Meeting Market Specs with Efficient Beef Genetics

Dr Liam A. Mowbray BVSc(Hons), DipBus, BMRSc

Research & Development Specialist – Genetic Improvement, Angus Australia

ANGUS AUSTRALIA

A bit about me

Setting the Scene….

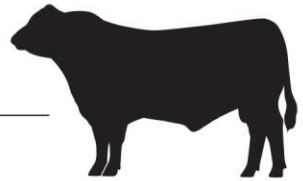
Why do we want to meet market specs?

Why do we want to increase performance and efficiency?

Business profitability $$$

…But also need to keep up with current challenges and opportunities…

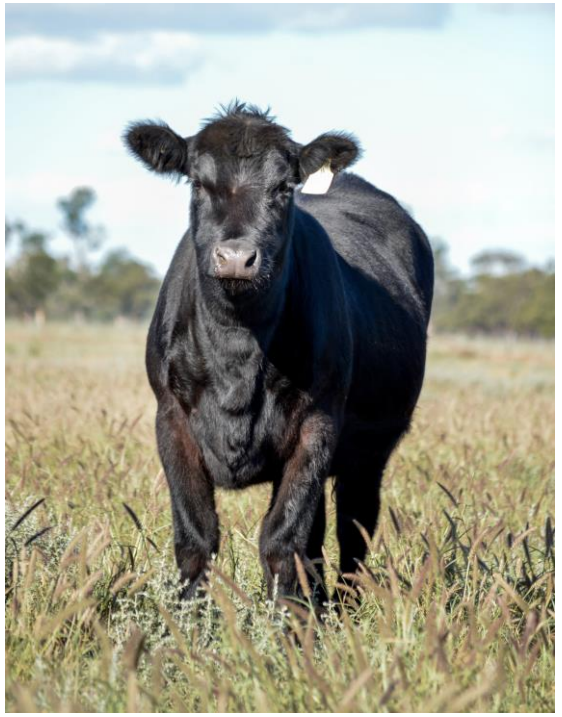
- Growing world population (supply and demand)
- Same or diminishing resources
- Consumer expectations evolving
- Climate is changing



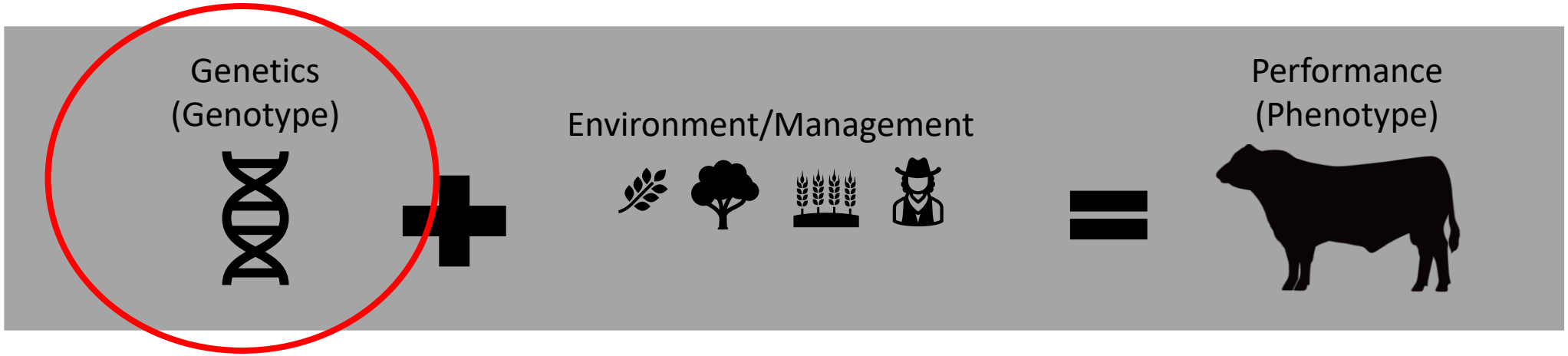

“If you do what you’ve always done, you’ll get what you’ve always gotten.”
- Tony Robins
ANGUS
AUSTRALIA

What we will cover in this session:

- Genetic Fundamentals
- Estimated Breeding Values (EBV's)
- Application of EBV's
- Looking to the future



So… We need to be better than ever before at what we do → producing beef



Lots of different traits:

- Traits important to the farm
- Traits important to the market
- Traits important to Welfare
- Traits important to the consumer

Examples

For Breeder:

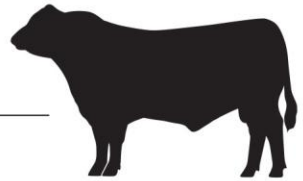
- Calving Ease
- Docility
- Fertility

Backgrounder/Finisher

- Ability to fatten
- Feed efficiency
- Growth

For Consumer:

