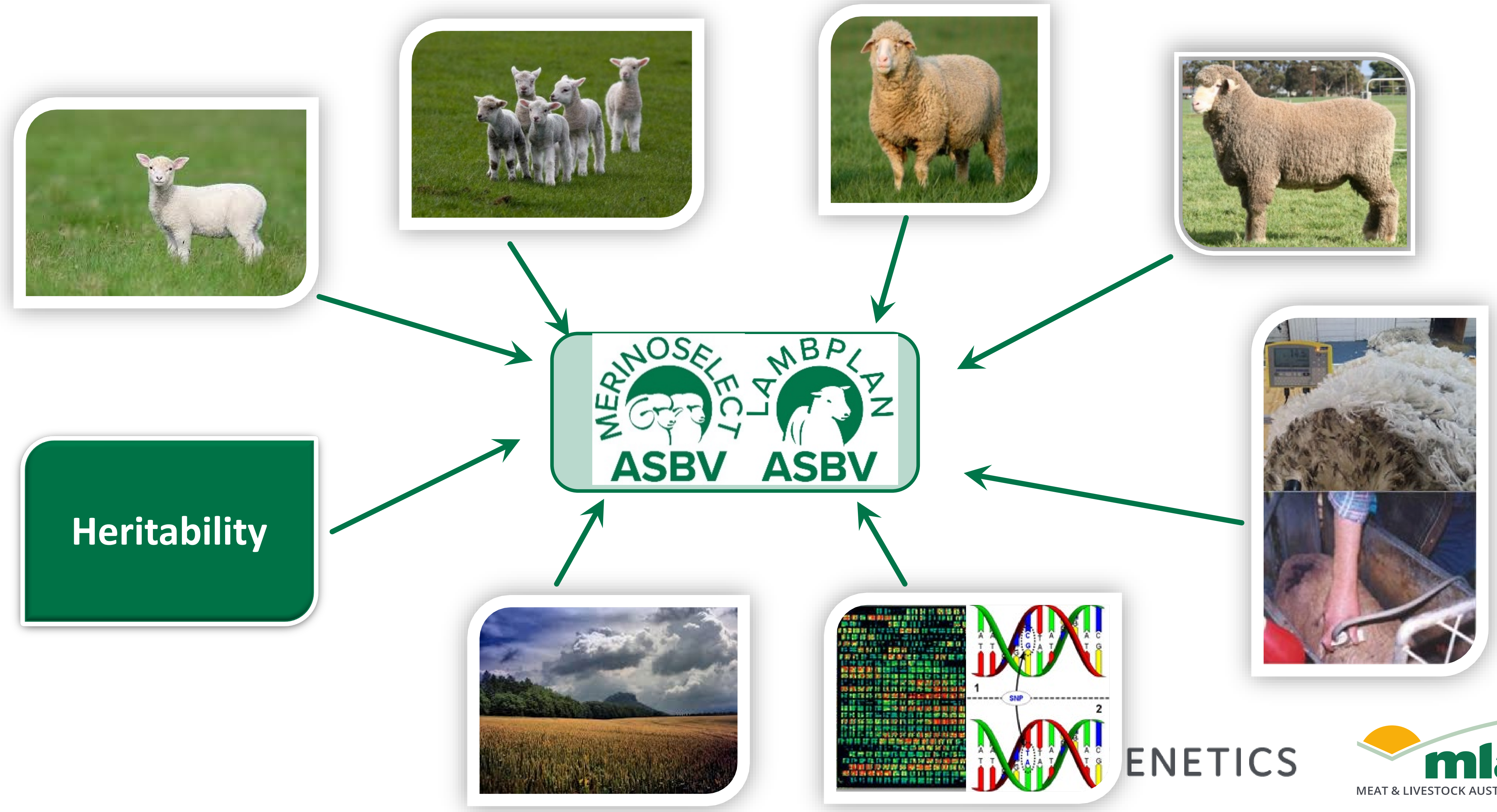
How an ASBV is Calculated



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Ram selection is important

- better performance !!
- more $$dollars !!

Genetics works for wool sheep!

Genetics works for meat sheep!

Tooraweenah Trial

- North of Dubbo in 2003
- Pearts unhappy with their lamb performance

Wanted to;

1. Maximise lamb sales before mid November and not impact on carcass weight
2. Improve quality
3. Find out if faster growth would improve returns

- Purchased new high growth rams
- Ran trial to compare to current rams
- Two sire groups – 1,000 ewes each – same breeding and management

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Results

	% of mob killed by **20** weeks and HSCW		% of mob killed by **27** weeks and HSCW	
High growth rams	**57.2%**	24.2 kg	**97.3%**	24.0 kg
Low growth rams	26.1%	22.5 kg	77.3%	22.8 kg

Source: McLeod and White NSW DPI

Lambs from high growth rams were heavier at slaughter

Lambs from high growth rams gained 50g/day more than lambs from low growth rams

How many more dollars $$$ could you expect high performance rams?????

- The high growth lambs were 5.4 kg heavier @ 1ST slaughter date:
- Using a market price of $6.00/kg @ 46% (DP) lambs would be 2.5 kg HSCW heavier

= **$15 per lamb extra** or

@ 60 lambs /ram / year with 4 joinings (1.5% joining 90% lambing)

$3600 more $$ per ram or $900 per ram per year

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What ASBV's are available?

- **major production areas**
  - **Growth**
  - **Carcase**
  - **Reproduction**
  - **Wool**
  - **Health**

Examples of some traits

Live weight (WT)
Eye muscle depth (EMD)
Fat depth (FAT)
Number of Lambs Born (NLB)
Number of Lambs Weaned (NLW)
Fleece weight (FW)
Fibre Diameter (FD)
Staple Length (SL)
Staple Strength (SS)
Worm Egg Count (WEC)
Breech Wrinkle (BWR)
Breech Cover (BCOV)
Dags (DAG)

What ASBV's are available?

- **For a number of ages**
  - Birth = b
  - Weaning = w
  - Post-weaning = p
  - Yearling = y
  - Hogget = h
  - Adult = a

What is the ASBV?

Birth weight?

BWT

Post-weaning fat depth?

PFAT

Yearling greasy fleece weight?

YGFW

Weaning worm egg count?

WWEC

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- ASBVs are based around 0
- Negative ASBVS are not always bad
- Accuracy is a reflection of the amount of info used
- ASBVS need to be compared to the current average

What ASBVs can be compared?

Maternal breeds

Border Leicester

Coopworth

Composite Maternal

East Friesian

LAMBPLAN ASBV

SAMM

Terminal breeds

Poll Dorset

Suffolk

White Suffolk

Texel

Southdown

Dorper

etc

Merinos

Merino

Poll Merino

Superfine

MERINOSELECT ASBV

Dohne

DOHNE ASBV

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Selection Indexes

- Breeding objectives include more than one trait
- A ‘selection index’ combines a number of ASBVs into one ranking figure
- The emphasis put on each trait depends on the breeding objective
- The index gives the overall merit, or score, to achieve a certain production goal

Selection Indexes

Maternal indexes

- BLX
- MCP
- MCP+
- MWP+

Terminal indexes

- TCP
- Eating Quality
- LAMB Eating Quality

MERINOSELECT indexes

- Fibre Production
- Fibre Production +
- Merino Production
- Merino Production +
- Dual Purpose
- Dual Purpose +

Dohne indexes

- Dohne Base
- Dohne Plus

Matching breeding objectives with ASBVs

Trait group	Relevant ASBV traits
Growth	Live weight (WT)
Carcase	Eye muscle depth (EMD), fat (FAT), intramuscular fat (IMF), shear force (SF5)
Reproduction	Number of lambs weaned (NLW)
Wool	Fleece weight (GFW), fibre diameter (FD) staple strength (SS), staple length (SL)
Health	Worm egg count (WEC), breech wrinkle (BRWR), breech cover (BCOV), Dag (DAG)

Don't forget the age stage that is most relevant to you

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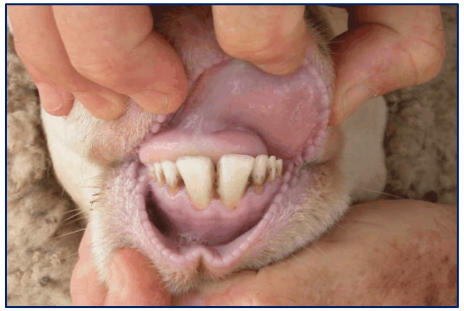
ASBVs Cannot Be Used Alone

- As much as ever before making sure a ram looks right is important.
- It must be:
  - sound and have good structure
  - suitable for your farm
  - wool quality ‘fit for purpose’
- This can differ between people and regions





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Some Traits that can be Measured by Stud Breeders

- Birthweight
- Maternal behaviour score
- Number of lambs born and raised
- Weaning weight (100 days)
- Post weaning (200 days) weight, eye muscle, fat, worm egg count and scrotal circumference
- Yearling (300 days) weight, wool test and greasy fleece weight
- Hogget (400 days) wool test and greasy fleece weight
- 200 DNA markers for traits including Lean Meat Yield, IMF and Shear Force

