BreedObject: Breeding for Future Profitability

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Introduction

- BreedObject
  - Selection Indexing system for BREEDPLAN
- BREEDPLAN
  - Multi-trait BLUP evaluation

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  - Selection Indexing system for BREEDPLAN
- BREEDPLAN
  - Multi-trait BLUP evaluation
- Large impact on profit (index)
  - $1.79 / cow / year (1999-2004)
  - ~$5.00 in leading herds

Banks 2005 Australian Journal of Experimental Agriculture

Introduction

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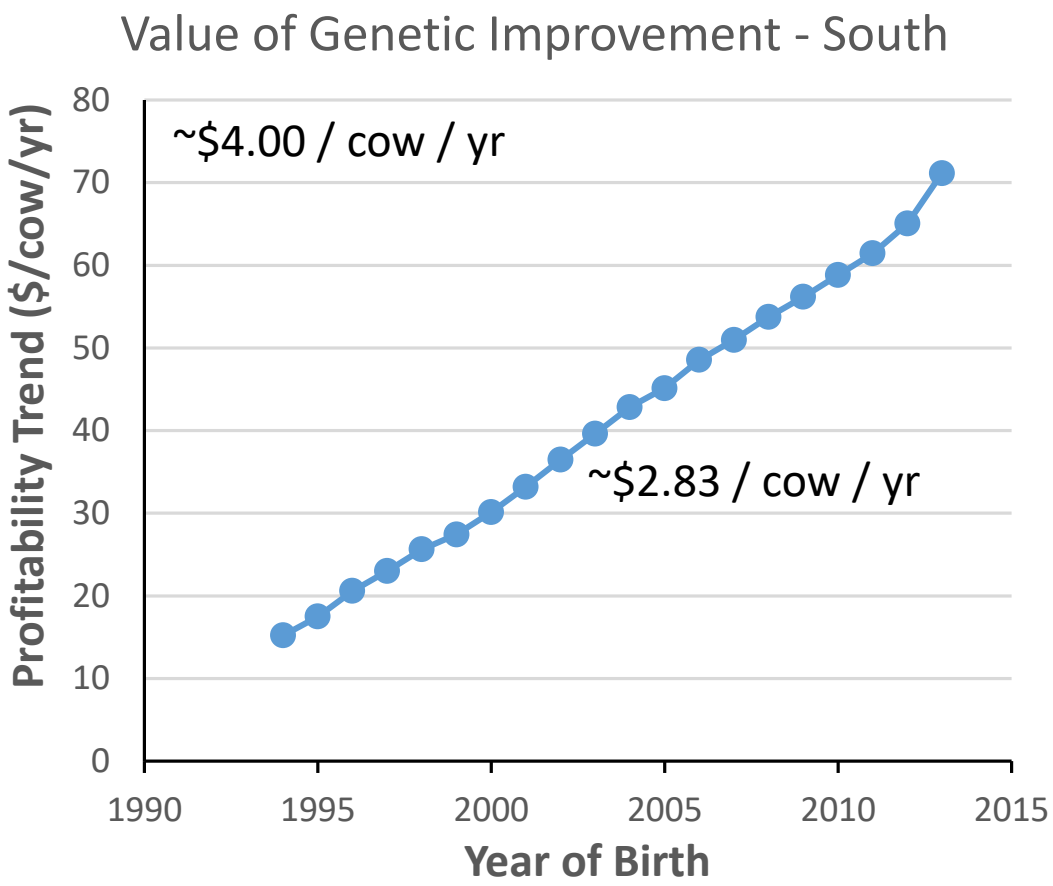
  - Selection Indexing system for BREEDPLAN
- BREEDPLAN
  - Multi-trait BLUP evaluation
- Large impact on profit (index)
  - $1.79 / cow / year (1999-2004)
  - ~$5.00 in leading herds

Best herds over $5.00 / cow / yr



- Banks 2015 Association for the Advancement of Animal Breeding and Genetics

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Introduction

- Change is constant
  - Markets & production systems evolve
  - Genetic change
  - Priorities move
  - New traits important
  - Etc ….

Always room for improvement

Objectives

- Brief BreedObject History
- BreedObject Developments
- Plans for the Future

Brief BreedObject History

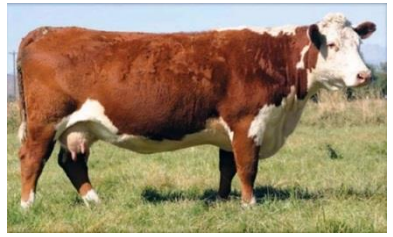
- Research began during 1980’s, released 1990’s

Approach

whole **commercial production system**

(birth to slaughter including cow herd)

X



Genes

Driving Force

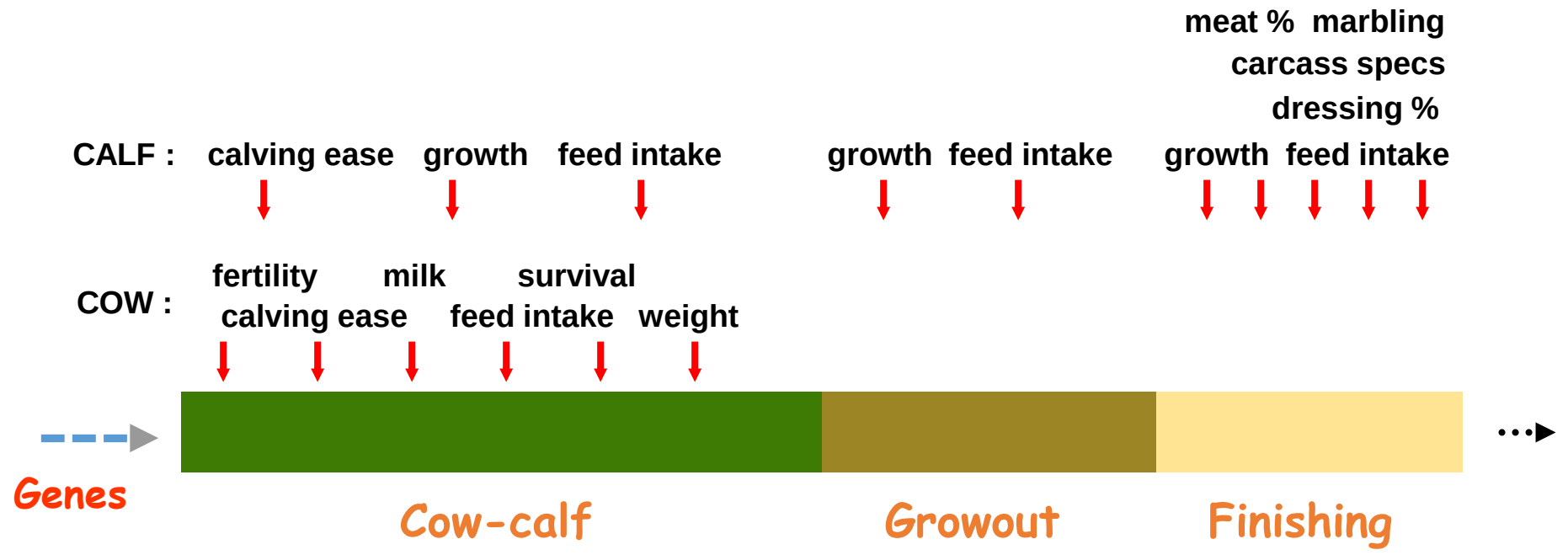
Profit = Income – Costs

- **Influenced by numerous traits to varying degrees**
  - **Can change between systems**

