

meatup FORUM

For the latest in red meat R&D

Improving and developing within-breed and multi-breed genetic evaluation for beef herds across Australia with the Southern Multi-Breed Project

Brad Walmsley

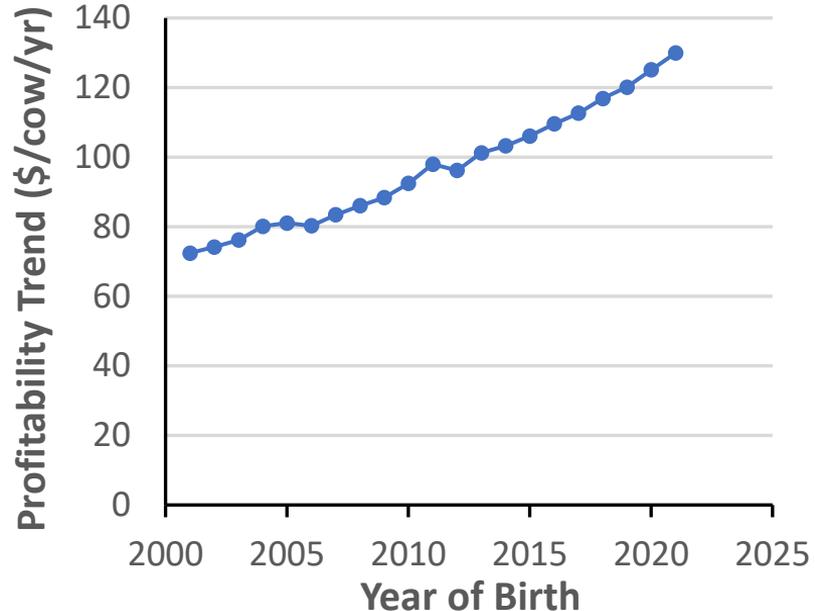
Animal Breeding and Genetics Unit

Commercial Profit

$$\text{Profit} = \text{Income} - \text{Costs}$$

- As driven by genetics

Value of Genetic Improvement - South



Up to 2021:
~\$2.79 / cow / yr

Up to 2014:
~\$2.83 / cow / yr

Best:
>\$5.00 / cow / yr

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Improving genetic evaluation

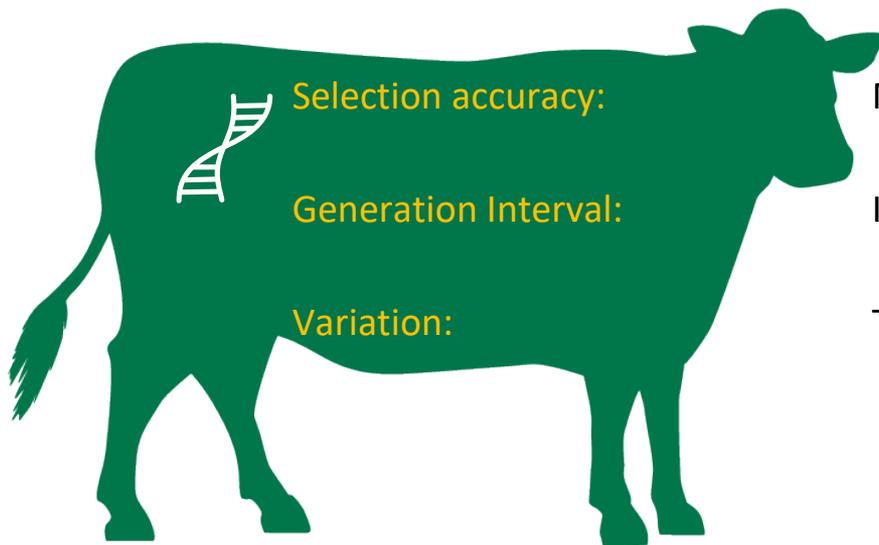
What drives genetic progress?

$$\text{Response} = \frac{\text{selection intensity} \times \text{selection accuracy}}{\text{generation interval}} \text{Variation}$$

- pick only the best - intensity ←
- make the right choice more often - accuracy ←
- breed from them ASAP - generation interval ←
- identify differences between animals - variation ←

How fast you make genetic progress is dependent on how you balance these factors.

How does genomics help?



Selection accuracy:

More information coming from “relatives”

Generation Interval:

Identifying earlier who carries good genes

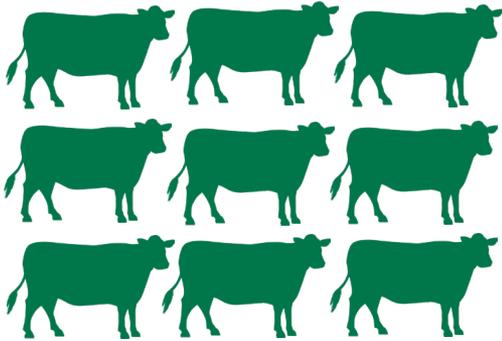
Variation:

Traits that we can't measure any other way



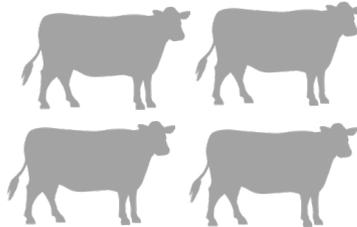
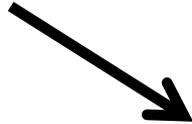
Genomics can be used to drive faster rates of genetic gain.

Genomics – basic principle



Reference population:

- measuring phenotypes and genotypes
- hard to measure traits
- late in life traits.



Industry animals:

- DNA tests on young animals
- predict breeding values based on genomic
- relationship and traits measured in reference.