Percentile Bands

ASBV and Index Percentile Band Table

Analysis **MERINO** Run date **21-Jun-19**

Animals born in 2017

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	-6.2	51.3	-3.8	32.3	12.1	24	6.3	-94	12.9	16.4	3.6	5.9	232.8	223.0	192.8
1	-3.7	32.4	-2.6	22.5	6.9	16	4.7	-81	8.5	11.6	2.0	3.1	193.5	187.9	169.3
2	-3.3	30.2	-2.4	20.8	6.0	14	4.2	-73	8.0	10.9	1.8	2.8	185.2	180.0	163.5
3	-3.1	29.0	-2.3	19.7	5.4	12	3.9	-68	7.6	10.4	1.6	2.6	179.4	175.2	160.2
4	-2.9	27.9	-2.2	18.8	5.0	11	3.7	-65	7.4	10.1	1.5	2.5	175.2	171.6	157.8
5	-2.8	27.1	-2.1	18.1	4.7	11	3.6	-61	7.1	9.8	1.4	2.4	171.9	169.1	156.0
10	-2.4	24.1	-1.8	15.3	3.7	8	3.1	-52	6.3	8.8	1.2	2.0	163.3	161.4	150.2
15	-2.1	22.1	-1.6	13.4	3.0	7	2.8	-46	5.7	8.0	1.0	1.7	158.3	156.9	146.7
20	-1.9	20.5	-1.4	12.0	2.5	6	2.6	-40	5.2	7.4	0.8	1.4	154.8	153.5	144.0
25	-1.8	19.2	-1.3	10.8	2.1	5	2.4	-36	4.8	6.9	0.6	1.2	151.7	150.6	141.7
30	-1.6	17.9	-1.2	9.9	1.7	4	2.3	-31	4.4	6.4	0.5	1.0	149.0	147.9	139.6
35	-1.5	16.8	-1.1	9.0	1.4	3	2.1	-27	4.0	6.0	0.4	0.8	146.5	145.5	137.7
40	-1.4	15.8	-0.9	8.2	1.0	3	2.0	-23	3.7	5.5	0.3	0.7	144.2	143.2	135.9
45	-1.2	14.7	-0.8	7.5	0.7	2	1.8	-19	3.3	5.1	0.2	0.5	141.9	141.0	134.2
50	-1.1	13.7	-0.7	6.7	0.4	1	1.7	-15	3.0	4.7	0.1	0.4	139.7	138.9	132.5
55	-1.0	12.6	-0.6	6.0	0.1	0	1.5	-12	2.6	4.3	0.0	0.2	137.4	136.7	130.8
60	-0.9	11.4	-0.5	5.2	-0.2	0	1.4	-8	2.3	3.8	-0.1	0.1	135.1	134.5	129.1
65	-0.8	10.2	-0.4	4.4	-0.6	-1	1.2	-4	1.9	3.4	-0.2	0.0	132.7	132.1	127.2
70	-0.6	8.9	-0.2	3.4	-1.0	-2	1.1	2	1.5	2.9	-0.3	-0.2	130.2	129.7	125.2
75	-0.5	7.5	-0.1	2.4	-1.4	-3	0.9	7	1.1	2.4	-0.4	-0.3	127.4	126.9	122.8
80	-0.3	5.8	0.1	1.2	-1.8	-3	0.7	13	0.6	1.9	-0.5	-0.5	124.2	123.8	120.1
85	-0.1	3.8	0.3	-0.3	-2.4	-5	0.5	21	0.1	1.2	-0.6	-0.6	120.3	120.3	116.5
90	0.2	1.1	0.5	-2.4	-3.1	-6	0.2	30	-0.5	0.4	-0.8	-0.8	115.1	115.7	111.2
95	0.7	-3.4	0.9	-5.4	-4.2	-9	-0.3	42	-1.4	-0.8	-1.0	-1.1	106.4	107.6	103.1
96	0.9	-4.9	1.0	-6.2	-4.6	-9	-0.4	46	-1.7	-1.1	-1.1	-1.3	103.5	104.5	100.5
97	1.0	-6.9	1.2	-7.2	-5.1	-11	-0.6	50	-2.0	-1.5	-1.1	-1.4	99.7	99.8	96.8
98	1.4	-9.7	1.4	-8.5	-5.7	-13	-0.9	54	-2.5	-2.1	-1.2	-1.5	93.6	90.4	88.8
99	1.9	-14.1	1.7	-10.3	-6.8	-22	-1.2	64	-3.2	-3.1	-1.4	-1.8	83.5	73.8	62.4
100	6.7	-37.4	3.7	-22.3	-13.0	-43	-3.5	117	-8.9	-11.7	-2.4	-4.1	-0.1	32.9	20.0

YWT (kg)

8.0

74 %

YCFW (%)

9.0

69 %

Sheep Meat Eating quality

- Key to consumers – important to WAPC going forward
- Unfavourable association with Lean Meat Yield
- Important for willingness to pay – especially long term
- We can measure Shear Force and Intramuscular Fat – DNA markers
- Moderate to High heritability so can select using ASBV's with confidence
- Good on farm management is critical to capitalize on genetics

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Coming up to sale day

- Preparation is key!
- Define your breeding objective
- Select a relevant index and look at individual traits
- Rank the animals that will be available on the day

Sale catalogue

Animal ID	YWT	AWT	YEMD	YFAT	YCFW	YFD	YDCV	YCUR	YSL	YSS	YWEC	NLW	EBWR	DP	DP+ ↓
Ram A	3.6 99%	0.8 98%	-0.1 97%	-0.3 96%	37.4 98%	-2.4 99%	0.0 98%	-4.3 98%	2.0 98%	4.0 97%	76 91%	30% 79%	0.7 98%	137 40%	248 82%
Ram B	9.2 98%	5.7 96%	2.1 96%	1.1 93%	36.7 97%	0.2 98%	-1.7 97%	-4.7 96%	8.9 97%	5.3 96%	-51 92%	28% 75%	-0.3 96%	145 39%	243 79%
Ram C	10.6 97%	9.7 91%	1.2 97%	1.0 96%	35.2 89%	-0.8 92%	-0.4 90%	-5.6 91%	12.3 85%	0.4 75%	60 78%	23% 54%	-0.3 62%	160 37%	237 61%
Ram D	7.5 85%	5.8 83%	1.4 72%	0.3 68%	28.5 80%	-1.4 80%	-1.5 74%	-4.6 80%	10.1 74%	6.4 69%	18 54%	23% 50%	-0.3 93%	144 33%	232 56%
Ram E	12.5 90%	11.1 83%	1.5 86%	0.8 82%	39.2 88%	-0.2 91%	0.0 88%	-0.5 90%	0.4 89%	2.3 86%	-25 77%	18% 52%	-0.3 60%	161 34%	231 58%

Linkage: *How can we compare performance across environments?*

Comparing Rams Across Properties

A

B

C

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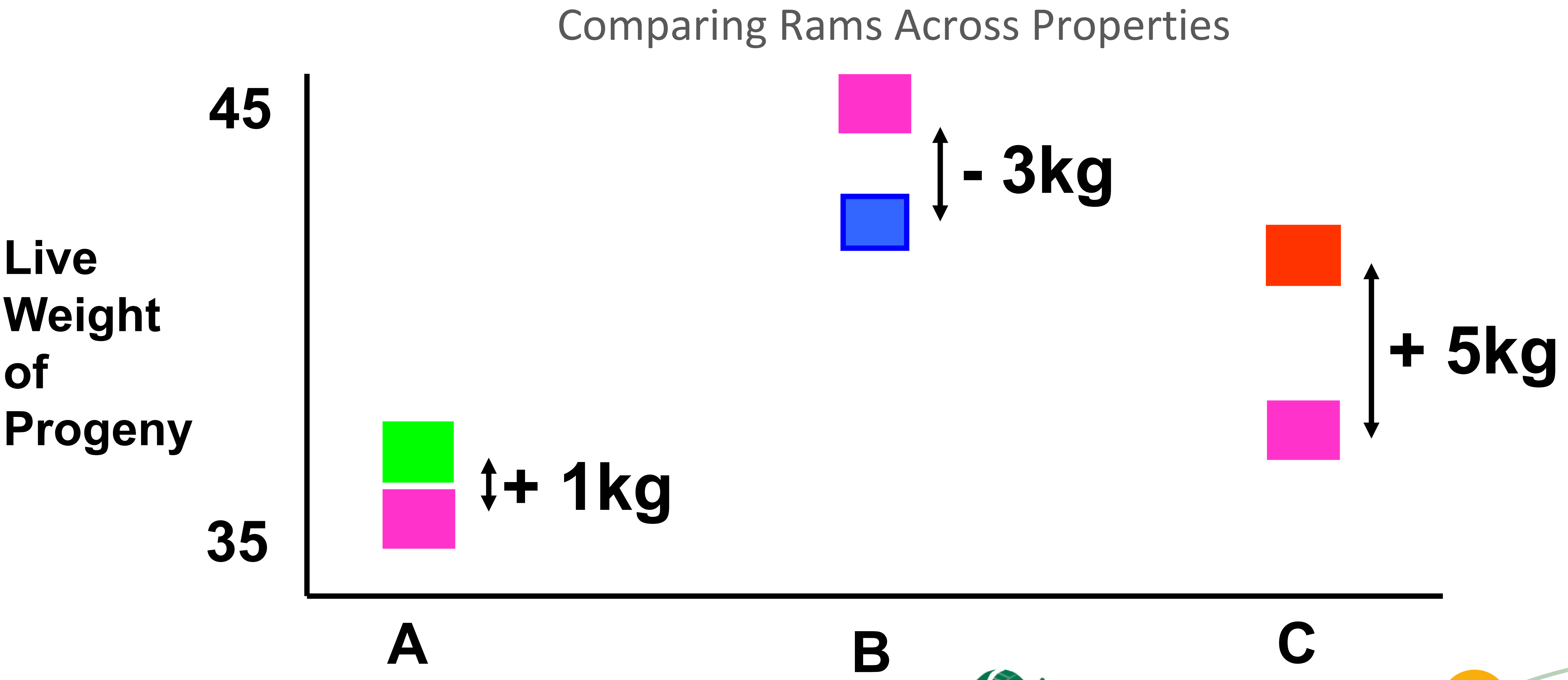
Linkage