What Impacts Profit?

whole **commercial production system**

(birth to slaughter including cow herd)



Barwick & Fuchs 1992 Animal Breeding – A modern approach

Barwick 2002 World Congress on Genetics Applied to Livestock Production

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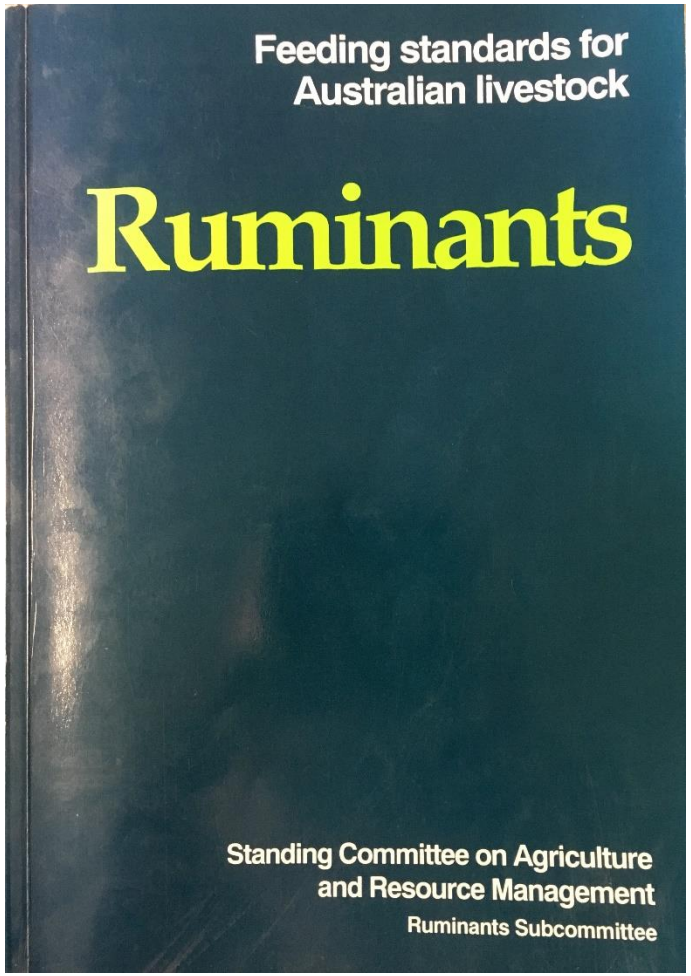
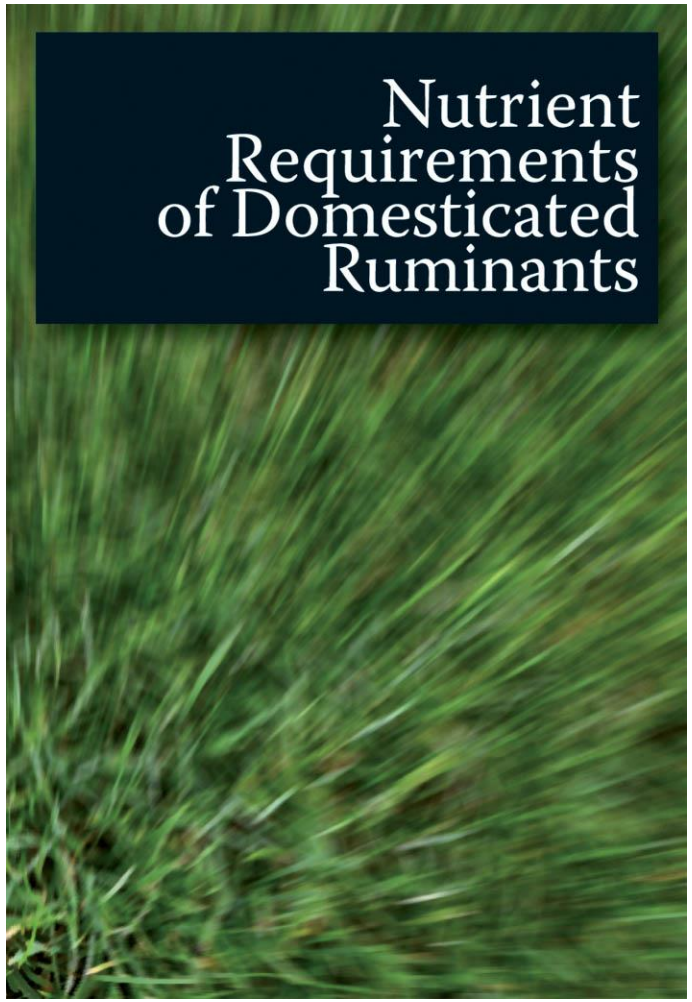
Predicting Feed Requirement



Corbett et al 1990



Freer et al 2007

Commercial Production Environment

Diversity in Beef Industry

Trait	Range	
Fertility (weaning rate)	50%	98%
Calving Difficulties	0%	40%
Age @ 400kg	10 months	2 years
Cow Weight	400 kg	900 kg
Annual Death Rate	1%	20%
Heifer Retention Rate	20%	100%
Carcass Weight	150 kg	500 kg
Fat Non-compliance	0%	25%
Marble Score	0	10
Feed Costs	<$100/t	>$300/t

Commercial Production Environment






Seedstock Environment






Objective Traits	Selection Criteria
Desirable to improve, impact profit	Measurable and related to objective