- Marbling
- Tenderness
- Nutrients
- Welfare



Fortunately, lots of variation exists – and we can select on it

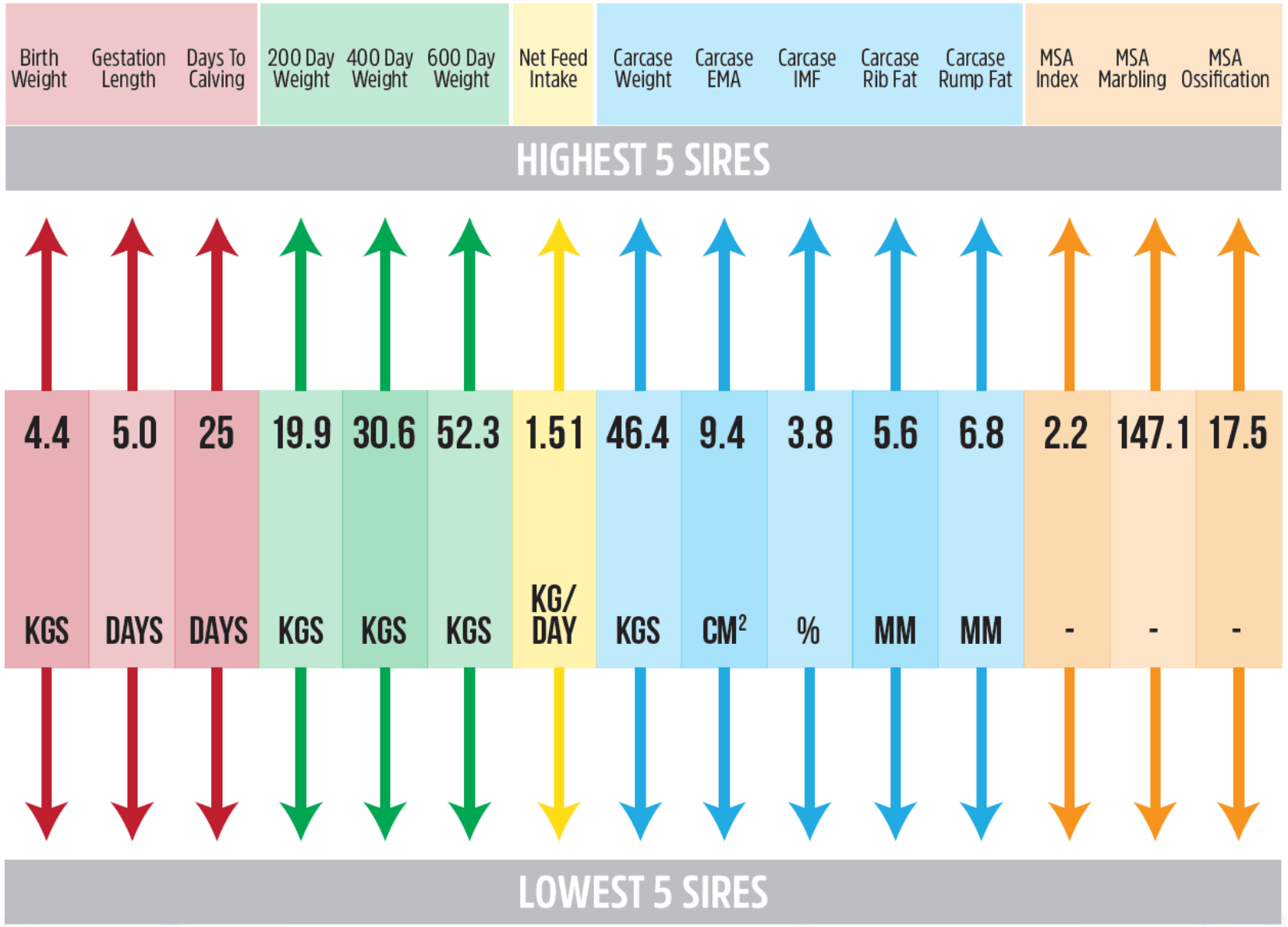







…And when we take environmental variables out of the equation, we see this variation at its best (eg the ASBP)…

Contemporary group of ASBP Cohort 12 Steers at Tullimba Research Feedlot



There is a significant amount of genetic variation between animals within the Angus population

Cohorts 5 – 7 of the Angus Sire Benchmarking Project

Why would that happen?

- Random Shuffling of Genes
- Heritability of Traits

Random Shuffling of Genes

- Cattle have 30 pairs of Chromosomes
- For each pair of chromosomes
  - One from dam
  - One from sire
- Random combinations
  - Number of possible combinations = 1,073,741,824.

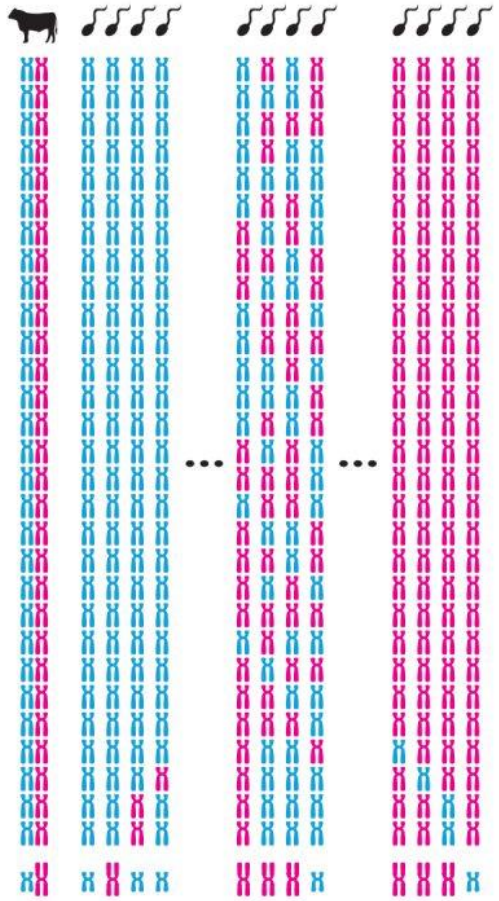
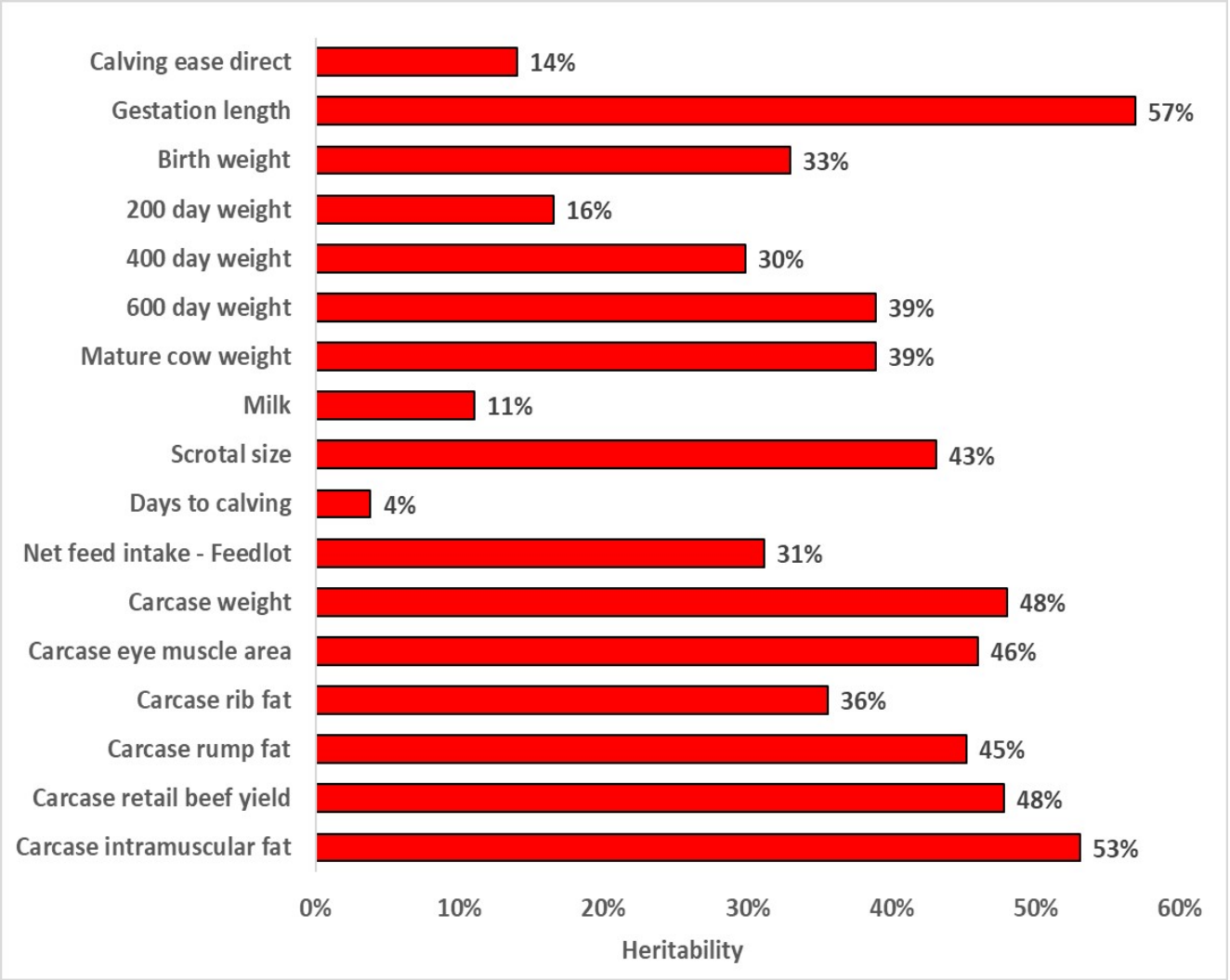


Figure 1. Illustration of the shuffling of chromosomes that occurs during sperm formation. The first column represents the bull's two sets of chromosomes. Chromosomes inherited from the bull's sire are in blue. Chromosomes from the bull's dam are in pink. The other columns depict possible combinations of paternal and maternal chromosomes in individual sperm cells. There are more than 1 billion possible combinations.