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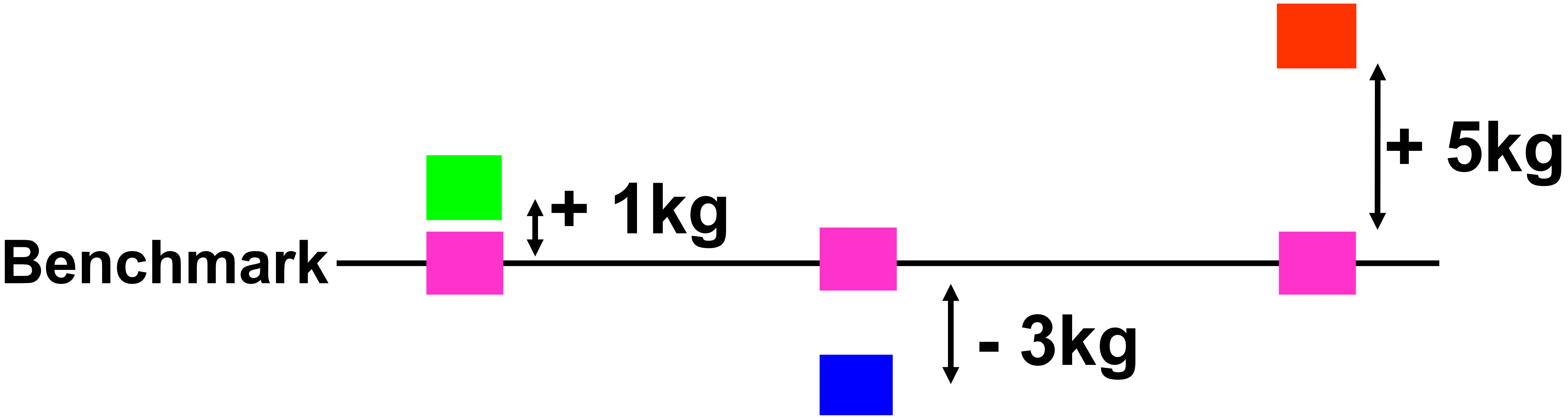
Linkage

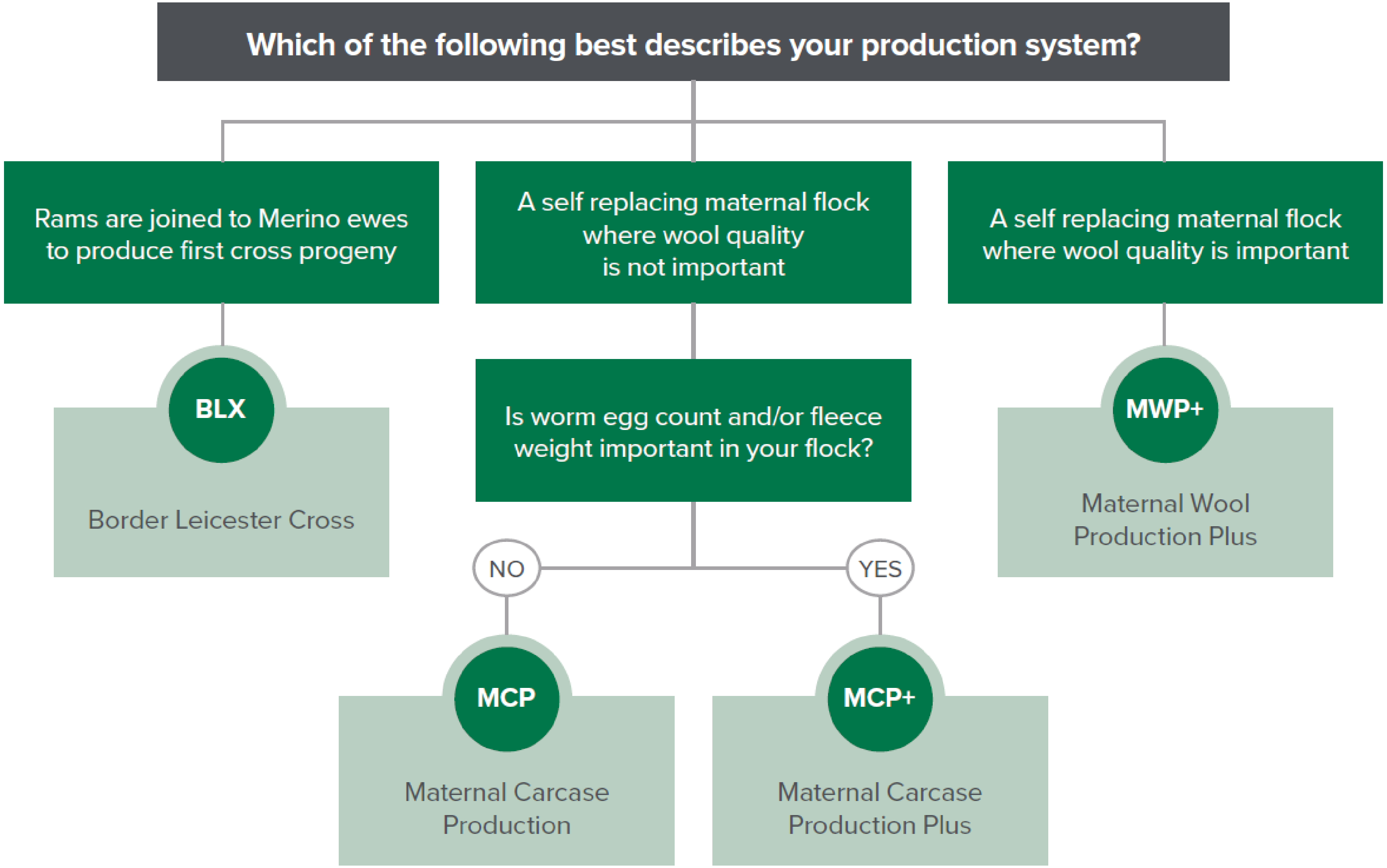
Comparing Rams Across Properties



2. Breeding Objective

3. The index for you

Select an index – Maternal breeders



1. Improving lamb eating quality & productivity

Dave Pethick

Veterinary & Animal Science

MURDOCH UNIVERSITY
PERTH, WESTERN AUSTRALIA

Advanced Livestock Measurement Technologies (ALMTech)

Meat & Livestock Australia

MEAT & LIVESTOCK AUSTRALIA

2. ASBV's and Indexes explained

Sandy Forbes

Royston Farms, Napier

Royston SAMM   Royston White Dorper

Balancing lean meat yield & eating quality

- Lean meat yield & measurement (LMY)
- Consumer eating quality results
- Carcase grading for LMY & Eating Quality
- Role of intramuscular fat to counter LMY
- Genetics for EQ

Background

- Lamb right up there on expense = $/kg lean
  - Chicken 3-7 times cheaper
  - Pork 2-3 times cheaper

- Consumers around the world make a deliberate decision, over and above price, to purchase lamb

LMY is <u>especially</u> important in lamb:

$37/kg (44% fat trim) → $66/kg (36% bone)

$104 /kg for lean !!

Meat Standards Australia Consumer taste tests

Tenderness 0 ——— 100

Juiciness 0 ——— 100

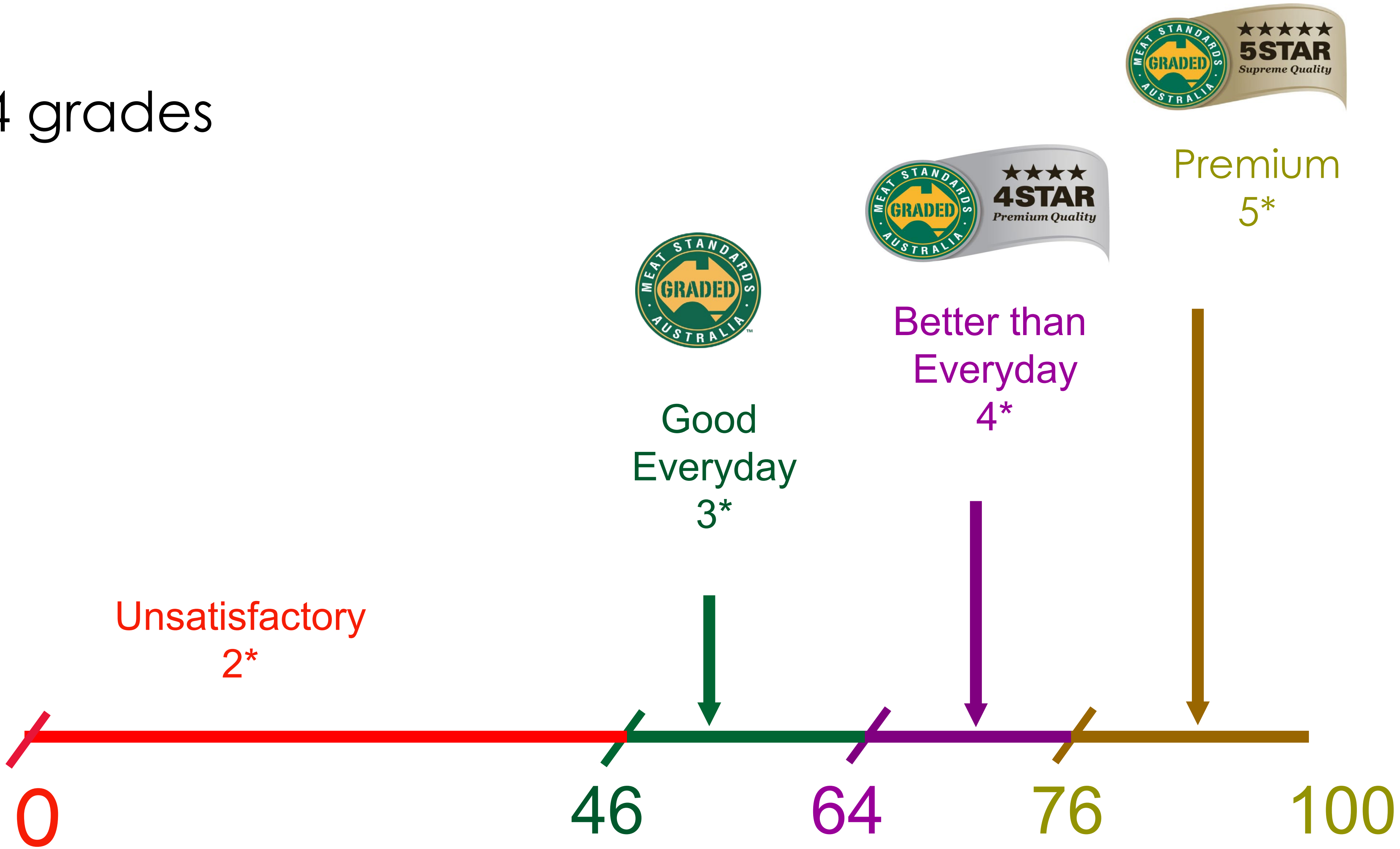
Liking Flavour 0 ——— 100

Overall Liking 0 ——— 100

2	MSA 3	MSA 4	MSA 5
Unsatisfactory	Good Everyday	Better than Everyday	Premium

The final grade

Identify 4 grades



SQ4 = 0.3T + 0.1J + 0.3F + 0.3OL

Willingness to pay for Lamb

	Fail	Pass (3*)	Credit (4*)	Distinction (5*)
USA	0.5	1	1.5	2.0
China	0.6	1	1.5	2.0
AUS	0.5	1	1.4	1.9