BREEDPLAN Developments

- BREEDPLAN includes genomics (single-step)
 - Brahman (2017)
 - Hereford (2017)
 - Angus (2017)
 - Wagyu (2018)
 - Santa Gertrudis (2021)
 - Speckle Park (2023)
 - Droughtmaster (soon)
 - Brangus (soon)

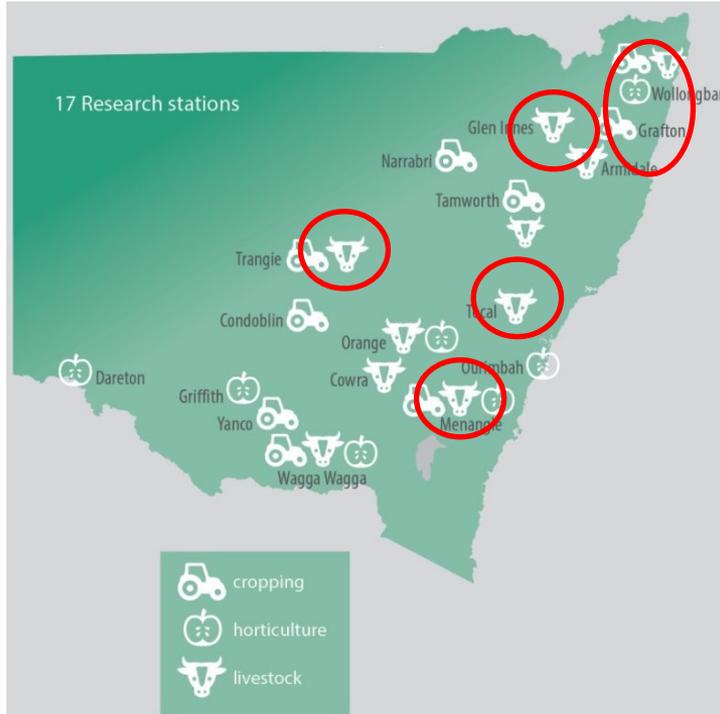


Major breeds
using genomics

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Southern Multi-Breed helping within-breed genetic evaluation