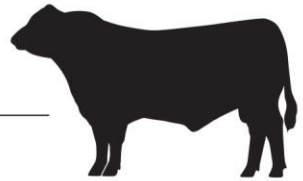
Reference: Andrew Byrne, Senior Technical Specialist, Neogen Australia

Heritability of Traits



Estimated Breeding Values (EBV's)

- We use the variation that exists to create EBV's
- EBV's are a prediction of the breeding value (genetic merit) of an animal for individual traits.
- EBV's indicate the expected difference in progeny performance due to genetics.



Why do we use EBV's?

- EBV's take out non-genetic factors.
- This enables comparison of individuals genetic merit fairly and without environmental bias.
- For example, without EBV's we would often just be selecting older animals or animals that have been raised in more favourable environmental conditions.

How are EBV's calculated?

More info on TACE Platform here

Pedigree

Performance

Genomics

EBVs

TACE

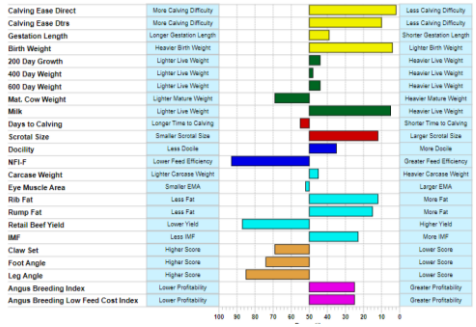
TransTasman Angus Cattle Evaluation

February 2024 TransTasman Angus Cattle Evaluation

	Calving Ease				Growth					Fertility		Temp.
	Calving Ease Dir	Calving Ease Dtrs	Gestation Length	Birth Weight	200 Day Growth	400 Day Weight	600 Day Weight	Mat Cow Weight	Milk	Days to Calving	Scrotal Size	Docility
EBV	+10.2	+7.4	-5.1	+0.6	+52	+92	+121	+89	+25	-4.4	+3.5	+24
Acc	65%	54%	82%	82%	83%	81%	80%	77%	72%	41%	79%	77%
Perc	2	10	39	4	44	48	44	69	5	55	12	35

	Carcase						Feed Efficiency	Structural			Selection Index	
	Carcase Weight	Eye Muscle Area	Rib Fat	Rump Fat	Retail Beef Yield	IMF	NFI-F	Claw Set	Foot Angle	Leg Angle	Angus Breeding Index	Angus Breeding Low Feed Cost Index
EBV	+69	+6.3	+2.0	+2.0	-0.3	+3.4	+0.77	+0.94	+1.08	+1.16	$227	$382
Acc	69%	69%	68%	70%	60%	73%	60%	67%	67%	65%	-	-
Perc	45	52	12	15	87	23	93	69	74	85	25	25

Traits Observed: GL,BWT,Genomics



TACE

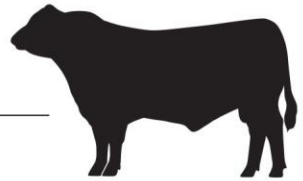
TransTasman Angus Cattle Evaluation

February 2024 TransTasman Angus Cattle Evaluation

	Calving Ease				Growth					Fertility		Temp.
	Calving Ease Dir	Calving Ease Dtrs	Gestation Length	Birth Weight	200 Day Growth	400 Day Weight	600 Day Weight	Mat Cow Weight	Milk	Days to Calving	Scrotal Size	Docility
EBV	+6.3	+5.7	-4.5	+2.6	+53	+92	+118	+92	+22	-4.4	+2.4	+25
Acc	80%	66%	99%	98%	97%	97%	91%	87%	79%	56%	95%	97%
Perc	16	23	48	21	39	49	51	65	14	55	39	30
Prog	246	0	856	1138	439	256	2	0	0	0	111	392

	Carcase						Feed Efficiency	Structural			Selection Index	
	Carcase Weight	Eye Muscle Area	Rib Fat	Rump Fat	Retail Beef Yield	IMF	NFI-F	Claw Set	Foot Angle	Leg Angle	Angus Breeding Index	Angus Breeding Low Feed Cost Index
EBV	+69	+11.3	+1.9	+1.6	+0.2	+4.6	+1.33	+0.92	+1.06	+1.04	$251	$406
Acc	82%	84%	83%	83%	78%	84%	70%	89%	88%	87%	-	-
Perc	44	9	13	19	66	7	99	65	70	52	8	11
Prog	0	149/0	154/0	154/0	0	154/0	0	42	42	42	-	-

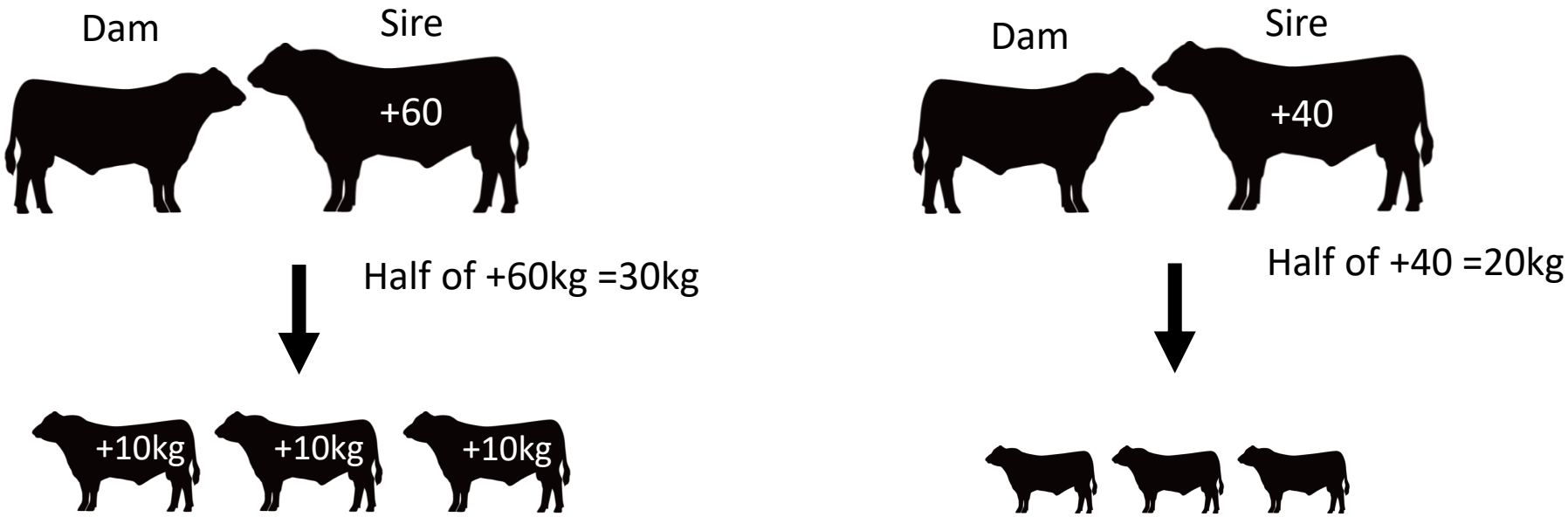
Traits Observed: CE,BWT,200WT(x2),400WT,SC,Scan(EMA,Rib,Rump,IMF),Genomics
Statistics: Number of Herds: **45**, Prog Analysed: **1208**, Genomic Prog: **448**



How do we use and interpret an EBV?