Barwick 1992 Animal Breeding – A modern approach

Objective Traits

Selection Criteria

Cow Weaning Rate

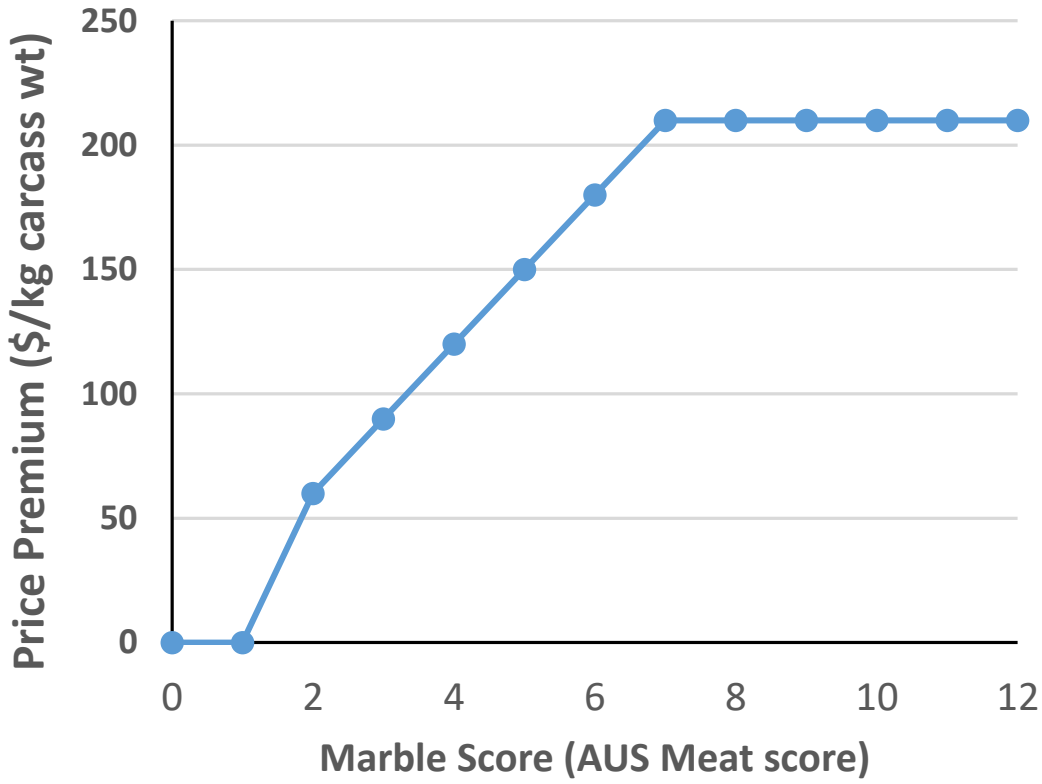
Days to Calving

Scrotal Size

Barwick 1992 Animal Breeding – A modern approach

Economics of Traits

- Not everything is linear
- Some prices have optima's
  - Fat specifications
- Other pricings structures
  - Marble Score



Barwick & Henzell 2003 Association for the Advancement of Animal Breeding and Genetics

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Brief BreedObject History

- Developed in the early 1980's, released 1990's

- Approach:
  - Whole commercial production system

  - Driven by Profit – always included costs

  - Breeding Objective – Desired to be improved, impact profit
  - Selection Criteria – Can be measured and related to objective

  - Non-linear economic values

Todays Objectives

- Brief BreedObject History
- BreedObject Developments
- Plans for the Future

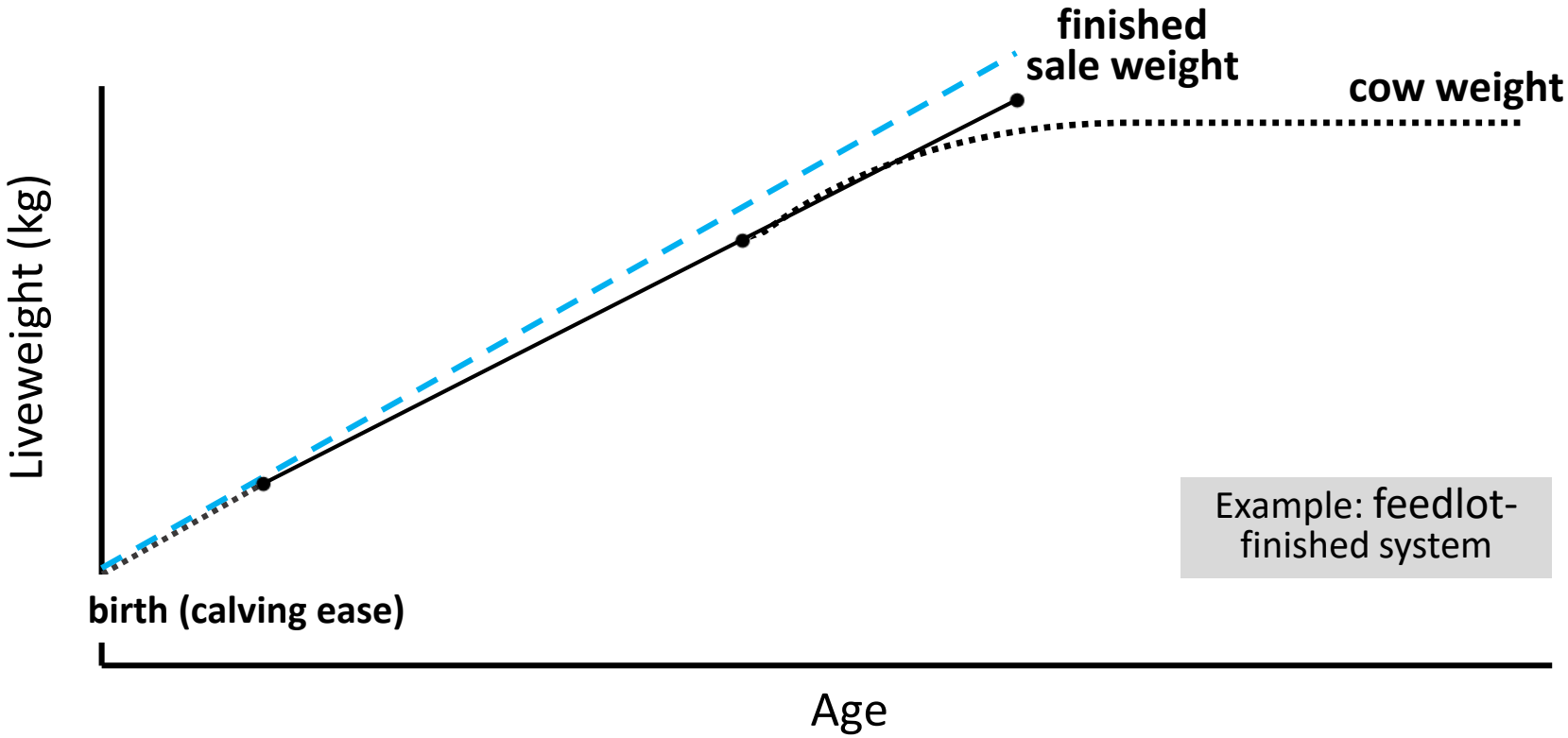
New Features: BreedObject Version 6

- Inclusion of all feed costs – NFI in objective (all breeds)
- NFI EBVs in Indexes (where available)

- Enhanced feedlot phase modelling for pasture-feedlot systems
- Enhanced cow weight valuing
- Cow condition score valuing