Grilled lamb n= 740 consumers per country eating same lamb

O'Reilly, Pannier, Garmyn, Miller, Meng, Luo, Pethick 2016

Carcase Value



Carcass value ($) = Wt retail cuts (kg) X Value of the cuts ($/kg)

LMY

Lean meat yield

MSA 3*4*5*

Supply/Demand

Provenance

Loyalty

offal/fat/bones/skins/wool

Carcase Value

Carcase value ($) = Wt retail cuts (kg) X Value of the cuts ($/kg)

LMY

Lean meat yield

MSA 3*4*5*

good/better/best

LMY – difficult to measure

CT scan Lean = gold standard

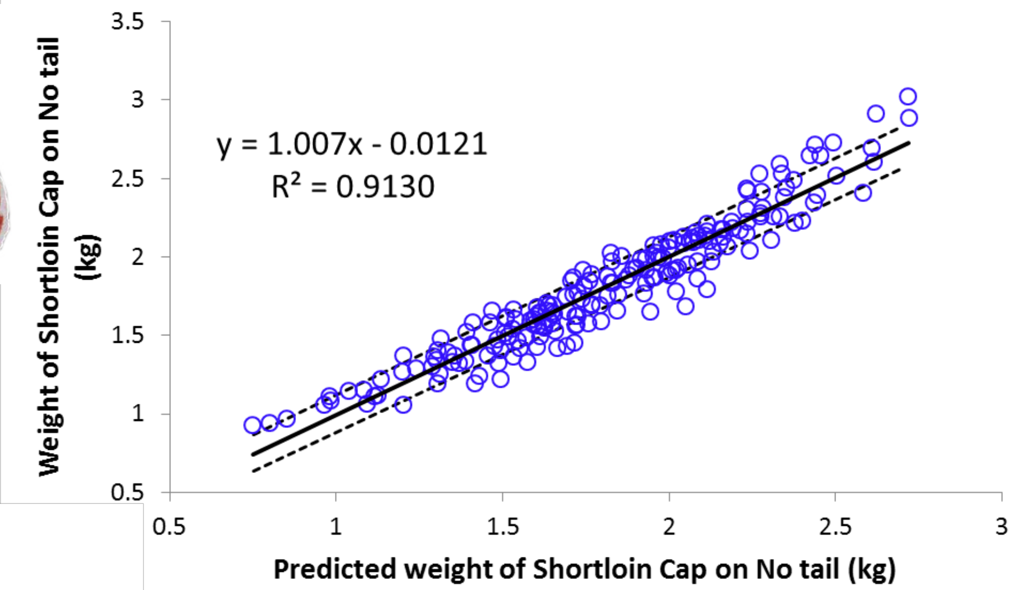
calibrate any measuring instrument against the CT composition

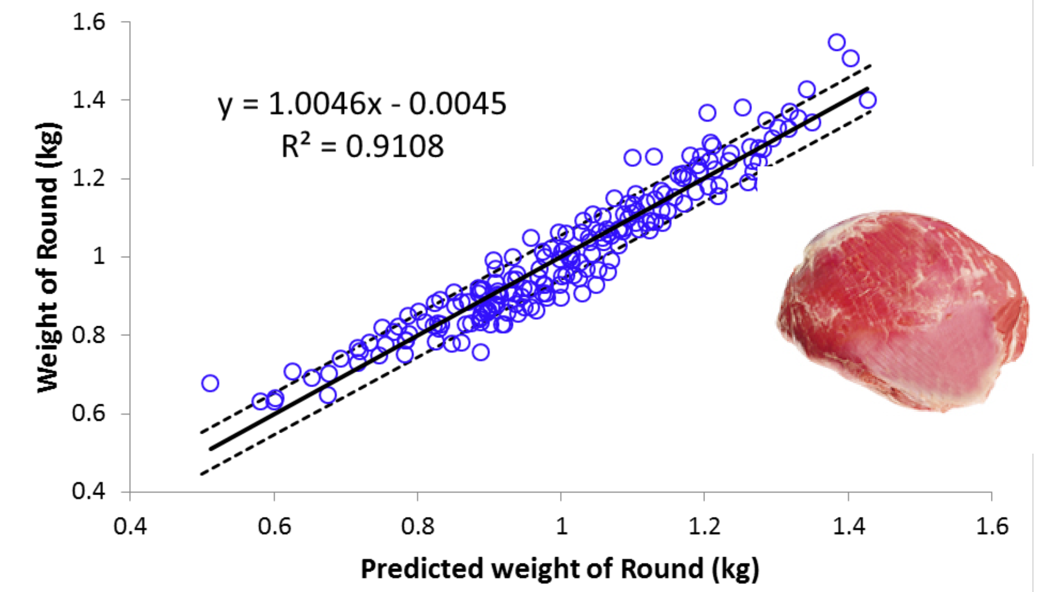

Terminology

- Lean Meat Yield (LMY) – Gold standard = CT lean
    - Fat
    - Muscle
    - Bone

- Saleable yield – Industry standard
    - It's what the packer/retailer sells so very important
    - Includes some fat and bone