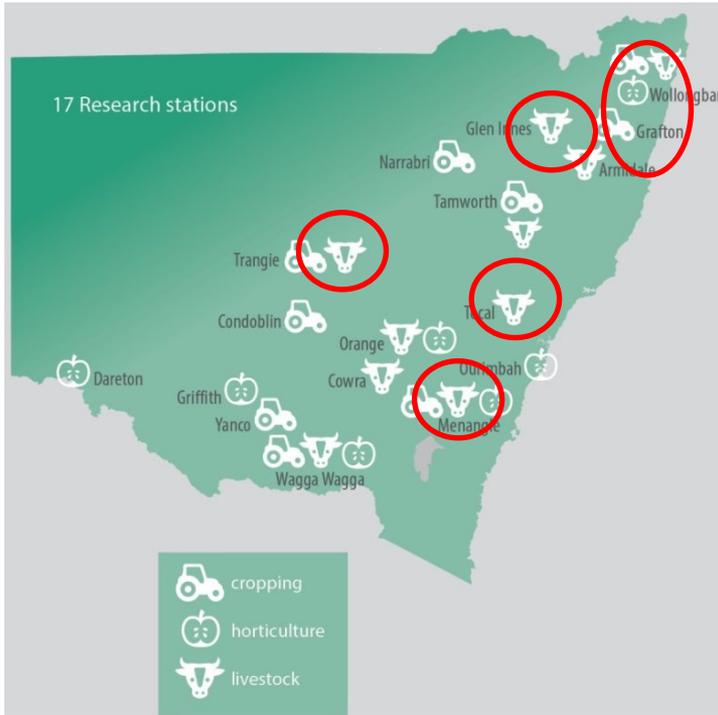
Research Stations



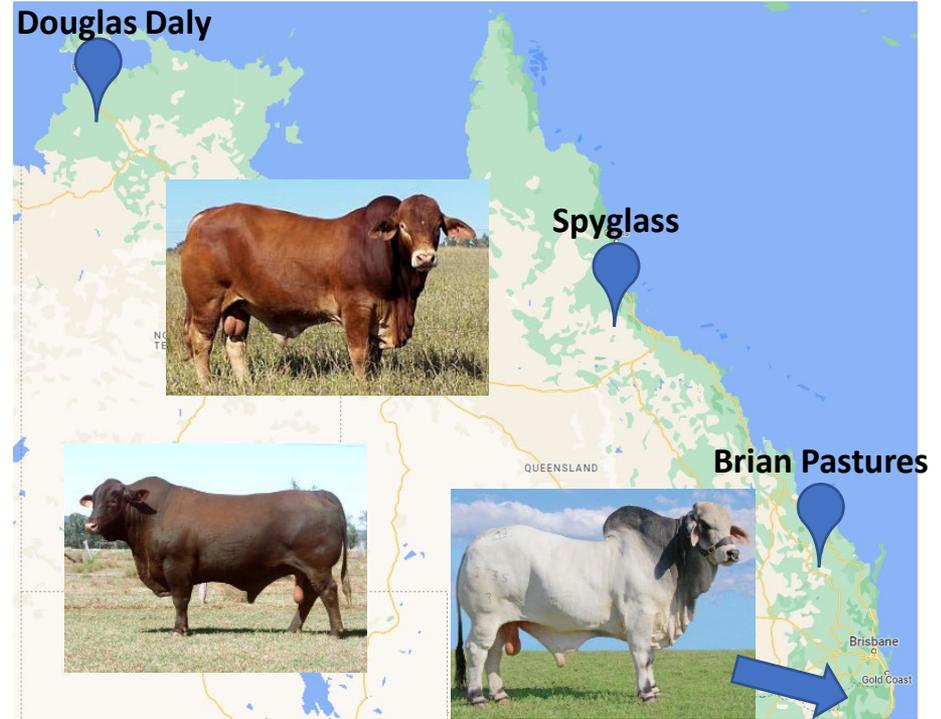
Site Diversity



Southern Multibreed



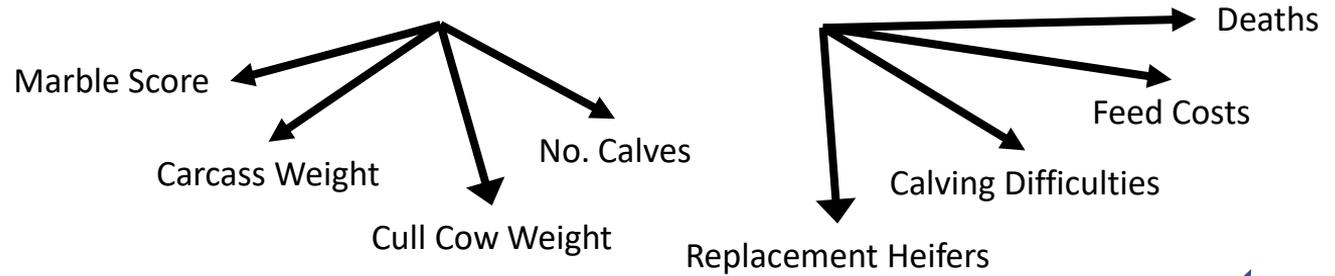
Repronomics



Commercial Profit

$$\text{Profit} = \text{Income} - \text{Costs}$$

Hard-to-Measure

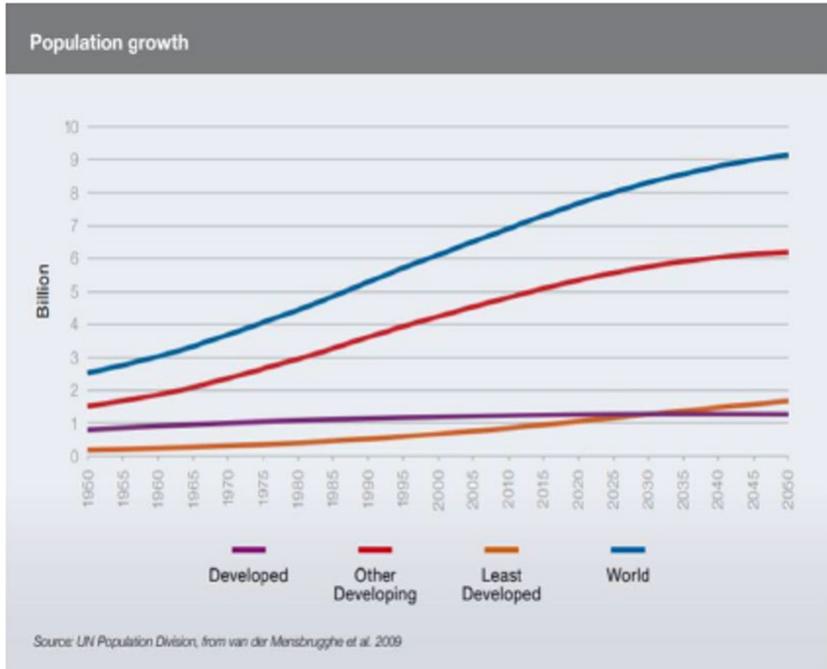


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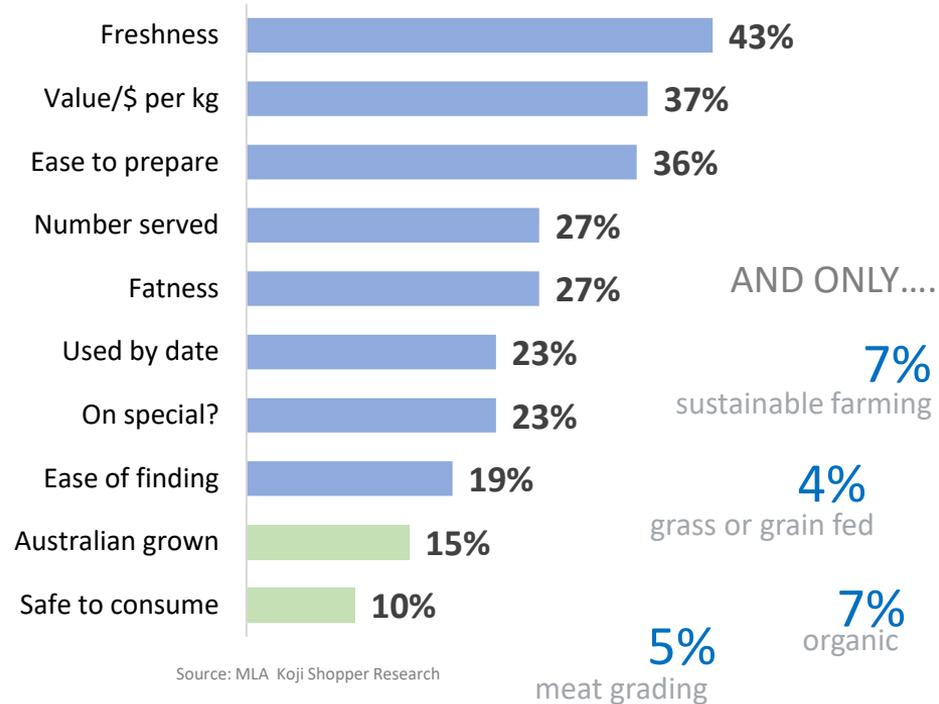
Current BREEDPLAN Traits

Growth	Repro	Carcase	Others
Birth Wt	Gestation Length	Scan (live)	Feed Efficiency
Weaning Wt	Calving Ease	Carcase Wt	Temperament
Yearling Wt	Days to Calving	Marbling	Structure
Sale Wt		Rump/Rib Fat	
Mature Wt		Eye Muscle	
		Tenderness (SF)	

Growing Population



Purchasing decisions



An extra 1 BILLION people to feed every 15 years

<https://news.un.org/en/story/2017/06/560022-world-population-hit-98-billion-2050-despite-nearly-universal-lower-fertility>; UN Dept of Economic & Social Affairs, 2017

REDUCERS: Consumers who are reducing RM consumption not as big as 'noise' suggests. Price and health driving reduction.