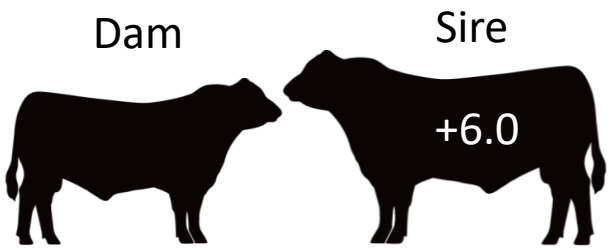
Note: same maths works out if minus one sire from the other and then divide by two…

Example with 200d weight

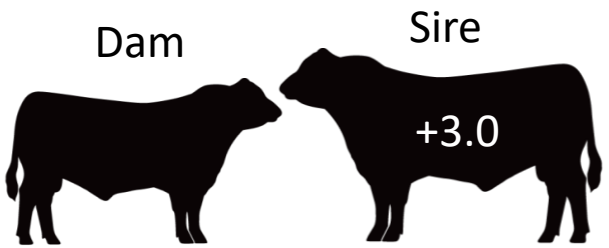


Calves at 200days will have 10kg difference in weight

Another example with Birth Weight

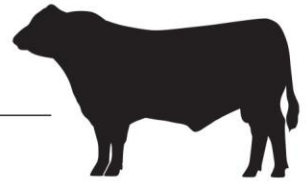


Half of +6.0kg =3kg



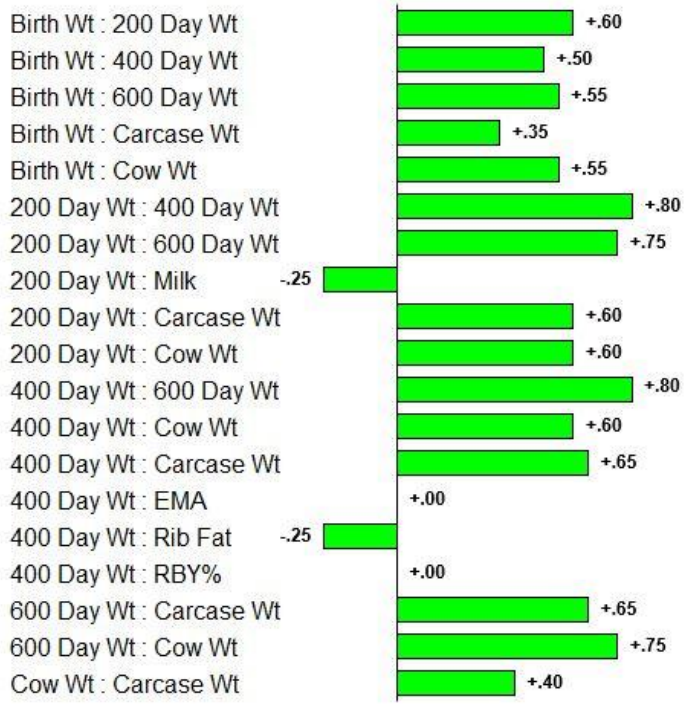
Half of +3.0kg =1.5kg

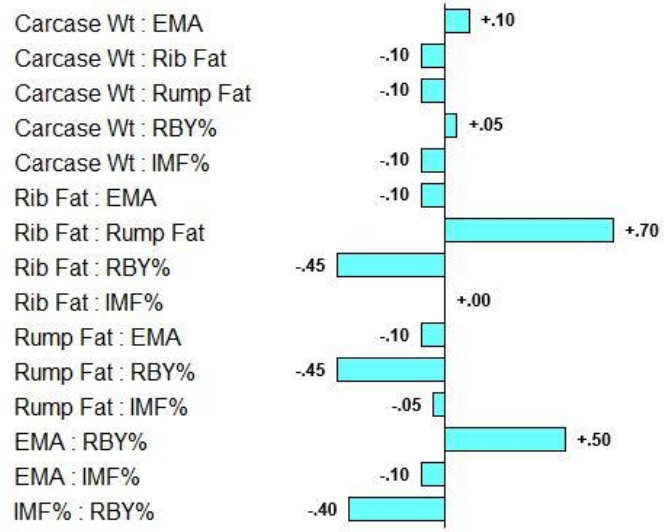
Calves at birth will have a
1.5kg difference



Trait correlations:

…Many traits have strong correlations

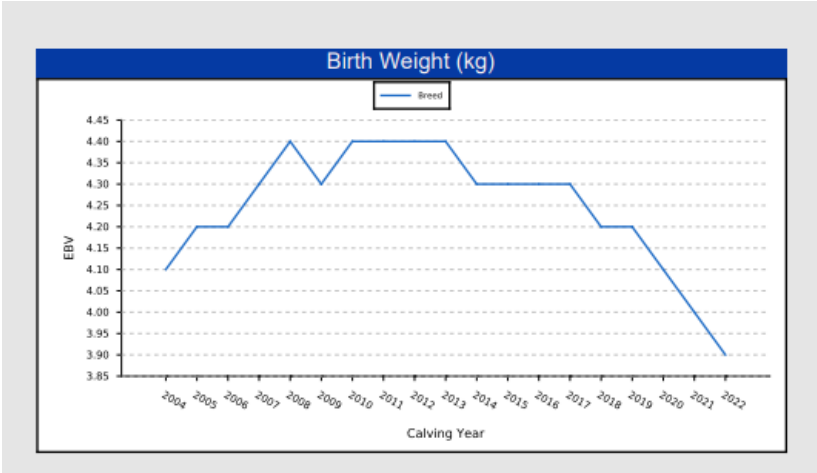


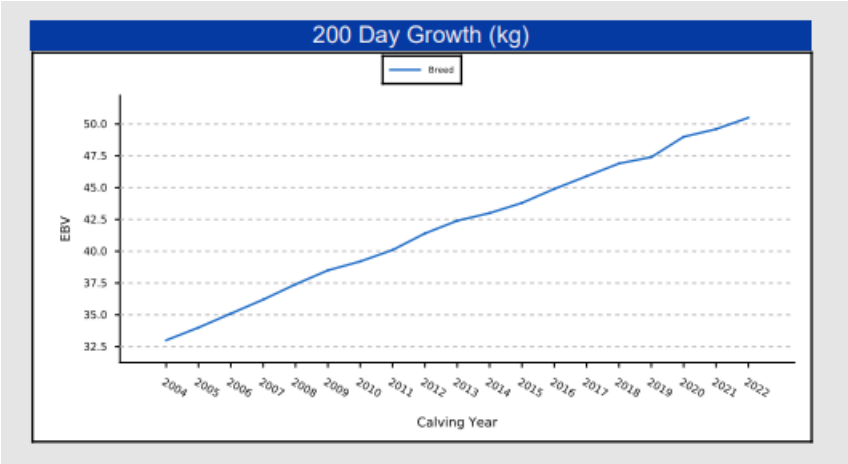


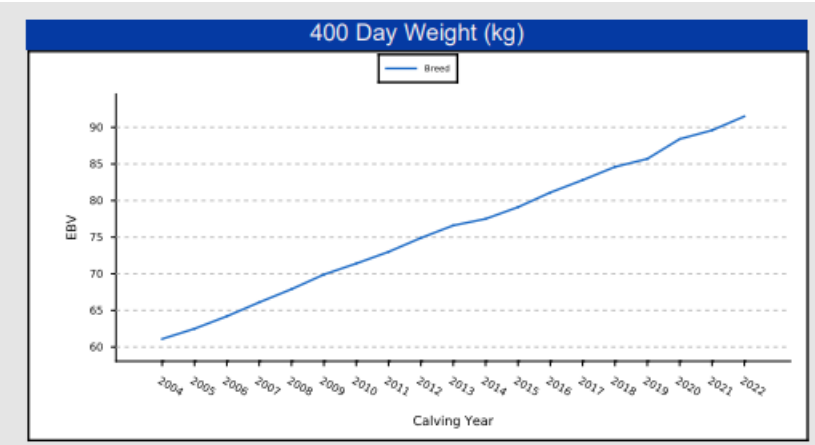
…But that does not mean we cannot create animals that do both things…