Predicting cut weight
using HCWT plus CT composition



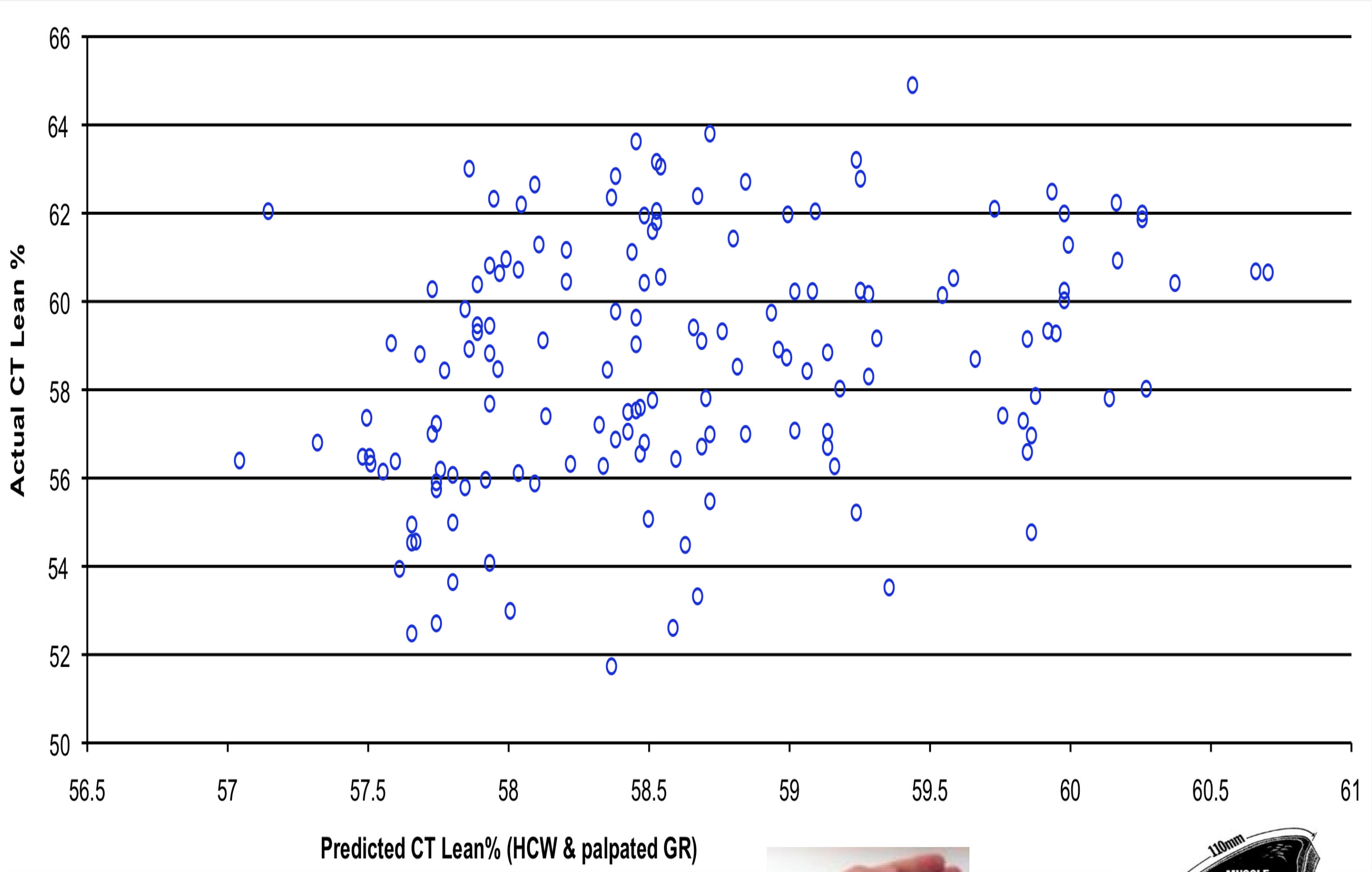


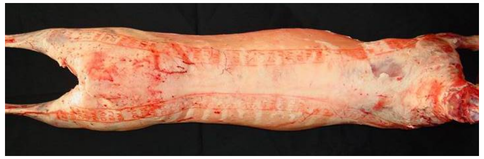
X-ray prediction of lean meat yield

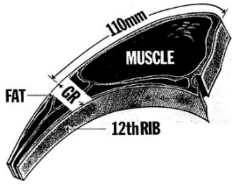
A new era or measurement

Palpated GR and HCW

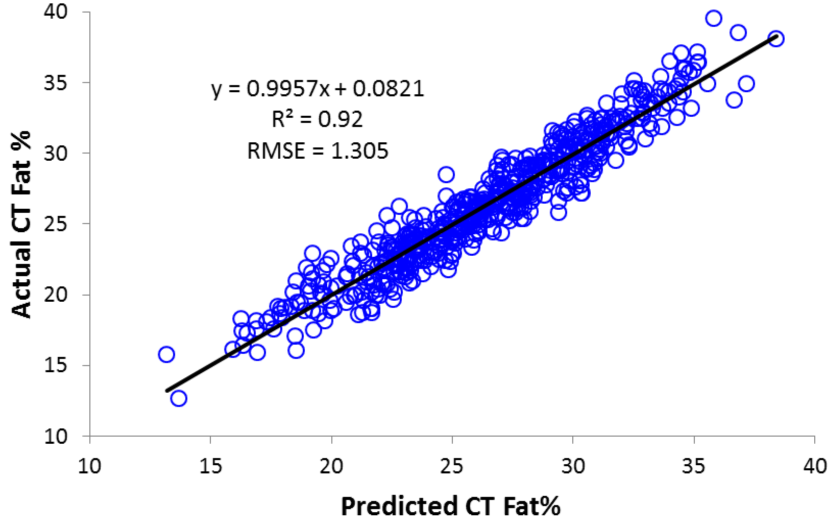
R^2=0.1-0.2; RMSE=3.0

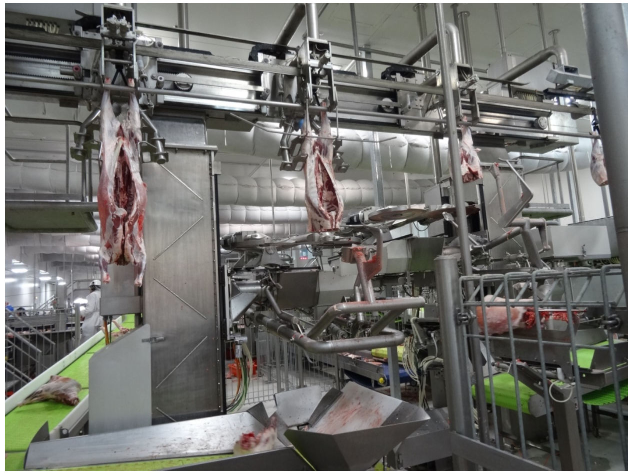






DEXA → LMY and/or Precision cutting





LMY

Dual Energy X ray = DEXA

Carcase Value

Carcase value ($) = Wt retail cuts (kg) ✓ X Value of the cuts ($/kg)

LMY

Lean meat yield

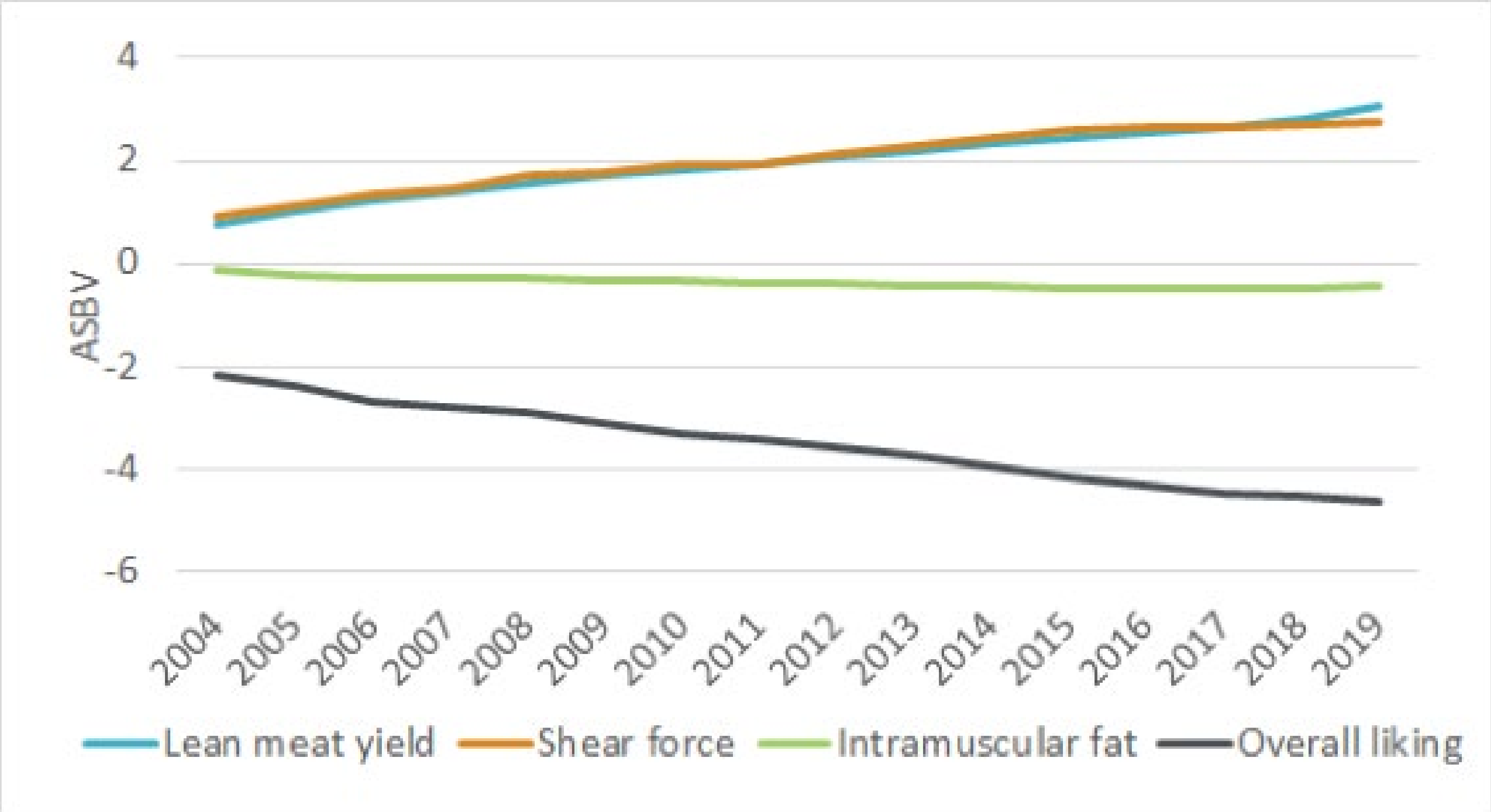
MSA 3*4*5*

good/better/best

Genetically - lean meat yield and eating quality are antagonistic

- World literature
- Its basic logic
- Our own data tells us so

Lean meat yield and eating quality are antagonistic



LMY & Shear force

IMF

Consumer score

MERINOSELECT ASBV · LAMBPLAN ASBV

SHEEP GENETICS · mla MEAT & LIVESTOCK AUSTRALIA · awi Australian Wool Innovation Limited

Carcase Value

Carcase value ($) = Wt retail cuts (kg) X Value of the cuts ($/kg)

LMY

Lean meat yield

MSA 3*4*5*

good/better/best

MLA Genetic Resource Flock
WA (DIPIRD, Katanning) & NSW

SHEEP GENETICS

• mla MEAT & LIVESTOCK AUSTRALIA • awi Australian Wool Innovation Limited •

SHEEP CRC

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MEAT STANDARDS AUSTRALIA GRADED

Eating Quality data – 1st cut

- 23kg HCW (15 -> 36kg)
- 1,702 lambs
- Short loin (sirloin) & topside grilled & each tested by 10 consumers
- **6,800 consumers**

New Meat Standards Australia grading model

Next we used carcase variables to predict the consumer score (SQ4)

- HCW
- Lean Meat Yield (-ve)
- Intramuscular fat (+ve)
- Sire type (Terminal, Maternal, Merino)

All are significant predictors

Then can estimate Eating Quality grade

Sire type x **IMF** x **LMY** x **cut** = EQ score prediction

Current data shows for the lamb short loin (striploin)

• Unsatisfactory	(2* fail)	7%
• Good every day	(3* Good)	34%
• Better then every day	(4* Better)	35%
• Premium	(5* Best)	24%

4* and 5* combined: 60%

So carcase grading and MSA Mark II will underpin lamb brands to desired quality

Practical accuracy due to grading

- 5* loin – 20% chance ungraded, after grading 60% chance
- 2* topside – 33% chance ungraded 8% chance after grading

This says – every day brand

- To guarantee a 3* lamb short loin in 20-30kg range:

- Wide window BUT down at 3% IMF your in strife !!