Barwick et al 2018 Journal of Animal Science

Growth curve - Previously



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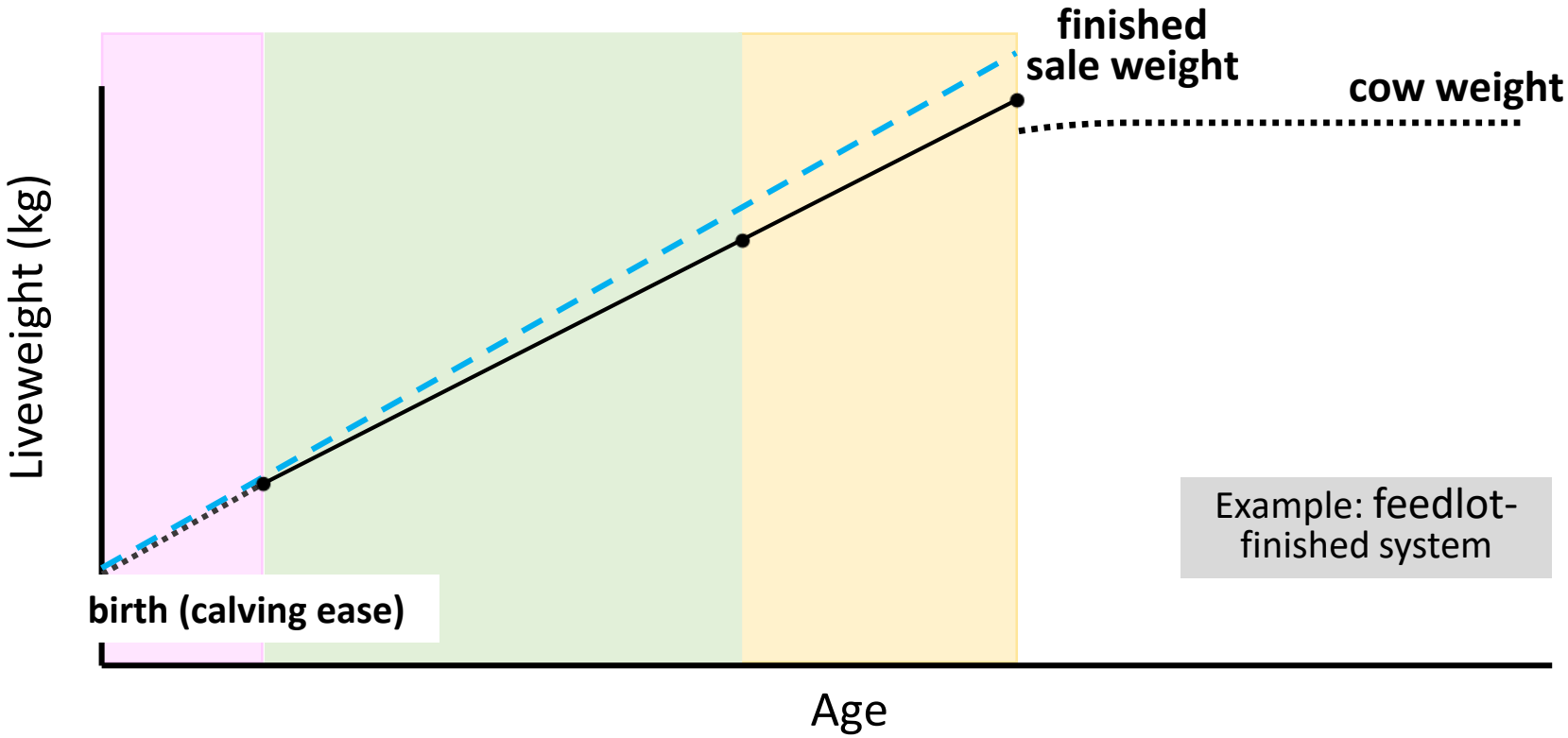
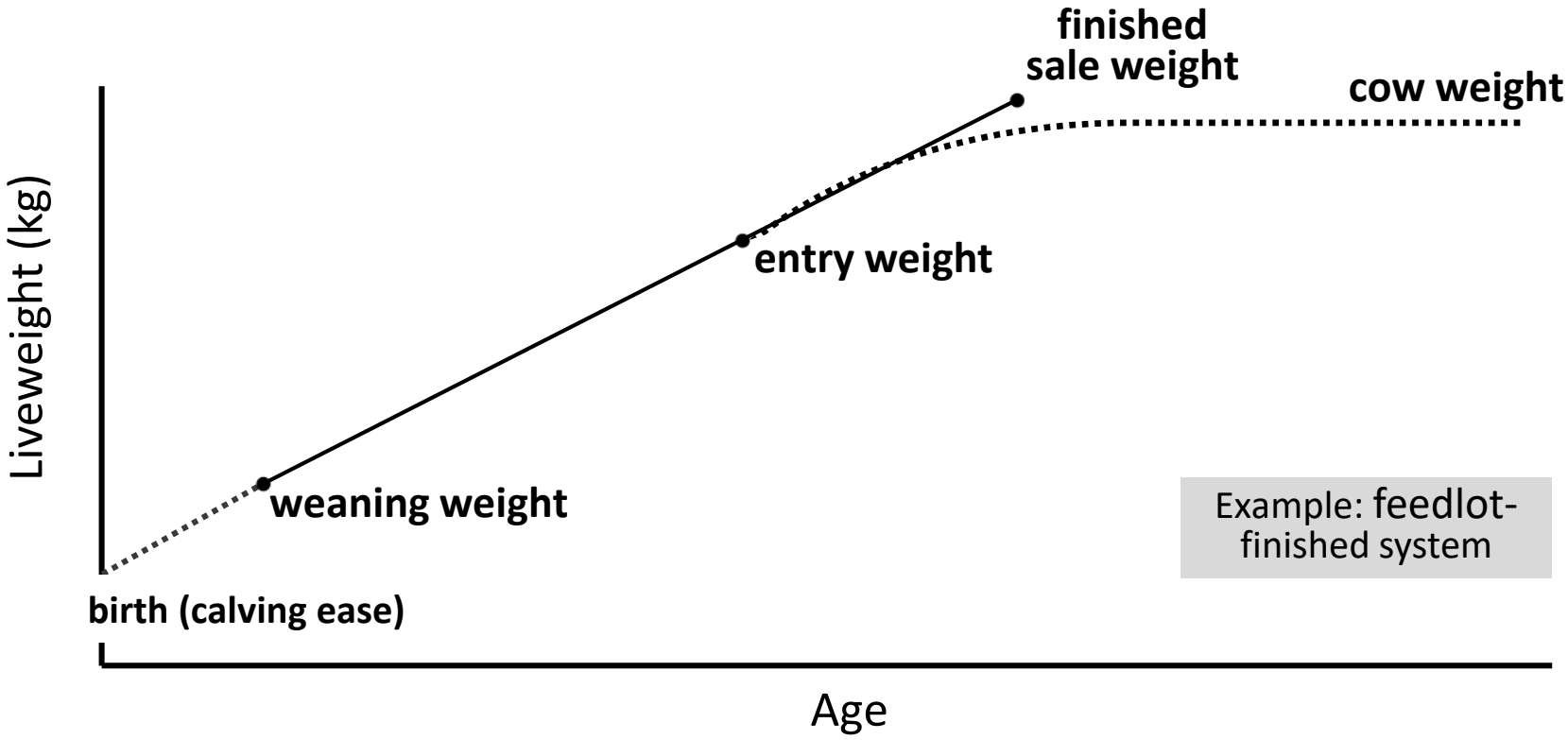