Example 1: BW and Growth

Highly corelated, but…

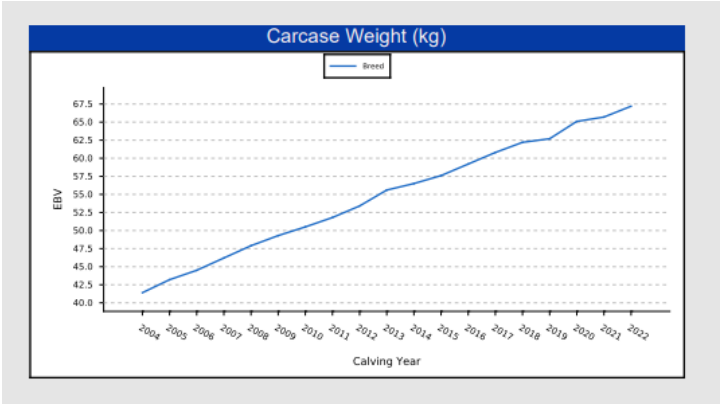


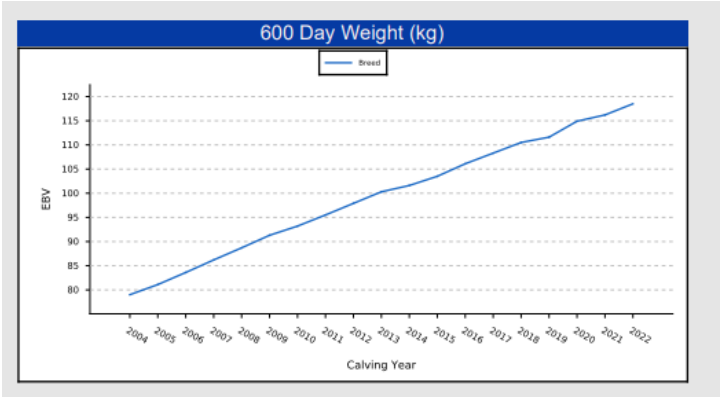


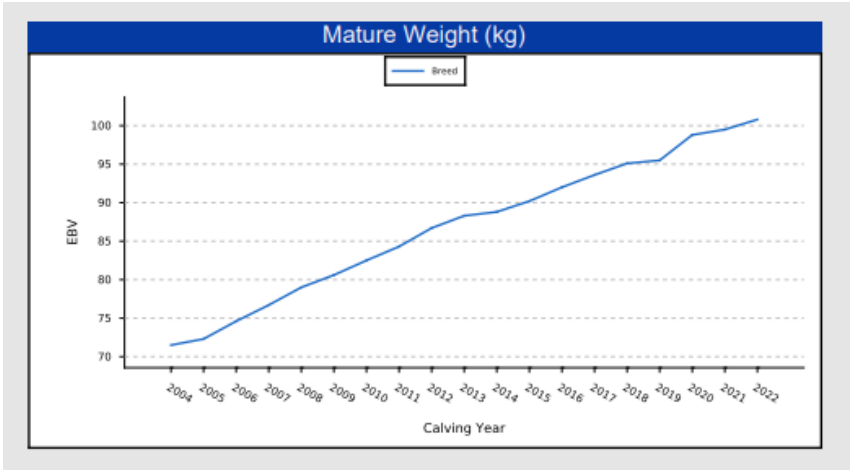


Example 2: BW and Mature Cow Wt

…perhaps an area that hasn't been looked at enough?



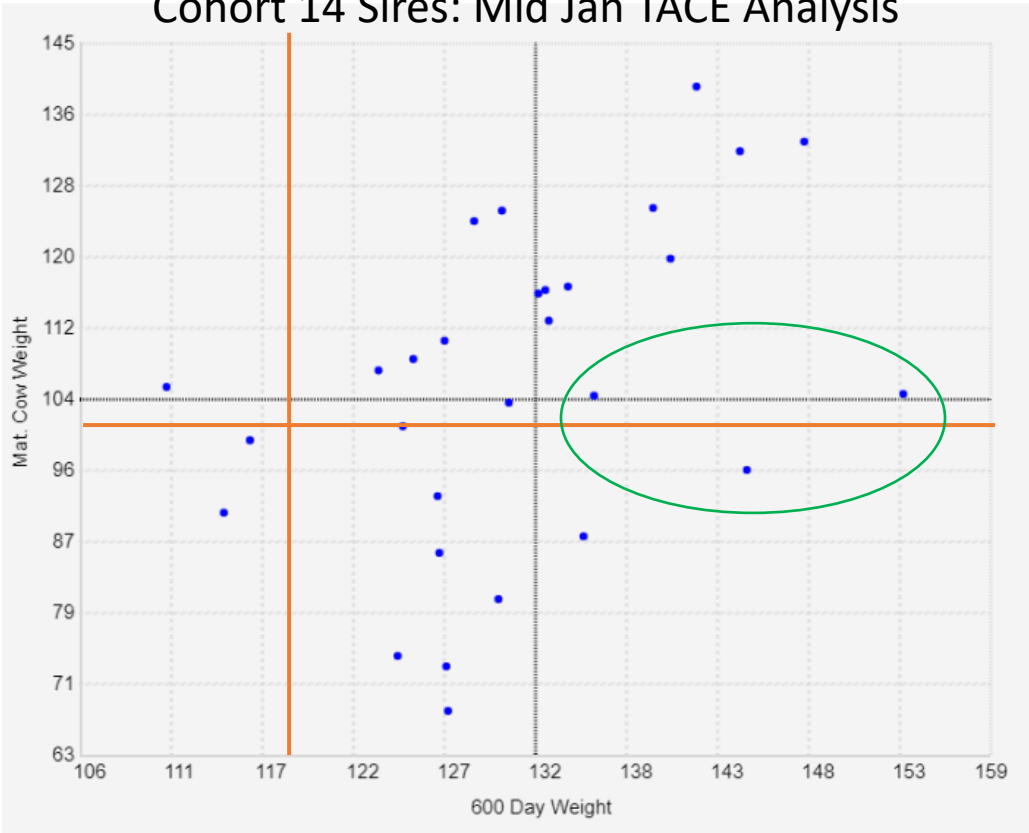




Bending the curve…

Very possible to adjust cow weight if desired, like we have done with other traits….