This says – supreme lamb brand

To guarantee a 4* or 5* lamb short loin in 20-30kg range:

- LMY and IMF interact
- Higher IMF means can increase LMY

Sweet spot something like

- LMY 55-59% (v. <u>roughly</u> fat score 2-4)
- IMF $\geqq$ 4.5% $\geqq$ 4*
- IMF $\geqq$ 5.5% = 5*

Intramuscular fat (IMF) – major factor to counter LMY

- Juiciness, flavour, tenderness
- 4.3 ± 0.04% (Terminal X)
- Called marbling in beef
- Heritability about 50%

Intramuscular fat abattoir grading in lamb

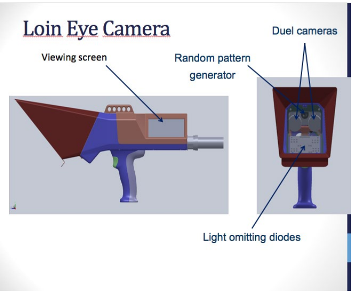
- Extremely difficult in lamb
- 10 per minute chain speed
- No ‘ribbing’ in lamb
- They would like a hot measure !!
- ……..

Intramuscular fat grading in lamb

all still in R&D phase

<u>*Cut Surface*</u>

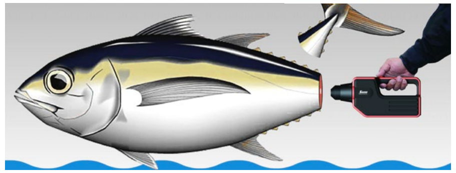
- Frontmatec rib eye hyperspectral camera – it works

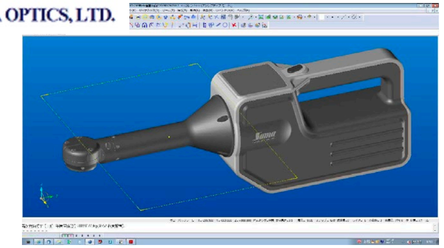


FRONTMATEC

- NIR – SOMA optics (looks promising)

SOMA OPTICS, LTD.





<u>*Penetrating probes*</u>

- MEQ probe – laser reflectance (some promise)

MEQ

Genetics to manage Eating Quality

Australian Sheep Breeding Values

- Lean Meat Yield (LMY)
- Intramuscular fat (IMF)
- EQ/LMY index's
- Progressing to actual Consumer Score breeding value

SHEEP GENETICS

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agbu

IMF breeding values percentile bands (best with genomics)

Percentile Report

Analysis **TERMINAL** Dated **1/12/2018**

Animals born in 2017 **Count 134915**

	Bwt	Wwt	PWwt	Ywt	Pfat	Yfat	Pemd	Yemd	Ysc	Hsc	Pfec	Yfec	MWwt	NLW	LMY	IMF	Dress	ShrF5		Carcase +		MCP		EQ	
Band	kg	kg	kg	kg	mm	mm	mm	mm	cm	cm	%	%	kg	%	%	%	%	N	LEQ		Trade$		SRC		LAMB2020
0	-0.80	16.0	23.8	25.1	2.5	2.9	5.5	5.7	5.9	5.3	-81	-76	9.2	21	6.9	1.3	4.4	-8.9	187.4	251.0	119.1	173.2	159.4	182.3	122.7
1	-0.54	11.8	18.3	18.8	0.9	0.9	3.7	3.5	5.1	4.5	-64	-60	5.6	11	5.[illegible]	0.1	3.0	-1.8	151.1	220.4	114.5	156.2	146.9	149.6	117.0
2	-0.49	11.5	17.8	18.2	0.7	0.7	3.4	3.2	4.9	4.4	-59	-56	5.0	10	4.9	0.0	2.8	-1.3	148.2	216.8	114.1	154.2	145.3	147.0	116.4
3	-0.45	11.2	17.4	17.8	0.6	0.6	3.2	3.1	4.8	4.3	-56	-54	4.7	10	4.7	0.0	2.[illegible]	-1.0	146.4	214.5	113.8	152.8	144.3	145.3	116.0
4	-0.41	11.0	17.1	17.5	0.5	0.5	3.1	2.9	4.7	4.1	-54	-52	4.4	9	4.6	-0.1	2.7	-0.7	145.0	212.8	113.6	151.8	143.6	144.1	115.7
5	-0.37	10.9	16.9	17.3	0.4	0.4	3.0	2.8	4.6	4.1	-52	-50	4.2	9	4.5	-0.1	2.6	-0.5	143.8	211.5	113.4	151.0	143.0	143.0	115.5
10	-0.01	10.4	16.1	16.5	0.2	0.1	2.6	2.5	4.4	3.9	-45	-44	3.8	7	4.2	-0.2	2.5	0.1	14[illegible].0	206.4	112.7	148.3	140.9	139.4	114.6
15	0.11	10.0	15.5	15.9	0.0	0.0	2.4	2.2	4.2	3.7	-41	-39	3.5	6	3.9	-0.2	2.3	0.6	137.3	202.7	112.3	146.3	139.4	136.7	114.0
20	0.17	9.8	15.1	15.5	-0.1	-0.1	2.2	2.1	4.1	3.6	-37	-36	3.3	6	3.8	-0.3	2.2	0.9	135.1	199.6	111.9	144.7	138.1	134.7	113.5
25	0.21	9.5	14.7	15.1	-0.2	-0.2	2.1	1.9	4.0	3.5	-34	-33	3.2	5	3.6	-0.3	2.1	1.3	133.5	196.9	111.5	143.3	137.1	133.0	113.1
30	0.24	9.3	14.4	14.8	-0.2	-0.3	1.9	1.7	3.9	3.4	-31	-29	3.0	5	3.4	-0.3	2.1	1.6	132.0	194.2	111.1	142.1	136.1	131.6	112.7
35	0.26	9.1	14.0	14.5	-0.3	-0.4	1.8	1.6	3.8	3.3	-28	-27	2.9	4	3.3	-0.4	2.0	1.9	130.7	191.8	110.7	140.8	135.1	130.3	112.4
40	0.29	8.9	13.7	14.2	-0.4	-0.5	1.7	1.5	3.7	3.2	-25	-24	2.8	4	3.2	-0.4	1.9	2.2	129.4	189.3	110.4	139.6	134.2	129.1	112.0
45	0.31	8.7	13.3	13.8	-0.4	-0.5	1.6	1.4	3.6	3.1	-23	-21	2.7	3	3.0	-0.4	1.8	2.5	128.2	186.9	110.0	138.4	133.3	127.9	111.7
50	0.33	8.5	13.0	13.5	-0.5	-0.6	1.5	1.3	3.5	3.0	-20	-18	2.5	3	2.9	-0.5	1.7	2.8	127.1	184.3	109.6	137.2	132.3	126.7	111.3
55	0.35	8.3	12.6	13.1	-0.5	-0.6	1.4	1.2	3.4	2.9	-17	-15	2.4	2	2.7	-0.5	1.7	3.1	126.0	181.5	109.2	135.9	131.3	125.6	111.0
60	0.37	8.0	12.2	12.8	-0.6	-0.7	1.3	1.1	3.3	2.9	-14	-12	2.3	2	2.6	-0.5	1.6	3.5	124.9	178.7	108.7	134.6	130.2	124.5	110.6
65	0.39	7.8	11.8	12.3	-0.7	-0.8	1.1	0.9	3.2	2.8	-11	-9	2.1	1	2.4	-0.6	1.5	3.8	123.8	175.4	108.3	133.2	129.1	123.4	110.1
70	0.41	7.5	11.3	11.8	-0.7	-0.8	1.0	0.8	3.1	2.7	-7	-6	2.0	1	2.2	-0.6	1.4	4.2	122.7	171.9	107.8	131.7	127.8	122.3	109.7
75	0.43	7.1	10.8	11.3	-0.8	-0.9	0.9	0.7	3.0	2.6	-3	-2	1.8	0	2.0	-0.7	1.3	4.6	12[illegible].4	168.0	107.4	130.1	126.4	121.1	109.2
80	0.46	6.7	10.2	10.6	-0.9	-1.0	0.8	0.6	2.9	2.6	1	3	1.7	-1	1.7	-0.7	1.2	5.1	120.1	163.8	106.8	128.4	124.7	119.8	108.7
85	0.48	6.2	9.4	9.7	-1.0	-1.1	0.6	0.4	2.7	2.4	6	8	1.4	-1	1.4	-0.8	1.1	5.6	118.5	159.5	106.2	126.3	122.8	118.2	108.1
90	0.52	5.6	8.6	8.5	-1.1	-1.2	0.4	0.2	2.4	2.2	13	14	1.2	-3	1.0	-0.8	0.[illegible]	6.2	116.5	154.3	105.4	123.5	120.5	116.2	107.4
95	0.57	4.7	7.5	7.0	-1.3	-1.4	0.1	-0.1	2.1	1.6	23	24	0.7	-5	0.5	-0.9	0.7	6.9	1[illegible]3.4	147.4	104.0	119.3	117.4	113.1	106.5
96	0.59	4.4	7.2	6.6	-1.3	-1.4	0.0	-0.2	2.0	1.4	26	27	0.6	-5	0.4	-0.9	0.6	7.1	112.4	145.5	103.5	118.1	116.5	112.1	106.2
97	0.60	4.1	6.8	6.1	-1.4	-1.5	-0.1	-0.3	1.8	1.2	30	30	0.4	-6	0.2	-1.0	0.5	7.4	111.2	143.3	102.8	116.6	115.4	111.0	105.9
98	0.63	3.8	6.3	5.6	-1.5	-1.6	-0.2	-0.4	1.7	1.0	34	34	0.2	-7	0.0	-1.0	0.4	7.8	109.6	140.5	101.9	114.7	114.1	109.3	105.5
99	0.67	3.3	5.6	4.7	-1.6	-1.7	-0.5	-0.6	1.4	0.7	41	40	-0.2	-8	-0.3	-1.[illegible]	0.2	8.4	106.4	135.9	100.1	111.5	112.1	106.2	104.9
100	0.94	-5.4	-7.6	-7.4	-2.7	-2.9	-2.6	-2.4	0.1	0.2	110	84	-2.6	-16	-3.3	-1.6	-1.3	14.1	88.5	59.0	78.1	78.3	86.9	88.3	94.5