Growth curve - Now



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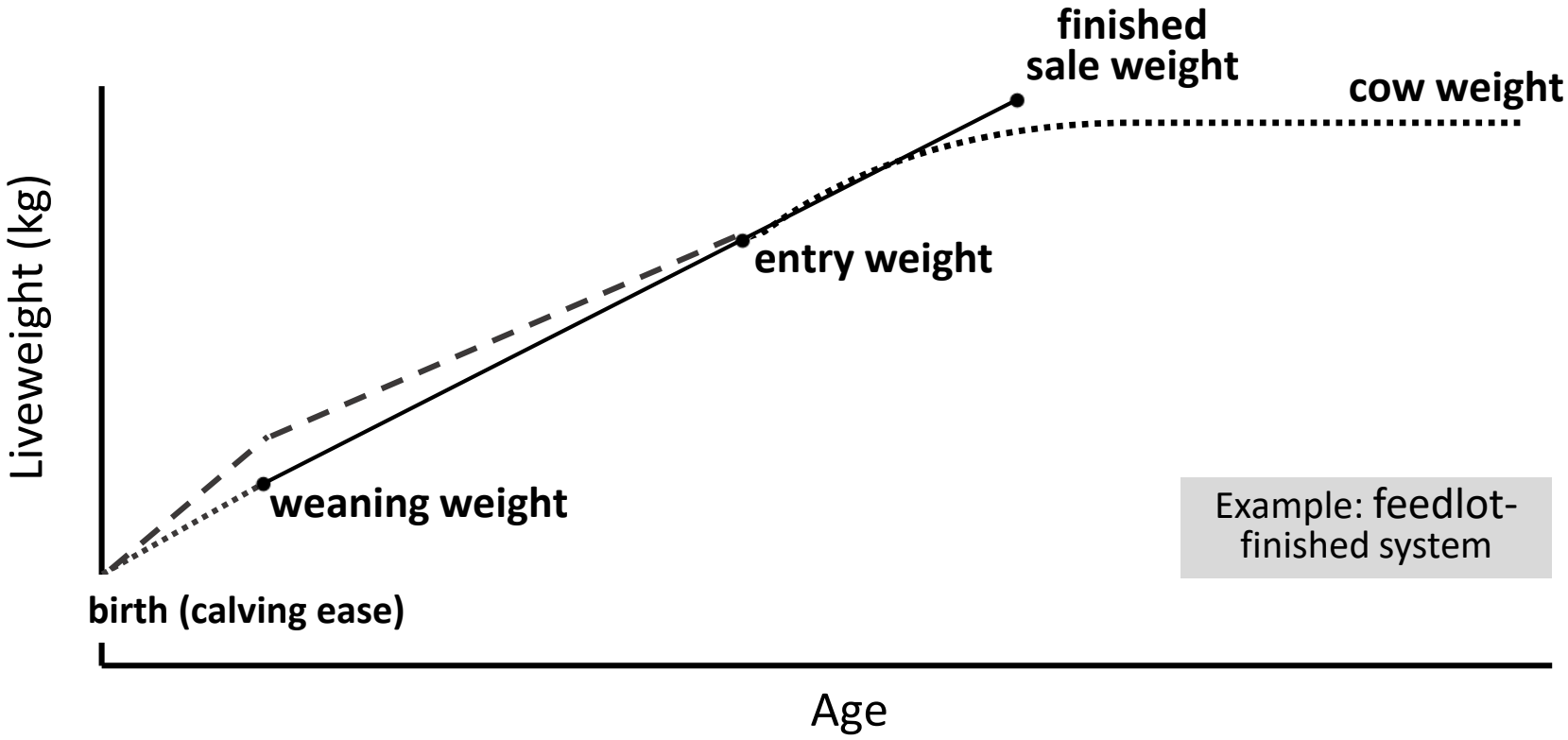