Cohort 14 Sires: Mid Jan TACE Analysis



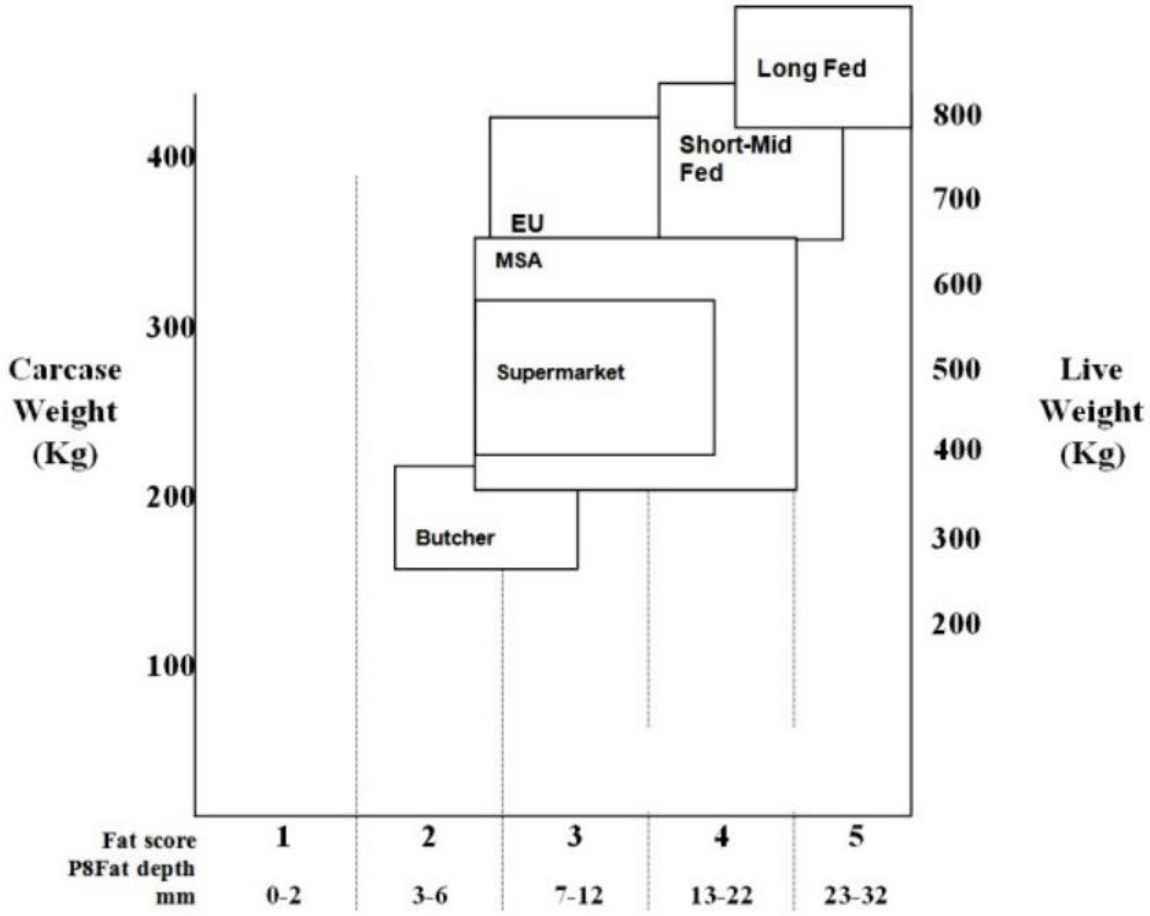
Breed av. +119

Breed av. +101

Using EBV's to meet market Specs

Great tool to take the genetic side further

What market are you targeting?



Target market specifications for cattle carcases

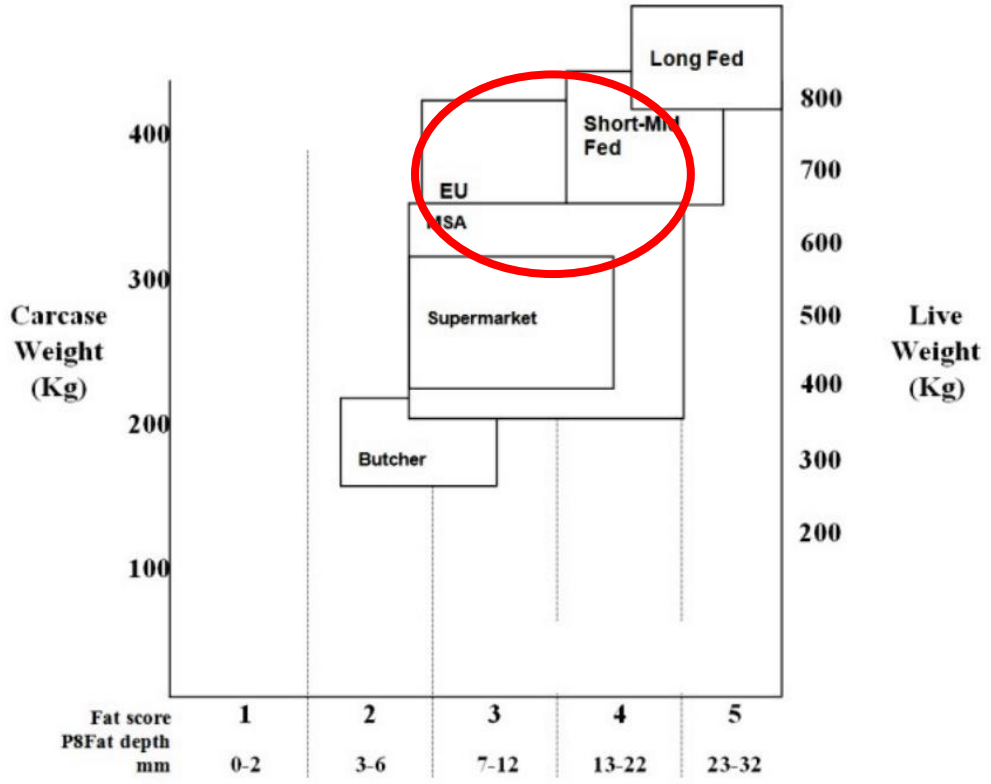
Ref: NSW DPI PrimeFact 621

Example 1:

- Self replacing Angus herd
- Retaining own replacement heifers
- Producing steers and surplus heifers for Grassfed EU slaughter.
  - Aim for 320-420kg carcass
  - 0-4 teeth
  - 7-22mm P8 fat

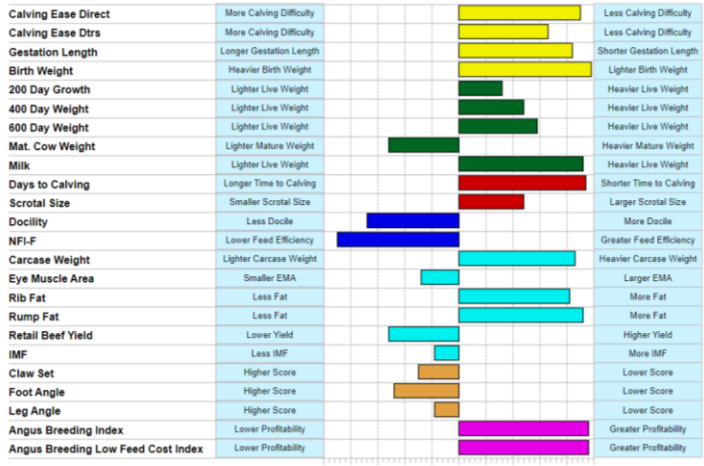
Key Traits for Grass Performance	Trait managed by
Weight for Age	*Growth EBVs*
Compliance	*Rib & Rump Fat EBVs*
Carcase Value	*Carcase Quality traits*