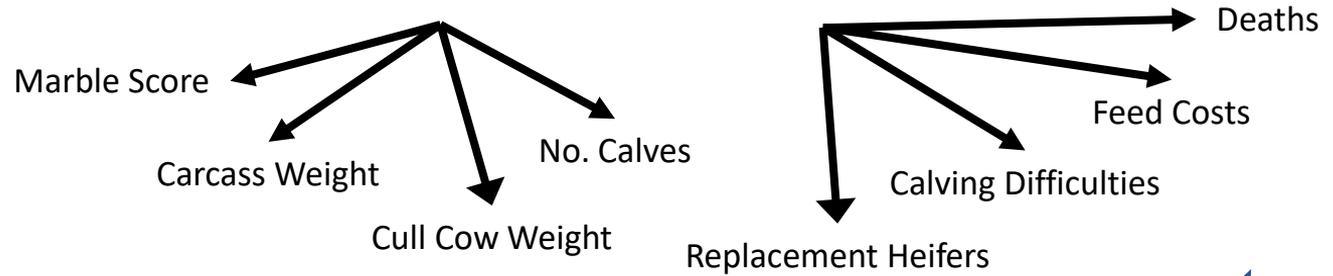
- Less than **1 in 3** consumers are **reducing** their red meat consumption
- Proportion of reducers has **remained stable** for over a decade
- **Price** and **health perceptions** main drivers
- **Environmental** and **animal welfare concerns** also driving reduction



So what? Address concerns of reducers to help them feel good about eating red meat.

Commercial Profit

$$\text{Profit} = \text{Income} - \text{Costs}$$



• What about future Profit?

- Eating experience
- Welfare
- Horns
- Health benefits
- Health
- Methane

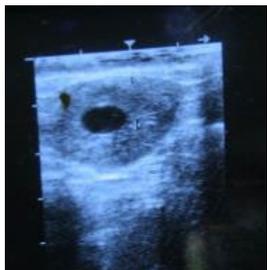


New Traits



Age at Puberty

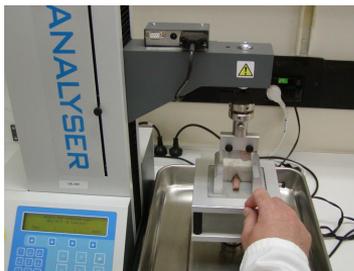
1st Calf Re-breed



Source: M. Wolcott



Meat Quality



Source: E. Toohey

Consumer Testing



Source: P. McGilchrist



Horn/Poll



Cow Composition

Immune Competence



Methane



Department of Primary Industries



Improving and developing within-breed and **multi-breed** genetic evaluation for beef herds across Australia with the Southern Multi-Breed Project

Southern Multi-Breed helping multi-breed genetic development

Designed Research Program

- Breeds in Southern Australia with highest BREEDPLAN registrations + Brahman

Charolais



Hereford



Shorthorn



Angus



Brahman



Wagyu

Managed Head-to-Head



Designed Research Program

- Purebred matings = Purebred calves[#]
- Designed mating
 - Avoid inbreeding
- Produce comparable progeny
 - All in – All out (No cull, no draft)



Grafton Matings[#]

		Cow breed		
		AA	BB	HH
Bull Breed	AA	✓	✓	
	BB	✓	✓	✓
	HH		✓	✓



M. Woods 2022



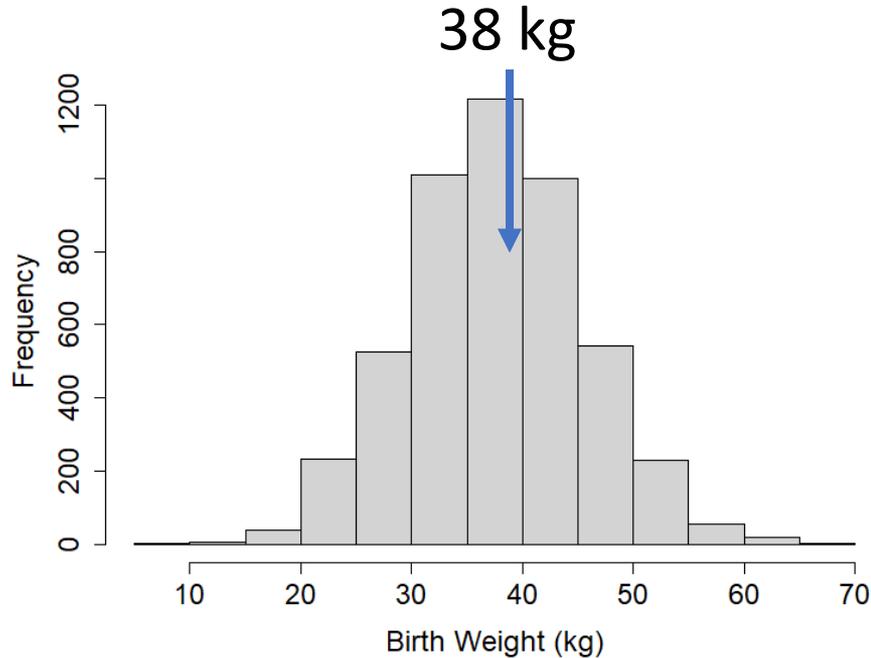
S. Mortimer 2022



Improving within-breed genetic evaluation and developing multi-breed genetic evaluation with the Southern Multi-Breed Project