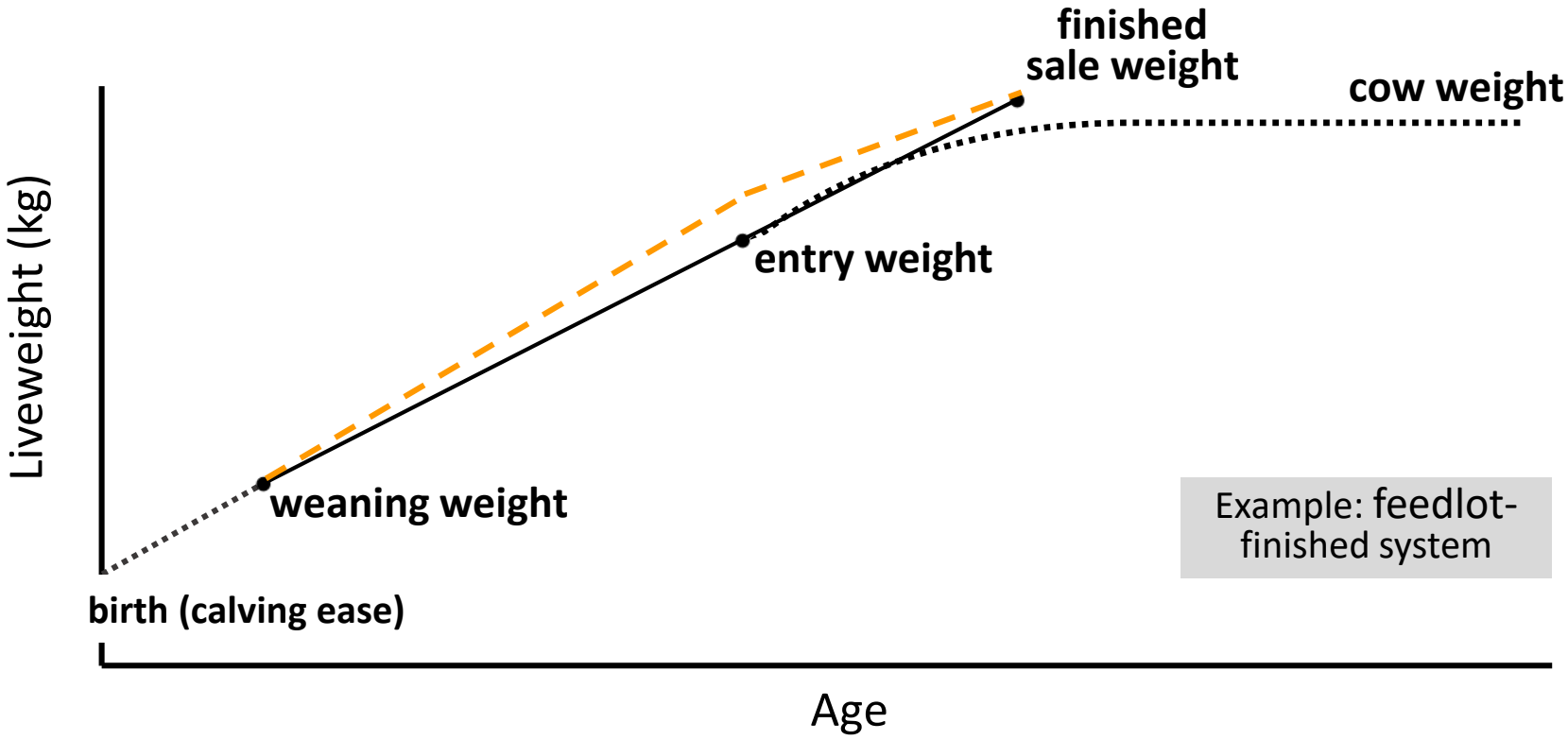
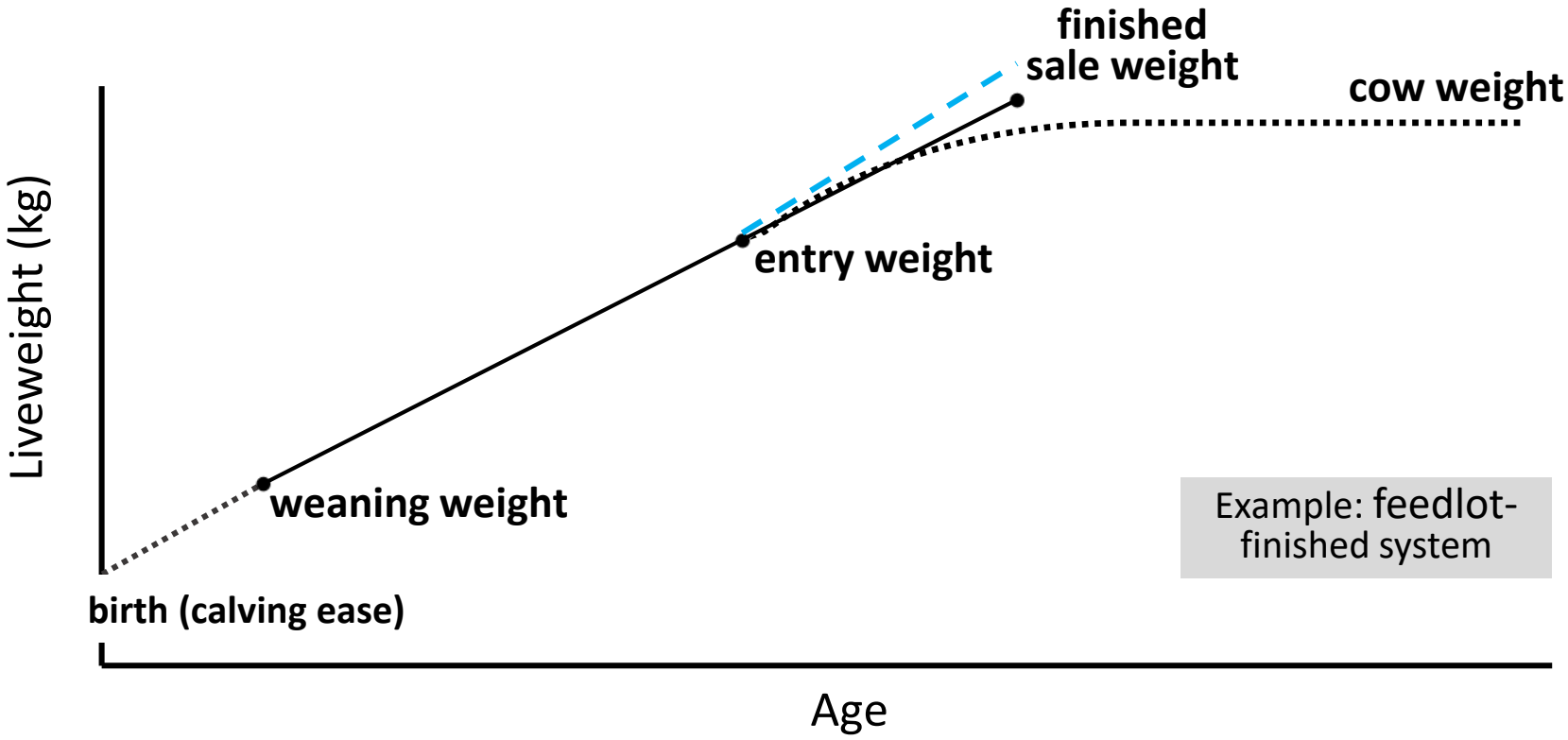