…Calving ease, fertility, maternal,



Target market specifications for cattle carcases

Sire example…



February 2024 TransTasman Angus Cattle Evaluation

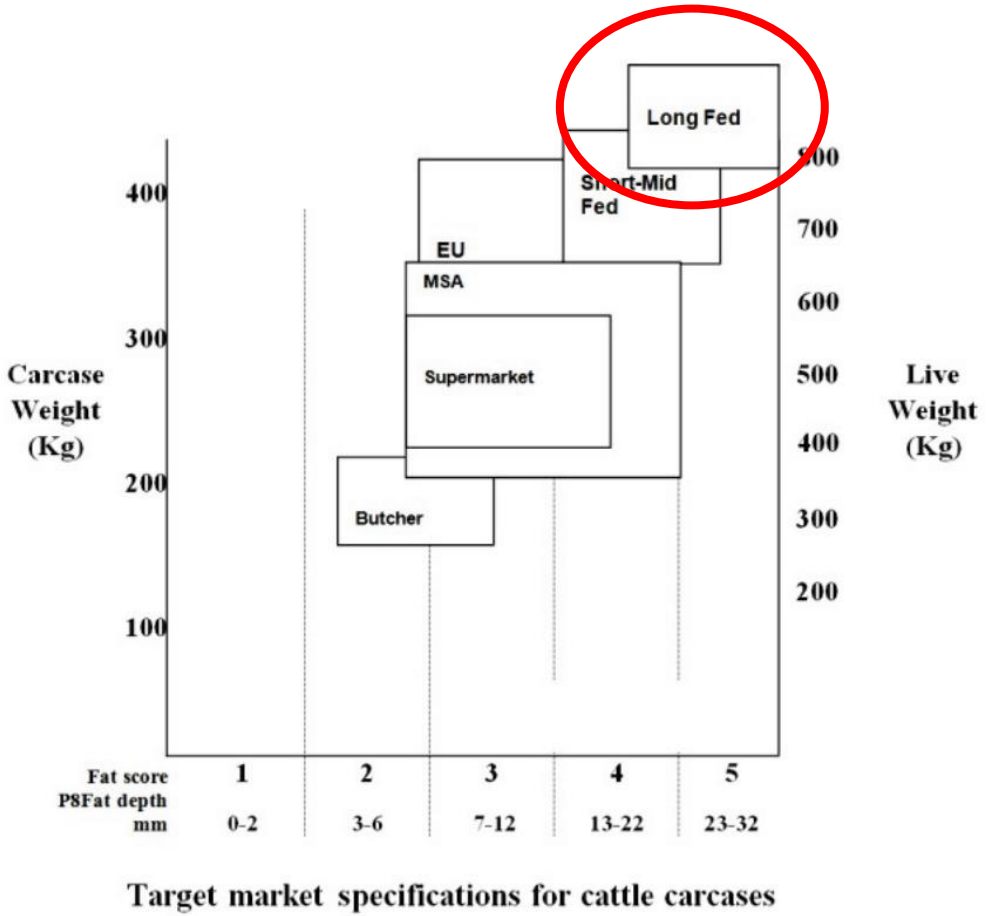
	Calving Ease				Growth					Fertility		Temp.
	Calving Ease Dir	Calving Ease Dtrs	Gestation Length	Birth Weight	200 Day Growth	400 Day Weight	600 Day Weight	Mat Cow Weight	Milk	Days to Calving	Scrotal Size	Docility
EBV	+8.5	+6.4	-8.0	-0.6	+54	+100	+133	+84	+26	-8.0	+2.8	+12
Acc	71%	62%	85%	85%	85%	83%	84%	81%	77%	50%	81%	80%
Perc	5	17	8	1	34	26	21	76	4	3	26	84
Prog	0	0	1	4	4	0	0	0	0	0	0	4

	Carcase						Feed Efficiency	Structural			Selection Index	
	Carcase Weight	Eye Muscle Area	Rib Fat	Rump Fat	Retail Beef Yield	IMF	NFI-F	Claw Set	Foot Angle	Leg Angle	Angus Breeding Index	Angus Breeding Low Feed Cost Index
EBV	+88	+5.3	+2.3	+4.0	+0.0	+1.9	+0.82	+0.92	+1.08	+1.06	$275	$444
Acc	75%	73%	73%	74%	66%	77%	67%	71%	71%	67%	-	-
Perc	7	64	9	4	76	59	95	65	74	59	2	2
Prog	0	0/0	0/0	0/0	0	0/0	0	0	0	0	-	-

Traits Observed: GL,BWT,200WT,400WT,Genomics
Statistics: Number of Herds: **7**, Prog Analysed: **4**, Genomic Prog: **4**

Example 2:

- Terminal Angus cow herd
- Buys in replacement females
- Producing steers to then background and sell to long fed lot feeding program.
  - Aim for 420-470kg carcass
  - 3+ marble score

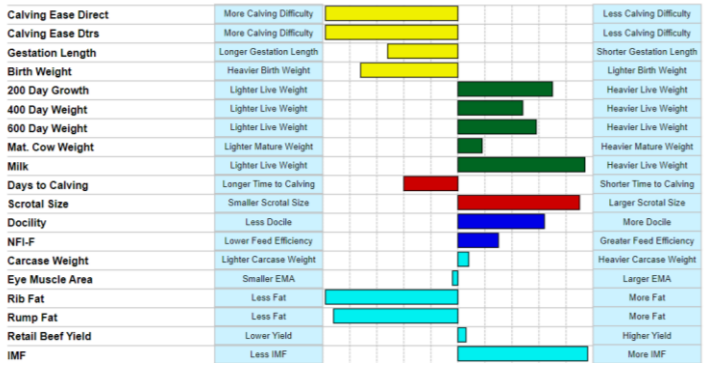


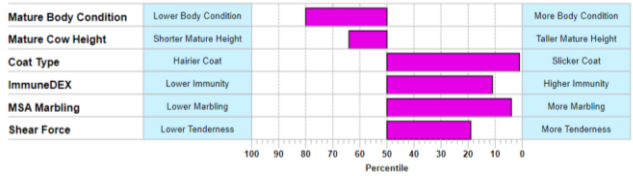
Target market specifications for cattle carcases

Key Traits for Performance	Trait managed by
Average Daily Gain	*Growth EBVs*
Carcase Value	*Carcase Quality traits*
Docility	*Docility EBV*
Health	*Immunedex Trait*

…consumer traits, tenderness, marbling…

Sire example…



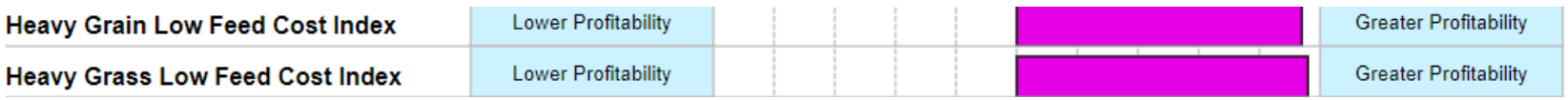


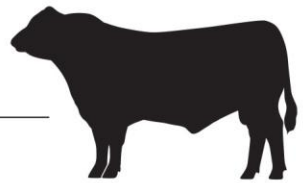
February 2024 TransTasman Angus Cattle Evaluation

	Calving Ease				Growth					Fertility		Temp.
	Calving Ease Dir	Calving Ease Dtrs	Gestation Length	Birth Weight	200 Day Growth	400 Day Weight	600 Day Weight	Mat Cow Weight	Milk	Days to Calving	Scrotal Size	Docility
EBV	-12.2	-8.3	-2.7	+5.8	+59	+100	+133	+106	+27	-3.8	+4.2	+29
Acc	80%	72%	98%	97%	97%	97%	97%	96%	92%	66%	93%	94%
Perc	99	99	76	86	15	26	21	41	3	70	5	18
Prog	153	55	292	204	401	386	191	87	126	23	38	131