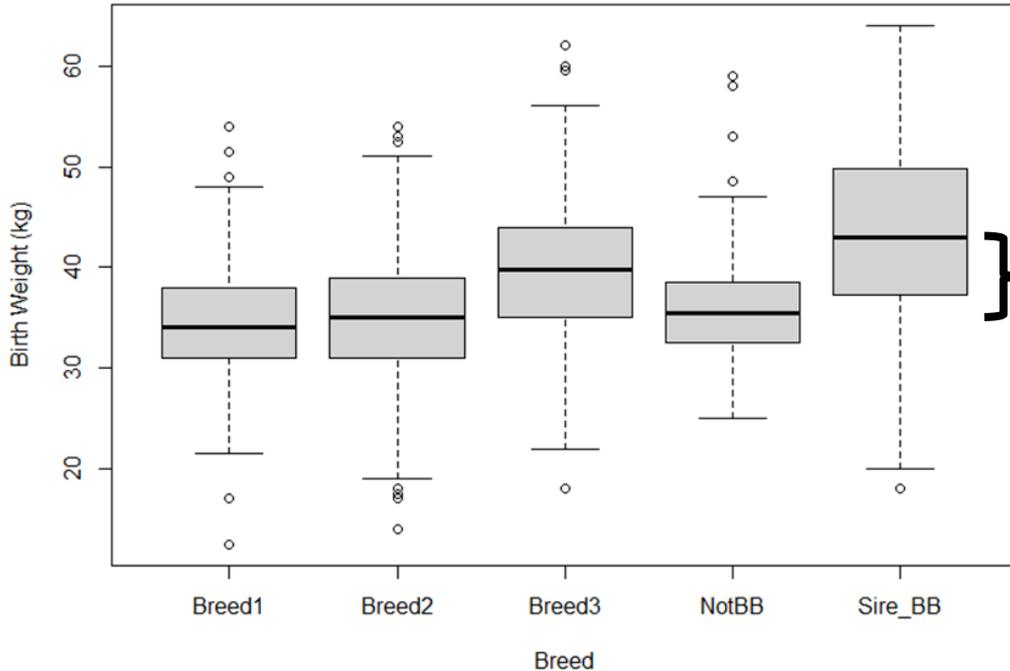
Key Learnings

Research Learnings - SMB



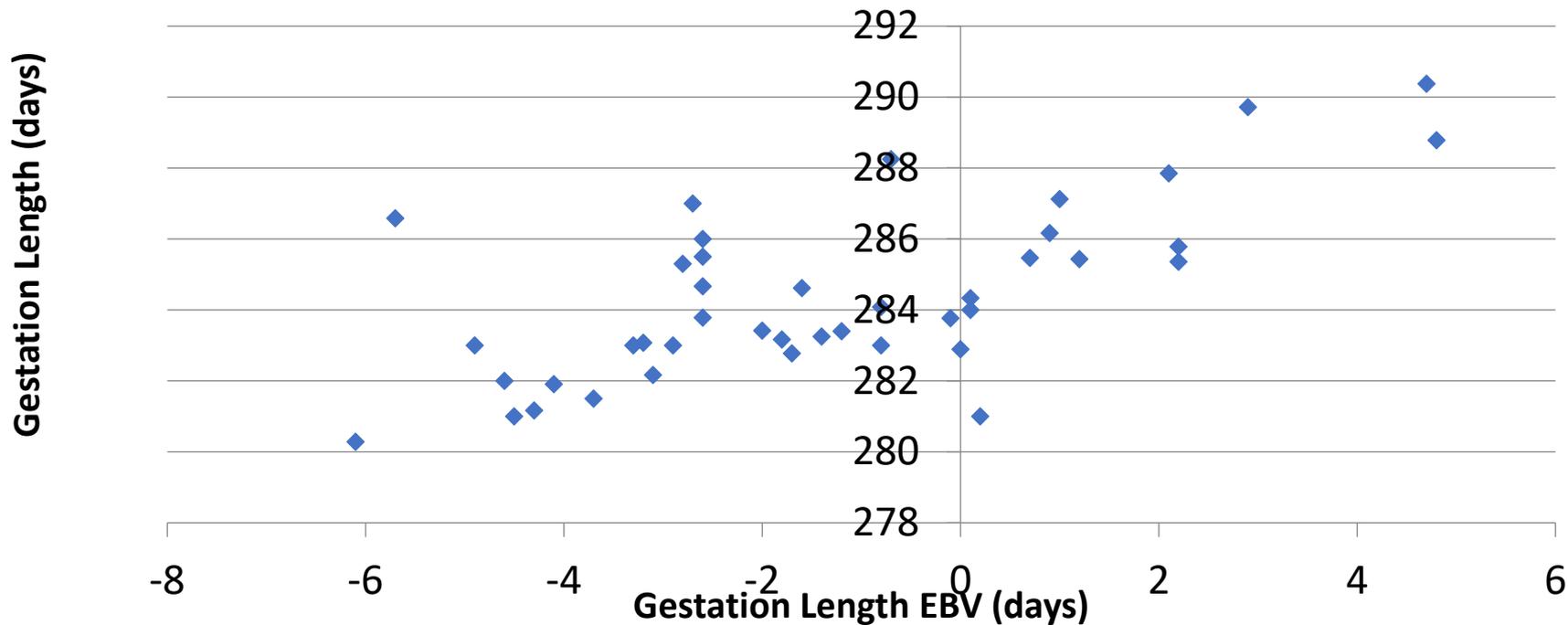
- Variation within breeds

Research Learnings - SMB

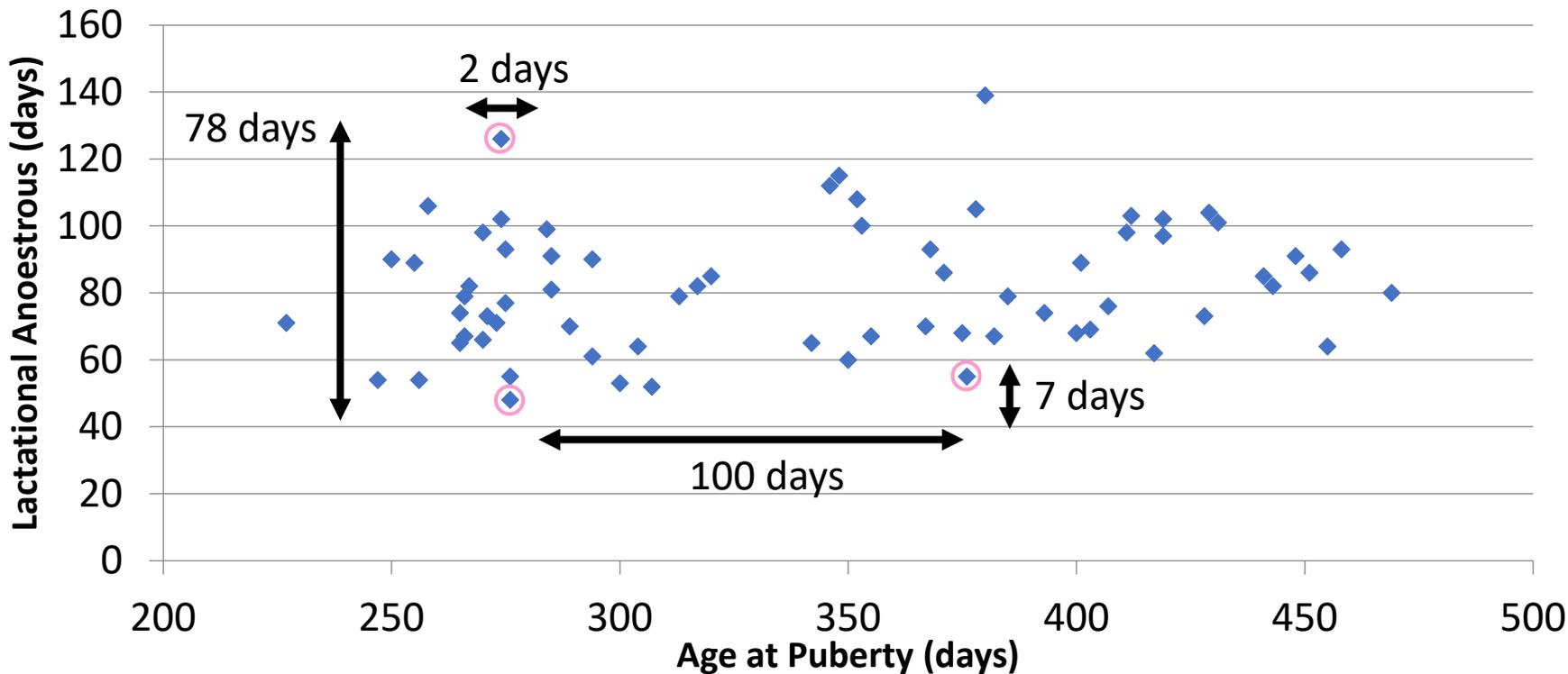


- Variation within breeds