Example: feedlot-finished system

Growth curve - Now



Growth curve - Now



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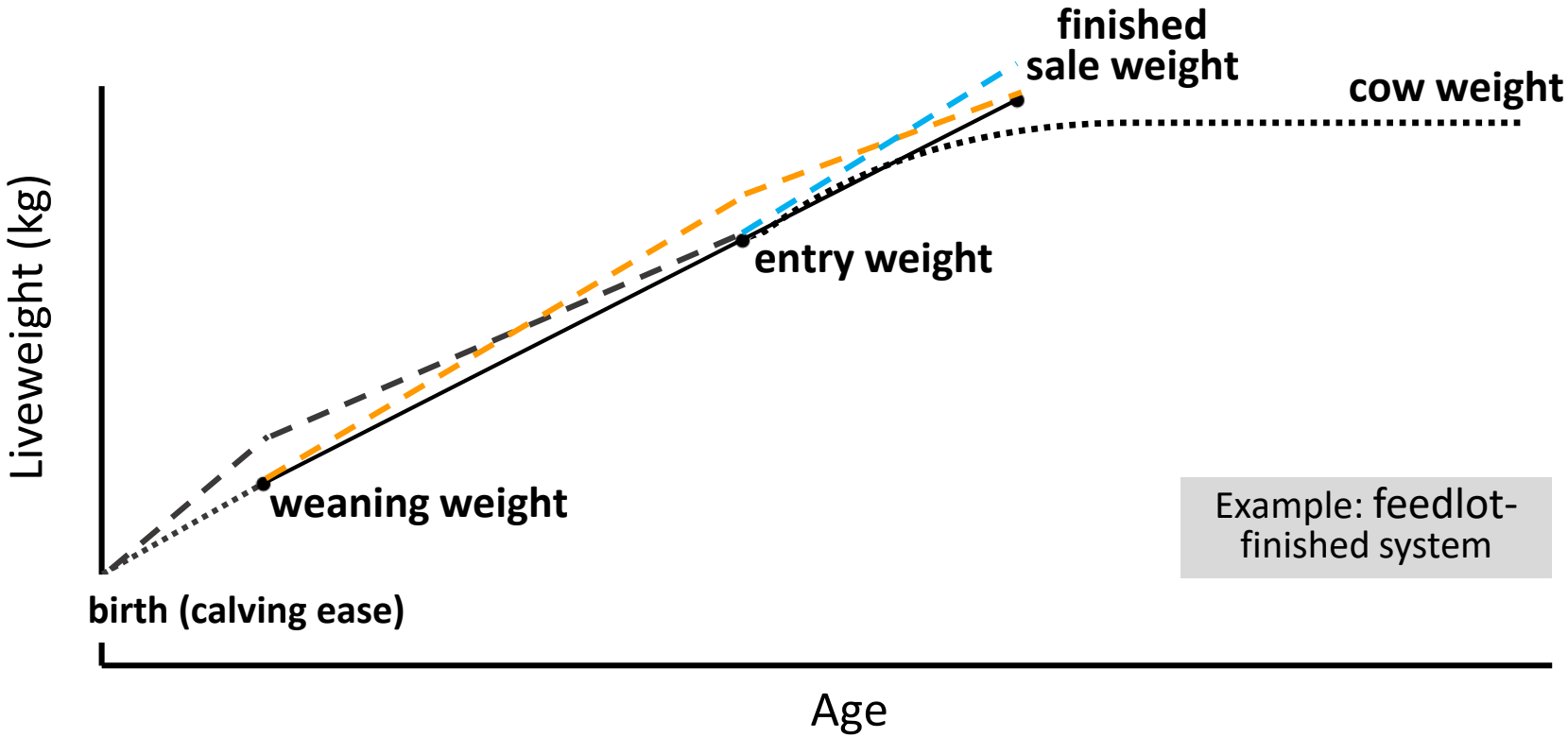

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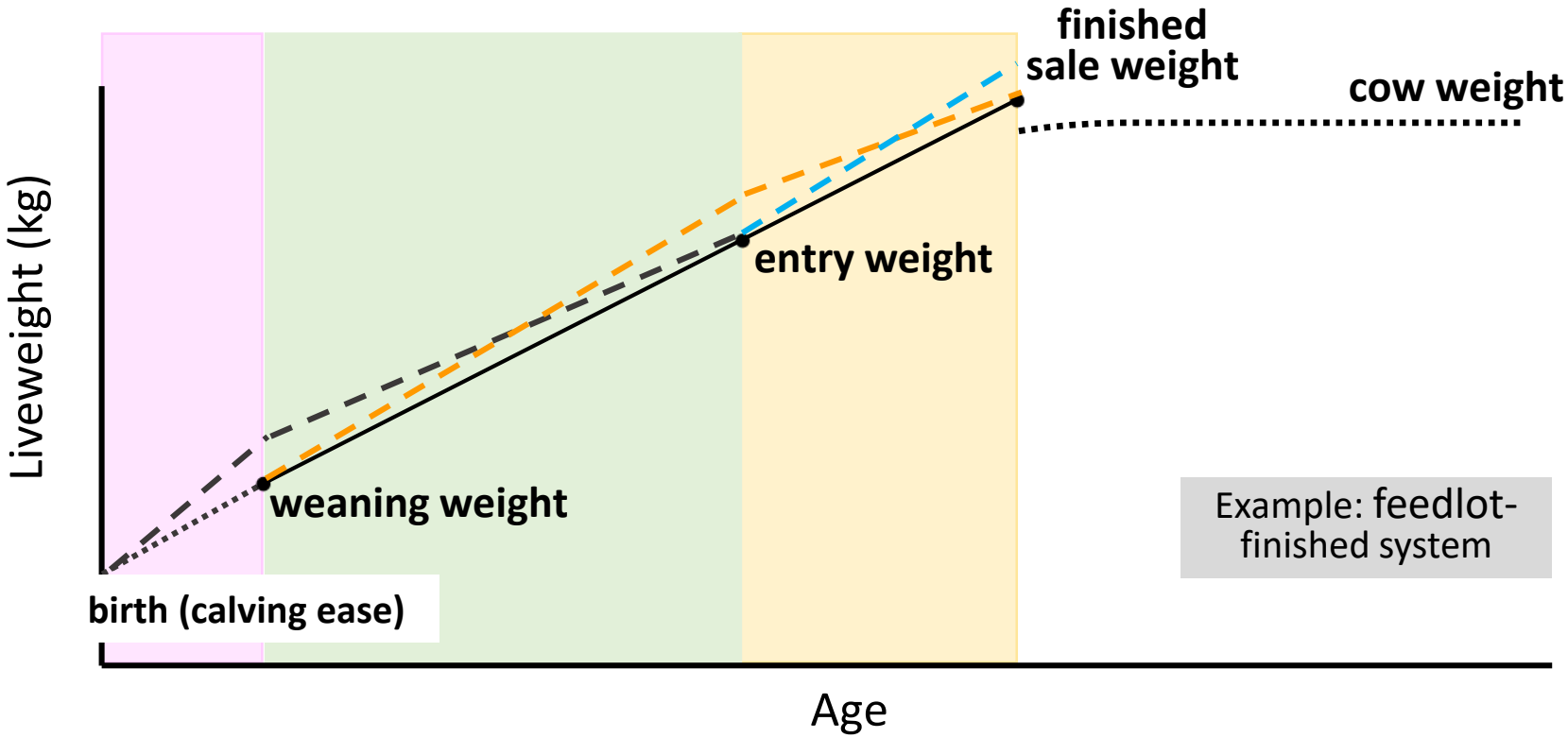


Cow Weight

Economic value encompasses

- feed for maintaining wt.
- feed for change in wt.
- return from surpl. cows

(at const. other performance)

Cow feed costs have to be considered over:

- **whole year**

  (effect isn't constant)