IMF breeding values percentile bands

Percentile Report

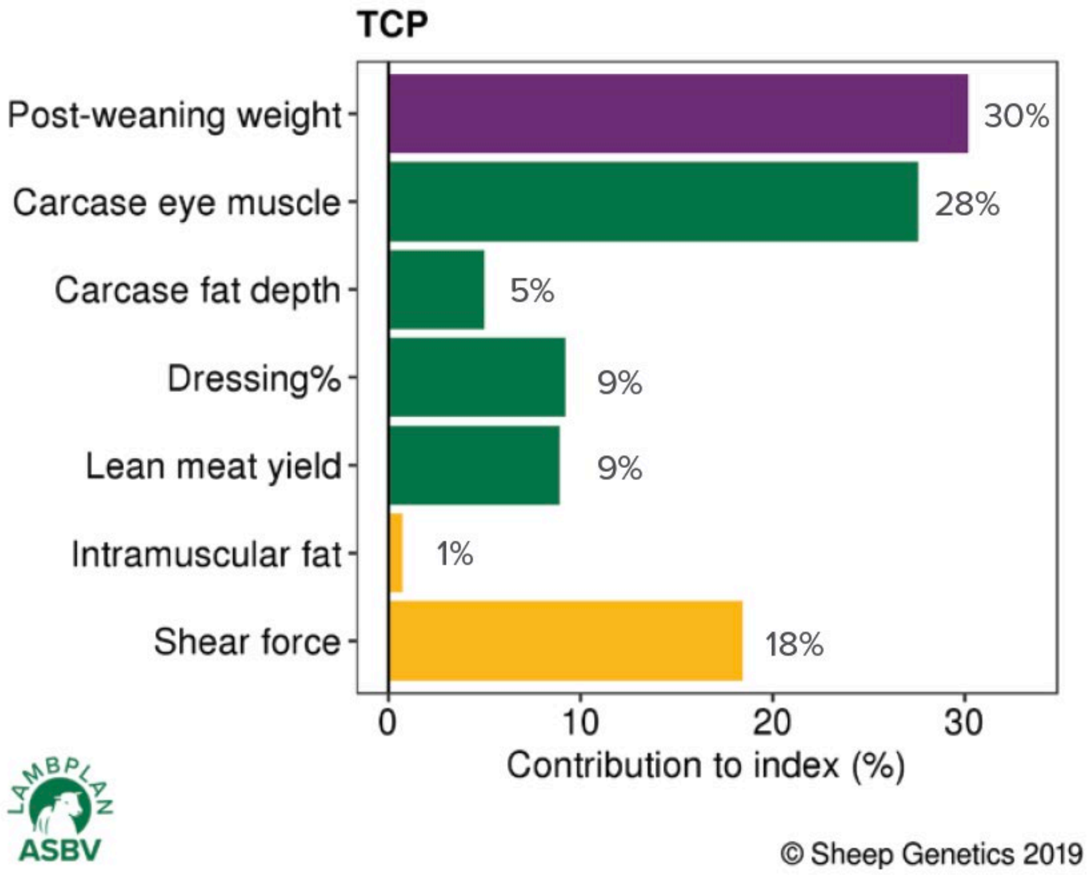
Analysis **TERMINAL** Dated **1/12/2018**

Animals born in 2017 **Count 134915**

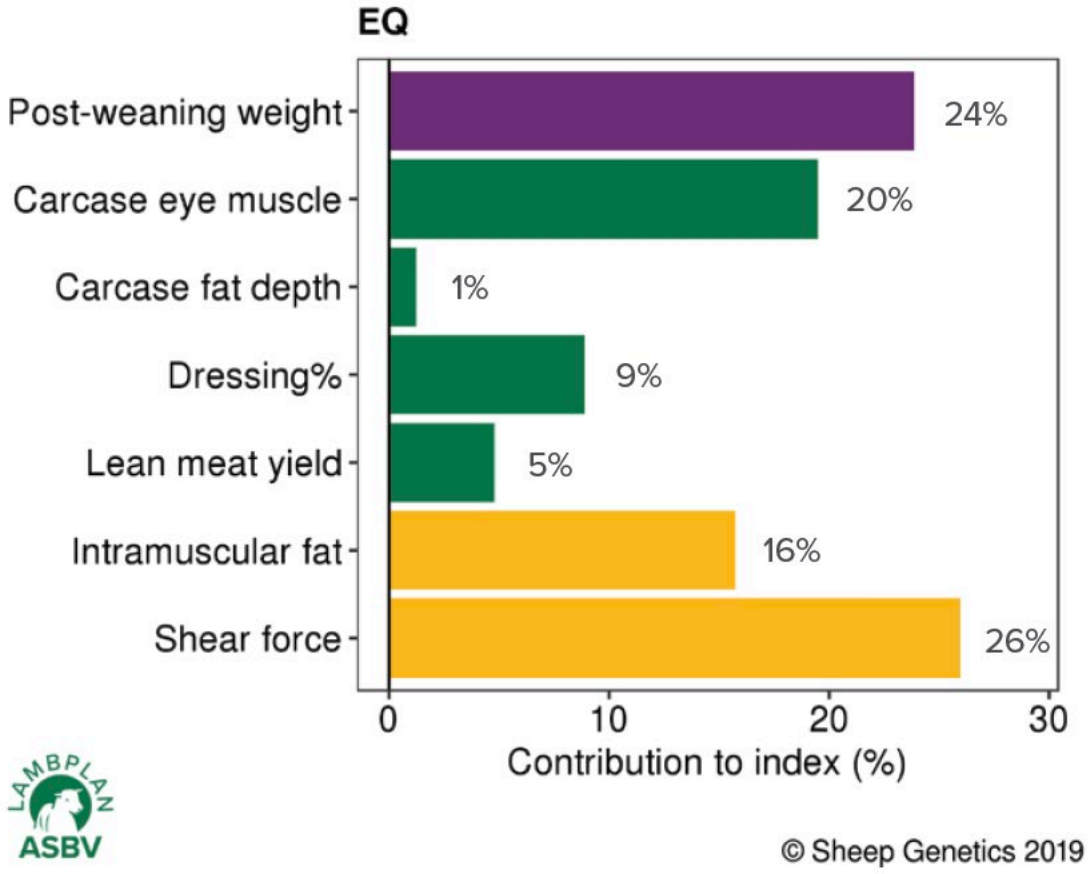
	Bwt	Wwt	PWwt	Ywt	Pfat	Yfat	Pemd	Yemd	Ysc	Hsc	Pfec	Yfec	MWwt	NLW	LMY	IMF	Dress	ShrF5		Carcase +		MCP		EQ	
Band	kg	kg	kg	kg	mm	mm	mm	mm	cm	cm	%	%	kg	%	%	%	%	N	LEQ		Trade$		SRC		LAMB2020
0	-0.80	16.0	23.8	25.1	2.5	2.9	5.5	5.7	5.9	5.3	-81	-76	9.2	21	6.9	1.3	4.4	-8.9	187.4	251.0	119.1	173.2	159.4	182.3	122.7
1	-0.54	11.8	18.3	18.8	0.9	0.9	3.7	3.5	5.1	4.5	-64	-60	5.6	11	5.[illegible]	0.1	3.0	-1.8	151.1	220.4	114.5	156.2	146.[illegible]	149.6	117.0
2	-0.49	11.5	17.8	18.2	0.7	0.7	3.4	3.2	4.9	4.4	-59	-56	5.0	10	4.9	0.0	2.8	-1.3	148.2	216.8	114.1	154.2	145.3	147.0	116.4
3	-0.45	11.2	17.4	17.8	0.6	0.6	3.2	3.1	4.8	4.3	-56	-54	4.7	10	4.7	0.0	2.7	-1.0	146.4	214.5	113.8	152.8	144.3	145.3	116.0
4	-0.41	11.0	17.1	17.5	0.5	0.5	3.1	2.9	4.7	4.1	-54	-52	4.4	9	4.6	-0.1	2.7	-0.7	145.0	212.8	113.6	151.8	143.6	144.1	115.7
5	-0.37	10.9	16.9	17.3	0.4	0.4	3.0	2.8	4.6	4.1	-52	-50	4.2	9	4.5	-0.1	2.6	-0.5	143.8	21[illegible].5	113.4	151.0	143.0	143.0	115.5
10	-0.01	10.4	16.1	16.5	0.2	0.1	2.6	2.5	4.4	3.9	-45	-44	3.8	7	4.2	-0.2	2.5	0.1	140.0	20[illegible].4	112.7	148.3	140.9	139.4	114.6
15	0.11	10.0	15.5	15.9	0.0	0.0	2.4	2.2	4.2	3.7	-41	-39	3.5	6	3.9	-0.2	2.3	0.6	137.3	20[illegible].7	112.3	146.3	139.4	136.7	114.0
20	0.17	9.8	15.1	15.5	-0.1	-0.1	2.2	2.1	4.1	3.6	-37	-36	3.3	6	3.8	-0.3	2.2	0.9	135.1	19[illegible].6	111.9	144.7	138.1	134.7	113.5
25	0.21	9.5	14.7	15.1	-0.2	-0.2	2.1	1.9	4.0	3.5	-34	-33	3.2	5	3.6	-0.3	2.1	1.3	133.5	19[illegible].9	111.5	143.3	137.1	133.0	113.1
30	0.24	9.3	14.4	14.8	-0.2	-0.3	1.9	1.7	3.9	3.4	-31	-29	3.0	5	3.4	-0.3	2.1	1.6	132.0	19[illegible].2	111.1	142.1	136.1	131.6	112.7
35	0.26	9.1	14.0	14.5	-0.3	-0.4	1.8	1.6	3.8	3.3	-28	-27	2.9	4	3.3	-0.4	2.0	1.9	130.7	19[illegible].8	110.7	140.8	135.1	130.3	112.4
40	0.29	8.9	13.7	14.2	-0.4	-0.5	1.7	1.5	3.7	3.2	-25	-24	2.8	4	3.2	-0.4	1.9	2.2	129.4	18[illegible].3	110.4	139.6	134.2	129.1	112.0
45	0.31	8.7	13.3	13.8	-0.4	-0.5	1.6	1.4	3.6	3.1	-23	-21	2.7	3	3.0	-0.4	1.8	2.5	128.2	18[illegible].9	110.0	138.4	133.3	127.9	111.7
50	0.33	8.5	13.0	13.5	-0.5	-0.6	1.5	1.3	3.5	3.0	-20	-18	2.5	3	2.9	-0.5	1.7	2.8	127.1	18[illegible].3	109.6	137.2	132.3	126.7	111.3
55	0.35	8.3	12.6	13.1	-0.5	-0.6	1.4	1.2	3.4	2.9	-17	-15	2.4	2	2.7	-0.5	1.7	3.1	126.0	18[illegible].5	109.2	135.9	131.3	125.6	111.0
60	0.37	8.0	12.2	12.8	-0.6	-0.7	1.3	1.1	3.3	2.9	-14	-12	2.3	2	2.6	-0.5	1.6	3.5	124.9	17[illegible].7	108.7	134.6	130.2	124.5	110.6
65	0.39	7.8	11.8	12.3	-0.7	-0.8	1.1	0.9	3.2	2.8	-11	-9	2.1	1	2.4	-0.6	1.5	3.8	123.8	17[illegible].4	108.3	133.2	129.1	123.4	110.1
70	0.41	7.5	11.3	11.8	-0.7	-0.8	1.0	0.8	3.1	2.7	-7	-6	2.0	1	2.2	-0.6	1.4	4.2	122.7	17[illegible].9	107.8	131.7	127.8	122.3	109.7
75	0.43	7.1	10.8	11.3	-0.8	-0.9	0.9	0.7	3.0	2.6	-3	-2	1.8	0	2.0	-0.7	1.3	4.6	121.4	168.0	107.4	130.1	126.4	121.1	109.2
80	0.46	6.7	10.2	10.6	-0.9	-1.0	0.8	0.6	2.9	2.6	1	3	1.7	-1	1.7	-0.7	1.2	5.1	120.1	163.8	106.8	128.4	124.7	119.8	108.7
85	0.48	6.2	9.4	9.7	-1.0	-1.1	0.6	0.4	2.7	2.4	6	8	1.4	-1	1.4	-0.8	1.1	5.6	118.5	159.5	106.2	126.3	122.8	118.2	108.1
90	0.52	5.6	8.6	8.5	-1.1	-1.2	0.4	0.2	2.4	2.2	13	14	1.2	-3	1.0	-0.8	0.9	6.2	116.5	154.3	105.4	123.5	120.5	116.2	107.4
95	0.57	4.7	7.5	7.0	-1.3	-1.4	0.1	-0.1	2.1	1.6	23	24	0.7	-5	0.5	-0.9	0.7	6.9	113.4	147.4	104.0	119.3	117.4	113.1	106.5
96	0.59	4.4	7.2	6.6	-1.3	-1.4	0.0	-0.2	2.0	1.4	26	27	0.6	-5	0.4	-0.9	0.6	7.1	112.4	145.5	103.5	118.1	116.5	112.1	106.2
97	0.60	4.1	6.8	6.1	-1.4	-1.5	-0.1	-0.3	1.8	1.2	30	30	0.4	-6	0.2	-1.0	0.5	7.4	111.2	143.3	102.8	116.6	115.4	111.0	105.9
98	0.63	3.8	6.3	5.6	-1.5	-1.6	-0.2	-0.4	1.7	1.0	34	34	0.2	-7	0.0	-1.0	0.4	7.8	109.6	140.5	101.9	114.7	114.1	109.3	105.5
99	0.67	3.3	5.6	4.7	-1.6	-1.7	-0.5	-0.6	1.4	0.7	41	40	-0.2	-8	-0.3	-1.[illegible]	0.2	8.4	106.4	135.9	100.1	111.5	112.1	106.[illegible]	104.9
100	0.94	-5.4	-7.6	-7.4	-2.7	-2.9	-2.6	-2.4	0.1	0.2	110	84	-2.6	-16	-3.3	-1.6	-1.3	14.1	88.5	59.0	78.1	78.3	86.9	88.3	94.5