- Crossing breeding
 - Similar to Grafton 70s & 80s
- Important ramifications

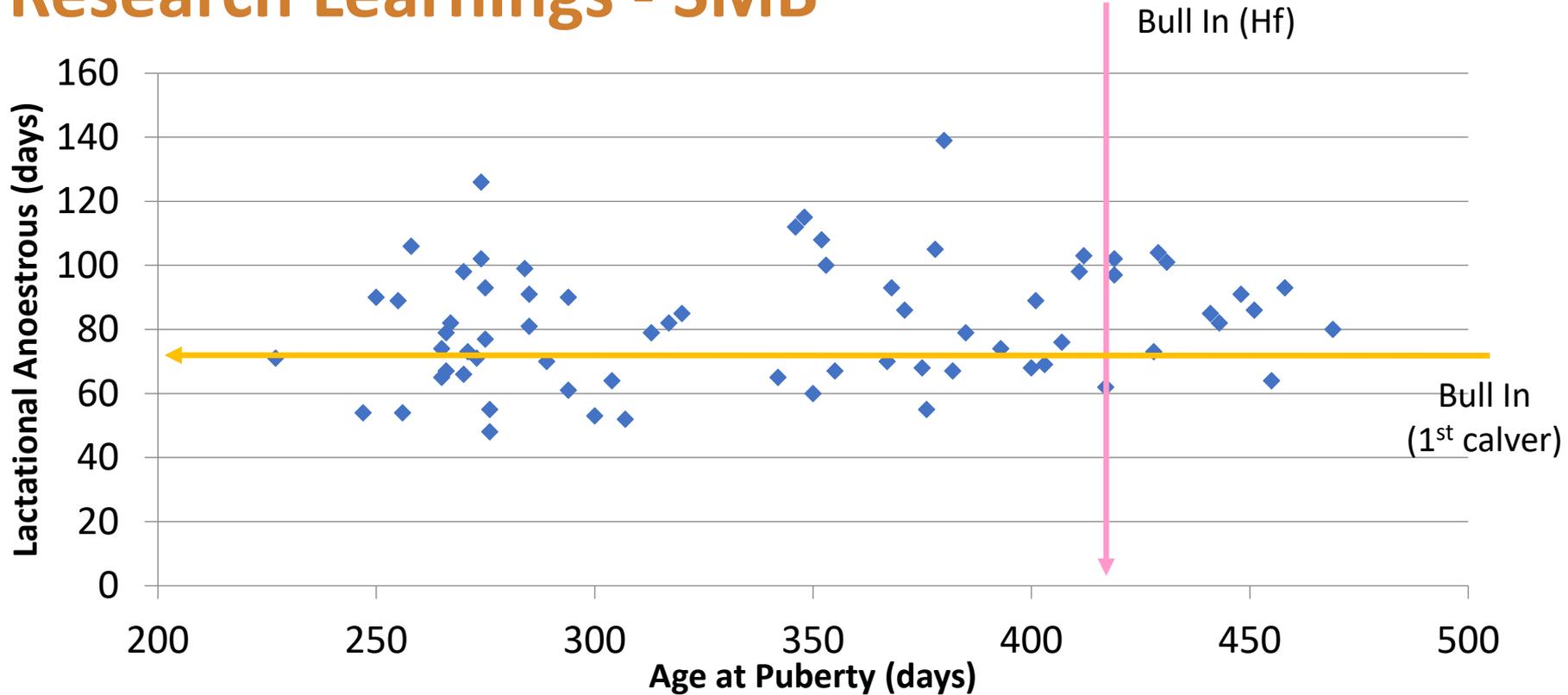
Research Learnings - SMB



Research Learnings - SMB



Research Learnings - SMB



Research Learnings - Repronomics



Daughter
Fertility?