	Carcase						Feed Efficiency	Structural			Selection Index	
	Carcase Weight	Eye Muscle Area	Rib Fat	Rump Fat	Retail Beef Yield	IMF	NFI-F	Claw Set	Foot Angle	Leg Angle	Angus Breeding Index	Angus Breeding Low Feed Cost Index
EBV	+69	+6.3	-3.8	-4.1	+0.5	+5.6	+0.09	+0.94	+1.00	+1.30	$190	$294
Acc	93%	93%	90%	93%	85%	92%	80%	94%	94%	92%	-	-
Perc	46	52	99	96	47	2	35	69	56	98	66	86
Prog	31	276/31	277/7	277/31	0	277/7	7	81	81	81	-	-

Traits Observed: GL,CE,BWT,200WT(x2),400WT,SC,Scan(EMA,Rib,Rump,IMF),DOC,Structure(Claw Set x 1, Foot Angle x 1),Genomics
Statistics: Number of Herds: **18**, Prog Analysed: **462**, Genomic Prog: **297**



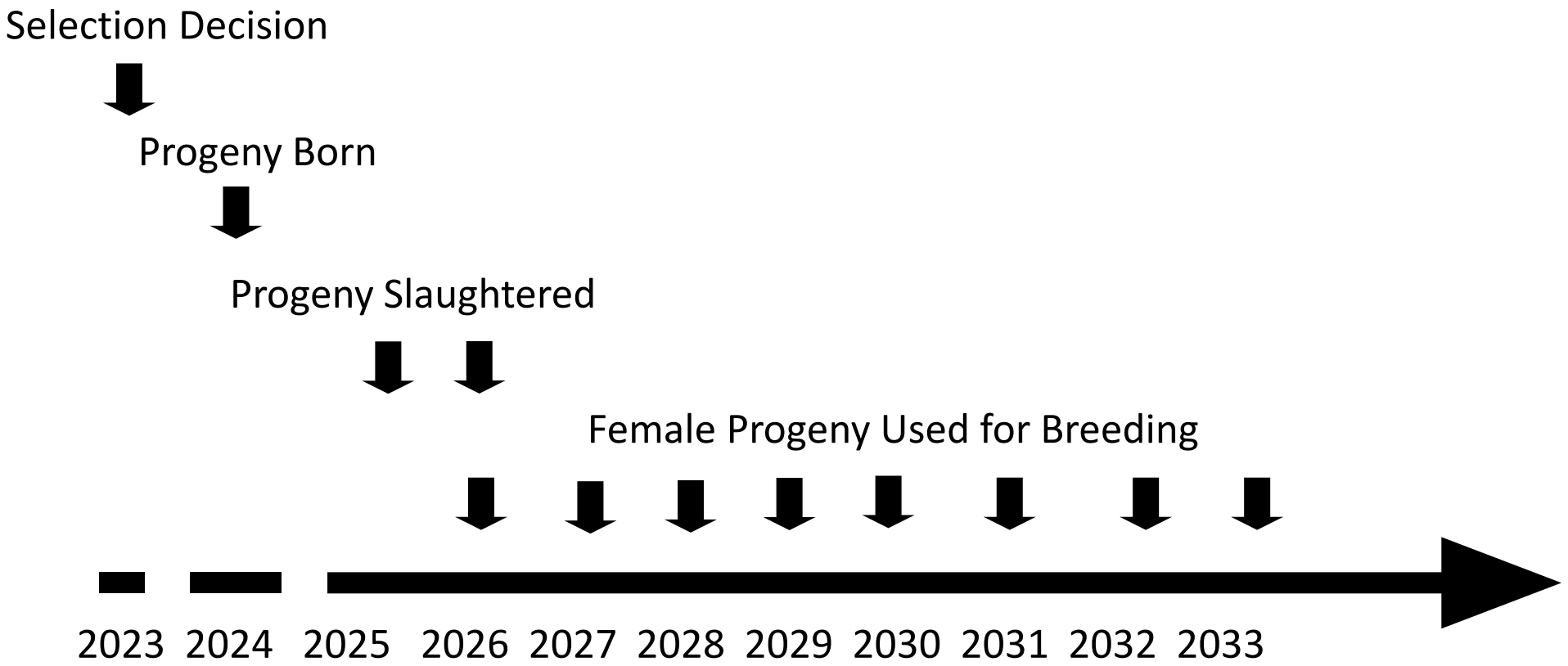


ANGUS www.angusaustralia.com.au

Bringing it all together – selecting your bulls

- Biggest impact on herd over time.
- Sires need to match your breeding objectives and target markets.

The long-term impact of selection decision on a self-replacing herd…



Taking it further – HEIFER SELECT

Genomic selection tool for replacement heifer selection

Sire Verification

Breed Check

14 commercially relevant traits (0-100 score)

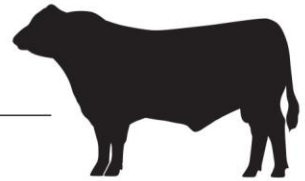
3 Selection Indexes

ID	Year	Sire ID	Angus BreedCHECK	CE	WW	YW	Milk	MCW	HC	ADG	DFI	CWT	EMA	RIB	MBL	OSS	IMM	CCV	FCV	TBV	HeiferSELECT Stars
RXPL229	2015	Unknown		54	48	63	77	51	40	52	40	70	89	71	42	80	67	54	73	72	★★★★☆
RXPQ9	2019	WWEL3		22	59	48	61	39	85	32	48	63	89	30	86	30	3	66	76	78	★★★★☆
RXPQ11	2019	WWEL3		62	56	76	72	40	53	13	51	63	73	29	81	62	43	67	84	85	★★★★½
RXPQ18	2019	WWEL3		47	65	50	47	44	79	39	50	42	89	61	51	56	36	72	38	47	★★½☆☆
RXPQ40	2019	NURM100		38	81	60	48	89	60	57	71	64	76	41	37	75	33	71	31	39	★★☆☆☆
RXPR4	2020	NURM100		71	45	71	67	56	49	74	60	69	61	62	50	78	35	52	67	67	★★★½☆
RXPR13	2020	NURM100		69	52	39	32	49	19	61	93	55	32	44	44	94	30	43	17	18	★☆☆☆☆
RXPT35	2022	USA19611994		31	90	93	56	60	71	60	85	94	92	44	87	57	14	89	92	95	★★★★★
RXPT102	2022	BWFQ33		51	36	62	37	37	41	49	71	68	56	74	60	50	51	45	69	67	★★★½☆
RXPT103	2022	BWFQ33		50	61	76	52	43	31	79	74	81	66	52	75	81	60	67	81	82	★★★★½

46,000 cattle tested at end of 2023

The future and Market Specs:

- Methane
- Eating Quality
- Sustainability



Take Away Messages

- Know your market – make sure your breeding objectives reflect this market.
- Use EBV’s to enhance how you perform in your market.
- Bull selection is key.
    - Genomic tools are at your fingertips if you want to take it further.

ANGUS AUSTRALIA

ANGUS
AUSTRALIA

Thank you

www.angusaustralia.com.au

Angus Australia @angusaustralia angusaustralia Angus Australia Angus Australia