Eating quality ASBVs combined with other traits in EQ index

Maintaining EQ



Improving EQ



Sheep Genetics fact sheets

Sheep GENETICS

mla
MEAT & LIVESTOCK AUSTRALIA

Terminal indexes

A ram breeder's guide

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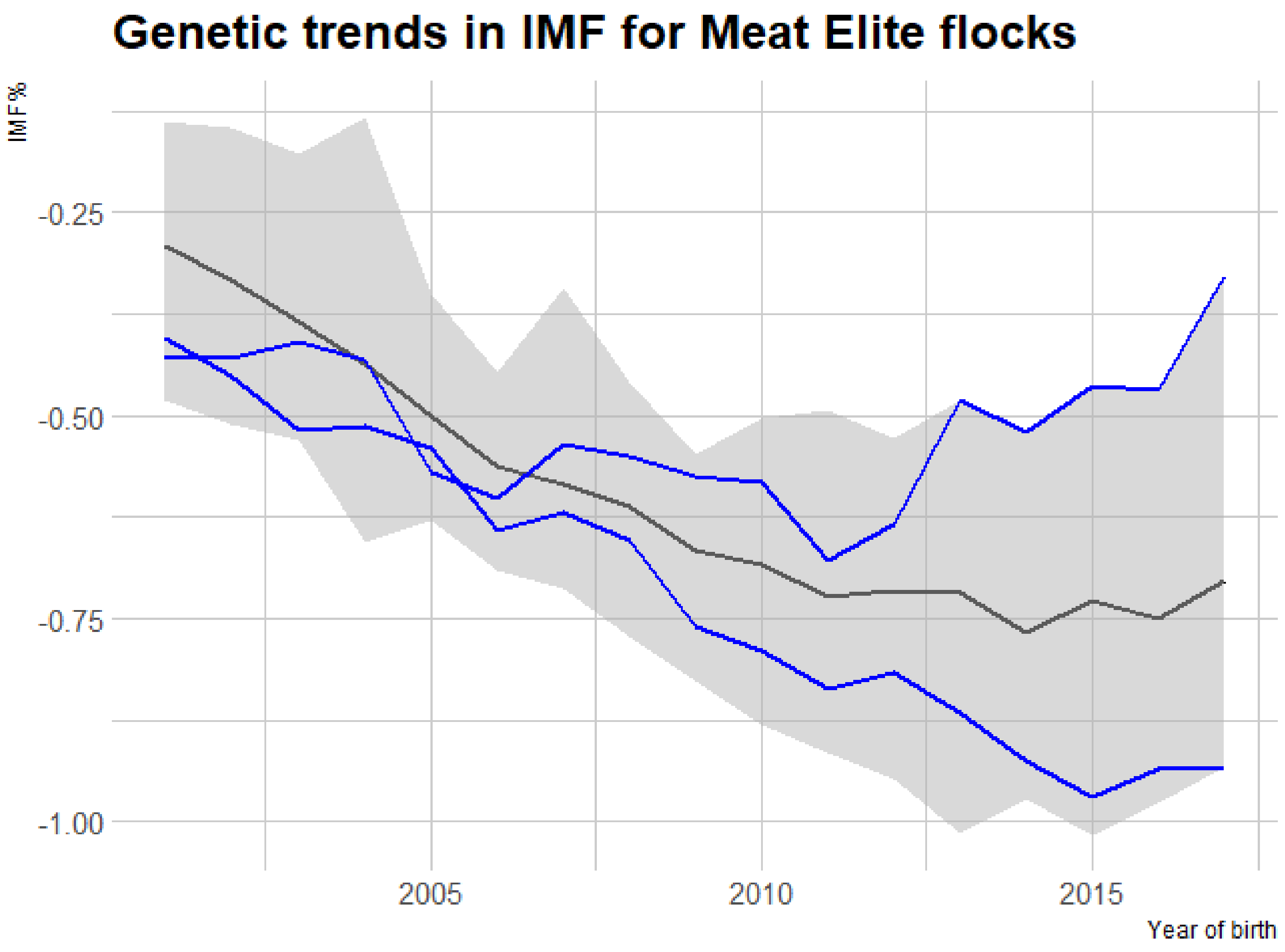
http://www.sheepgenetics.org.au/files/8224f5bd-93af-4638-aa7f-aab200fded17/19MLA-Breeder-terminal.pdf
http://www.sheepgenetics.org.au/files/f5ecdd78-68e5-46b7-9159-aab200fdeebd/19MLA-Buyer-terminal.pdf

Changing selection emphasis



Take home messages

- LMY important
- Eating quality important
- Both needed to predict eating quality
- Both important for carcase value

Take home messages

- Genetics of eating quality is here NOW
- Carcase grading rapidly approaching
- New MSA model is ready to go !
- Genetics and Nutrition BOTH play a role
- Current MSA principles still apply (e-stimulation; meat aging, best practice handling, no entire ♂ ….)

Graham Gardner
Liselotte Pannier
Fiona Anderson
Sarah Stewart
Honor Calnan

Andrew Williams
Claire Payne
Maddison Corlette
Steve Connington
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SHEEP CRC
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MEAT STANDARDS AUSTRALIA GRADED