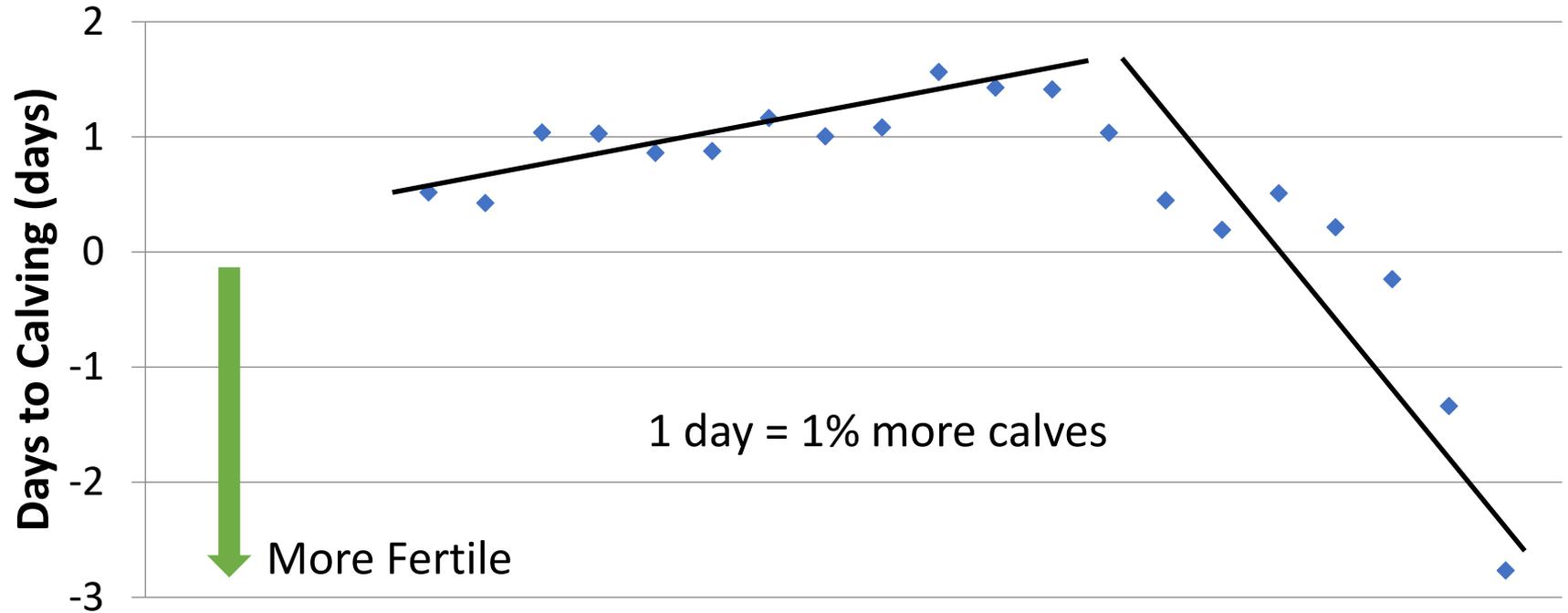
Puberty → 8.9 months
Recycle → 4.4 months



20 day difference
DTC EBV

Repronomics^{MT} -
Johnston 2021

Research Impact - Brahman



Research Impact - Brahman



November 2022 Brahman BREEDPLAN																		
Gestation Length (days)	Birth Wt. (kg)	200 Day Wt (kg)	400 Day Wt (kg)	600 Day Wt (kg)	Mat Cow Wt (kg)	Milk (kg)	Scrotal Size (cm)	Days to Calving (days)	Carcase Wt (kg)	Eye Muscle Area (sq.cm)	Rib Fat (mm)	Rump Fat (mm)	Retail Beef Yield (%)	IMF (%)	Percent Normal Sperm (%)	Flight Time (secs)	Shear Force (kgs)	
+0.1	+3.4	+22	+29	+39	+46	+1	+1.7	-4.9	+22	+2.6	-0.7	-1.4	-	0.0	-	-0.11	+0.11	
25%	49%	53%	54%	56%	53%	36%	41%	34%	45%	36%	38%	49%	-	29%	-	42%	38%	

Traits Analysed: Genomics



November 2022 Brahman BREEDPLAN																		
Gestation Length (days)	Birth Wt. (kg)	200 Day Wt (kg)	400 Day Wt (kg)	600 Day Wt (kg)	Mat Cow Wt (kg)	Milk (kg)	Scrotal Size (cm)	Days to Calving (days)	Carcase Wt (kg)	Eye Muscle Area (sq.cm)	Rib Fat (mm)	Rump Fat (mm)	Retail Beef Yield (%)	IMF (%)	Percent Normal Sperm (%)	Flight Time (secs)	Shear Force (kgs)	
0.0	+4.3	+21	+27	+38	+53	0	-0.3	+8.3	+26	+3.1	-1.2	-1.4	+0.9	-0.4	-	+0.03	-0.08	
44%	55%	58%	59%	60%	56%	36%	45%	34%	49%	35%	37%	47%	25%	30%	-	43%	38%	

Traits Analysed: Genomics



Others Findings

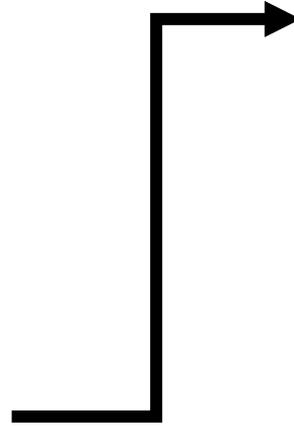


↑
worst

\$2076
difference

↑
best

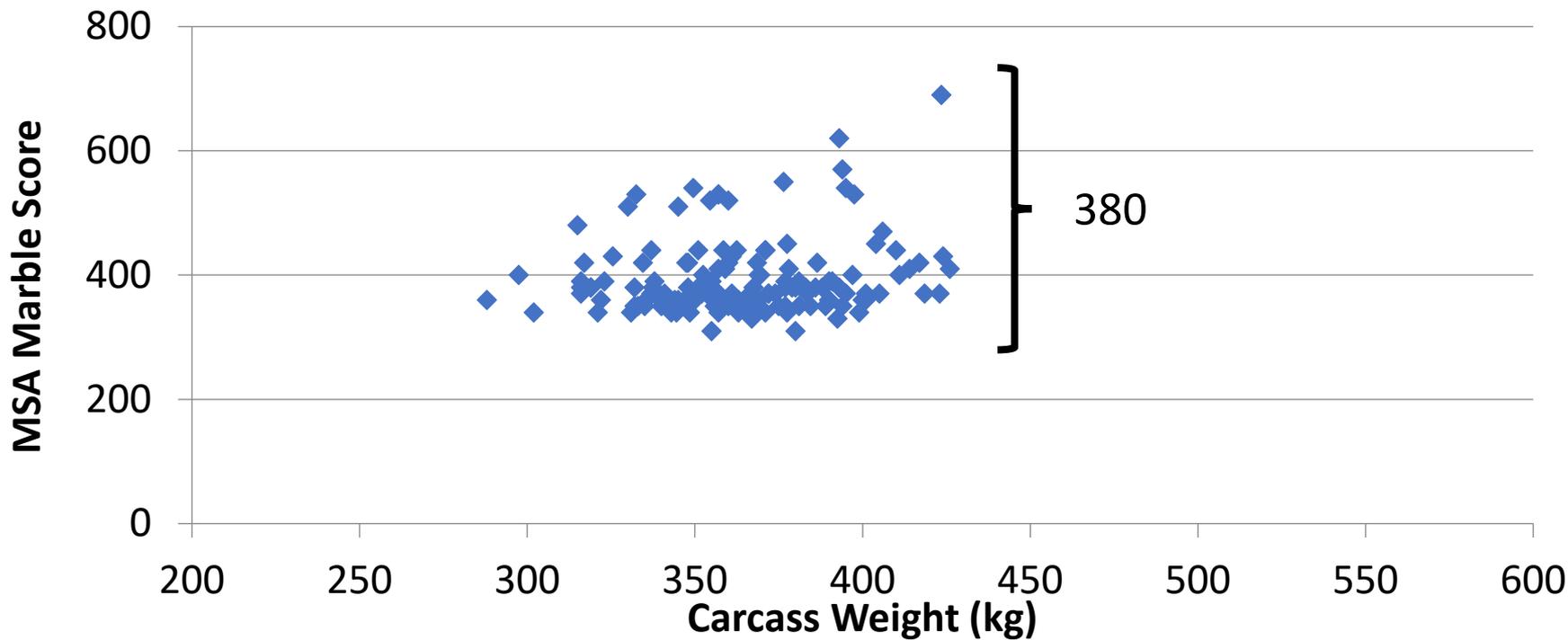
Carcass
Value?



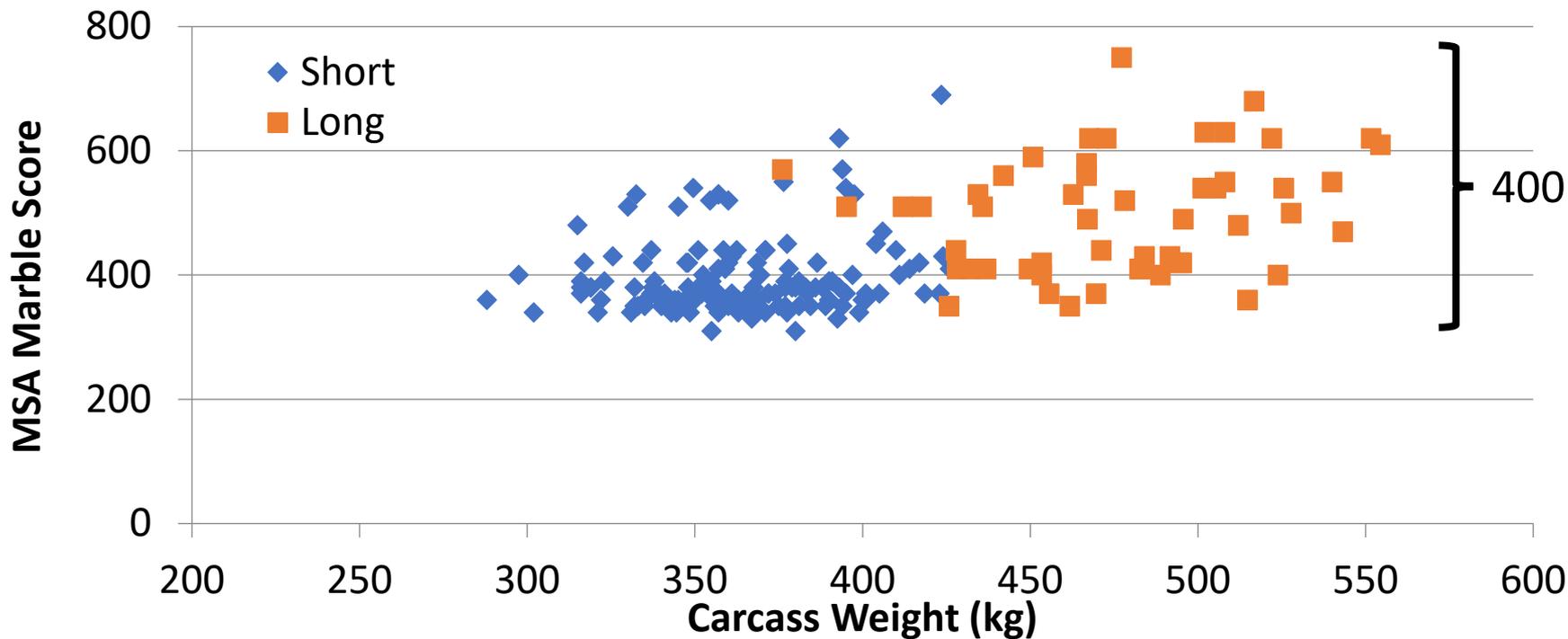
sire averages

\$619
difference

Research Learnings - SMB



Research Learnings - SMB



Acknowledgements

- David Johnston (AGBU - Repronomics)
- Leadership Team: Kath Donoghue, Jason Siddell & Sam Clark
- Other Scientists (DPI, UNE, AGBU & CSIRO)
- Management and staff at Trangie, Grafton, Tocal, Glen Innes, EMAI, North Coast and Tullimba
- All technical staff (DPI, UNE & CSIRO)
- Project partners – AI, DNA, Merchandise, Breeders, Breed Societies, Producers

Take home messages

- Work needed to capture benefits of genomics
- Investment in Southern Multibreed and Repronomics™
- Southern Multibreed benefits to emerge in the future
- Repronomics™ benefits can be seen in:
 - Brahman
 - Santa
 - Droughtmaster



↓
Data available soon for within breed

Tools and resources

- BREEDPLAN
 - Tropical breeds already benefiting
- BreedObject \$Indexes
 - Temperate breeds soon from SMB

<https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/breeding/southern-multi-breed-smb-project/project-overview>

- Google – Southern Multibreed