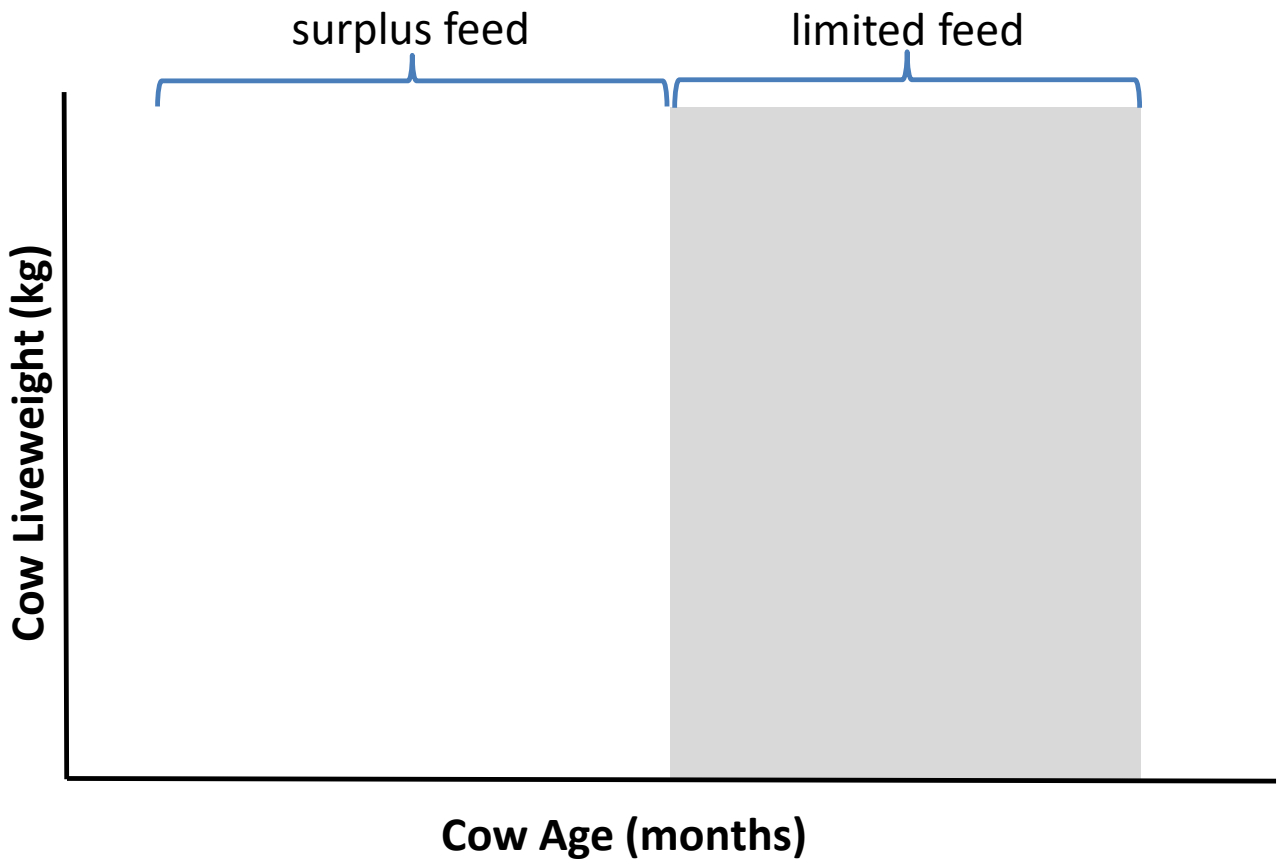
  &

- **whole lifetime**

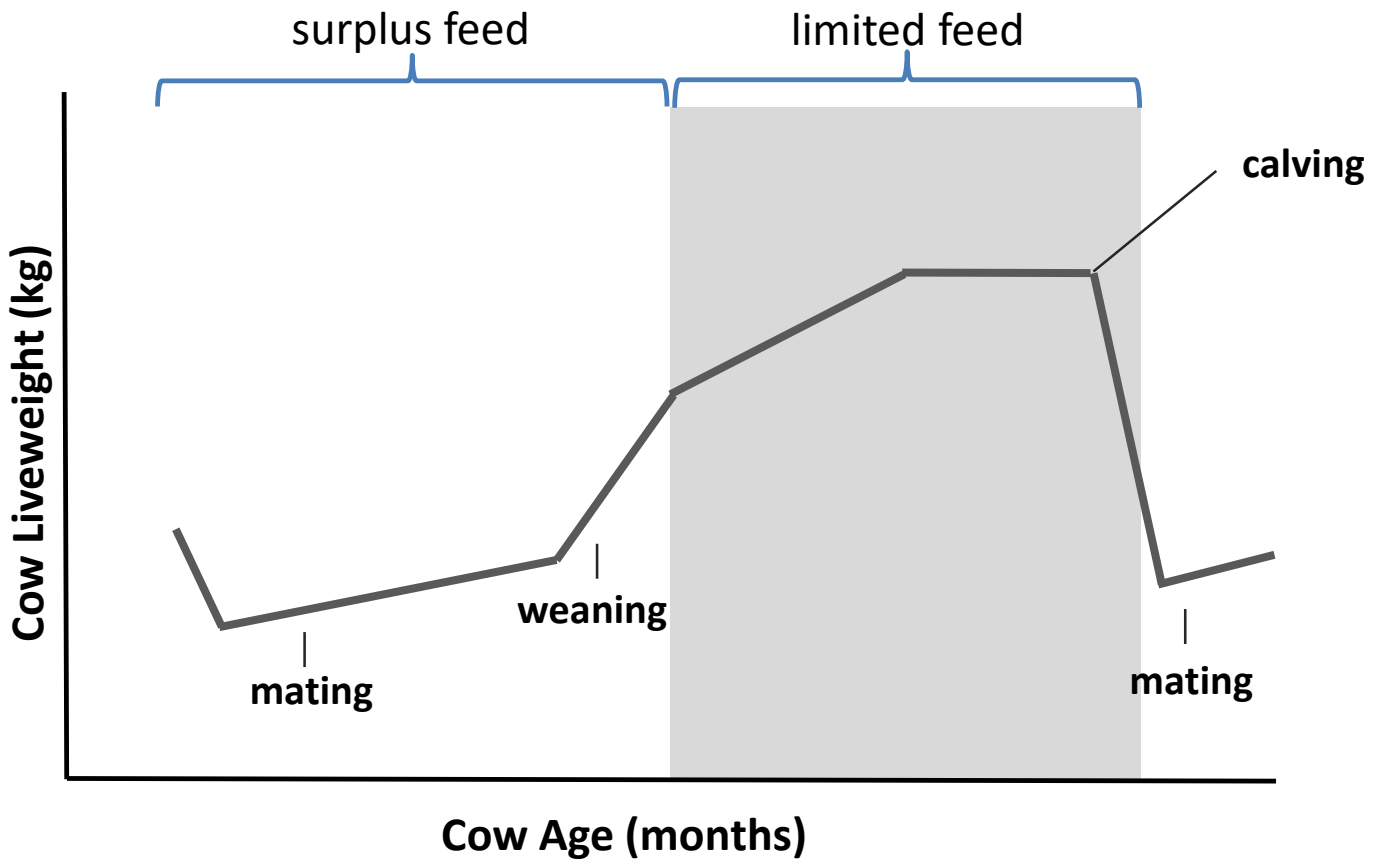
  (a multiplier is involved)

Walmsley et al 2015 Association for the Advancement of Animal Breeding and Genetics

Annual Production Cycle

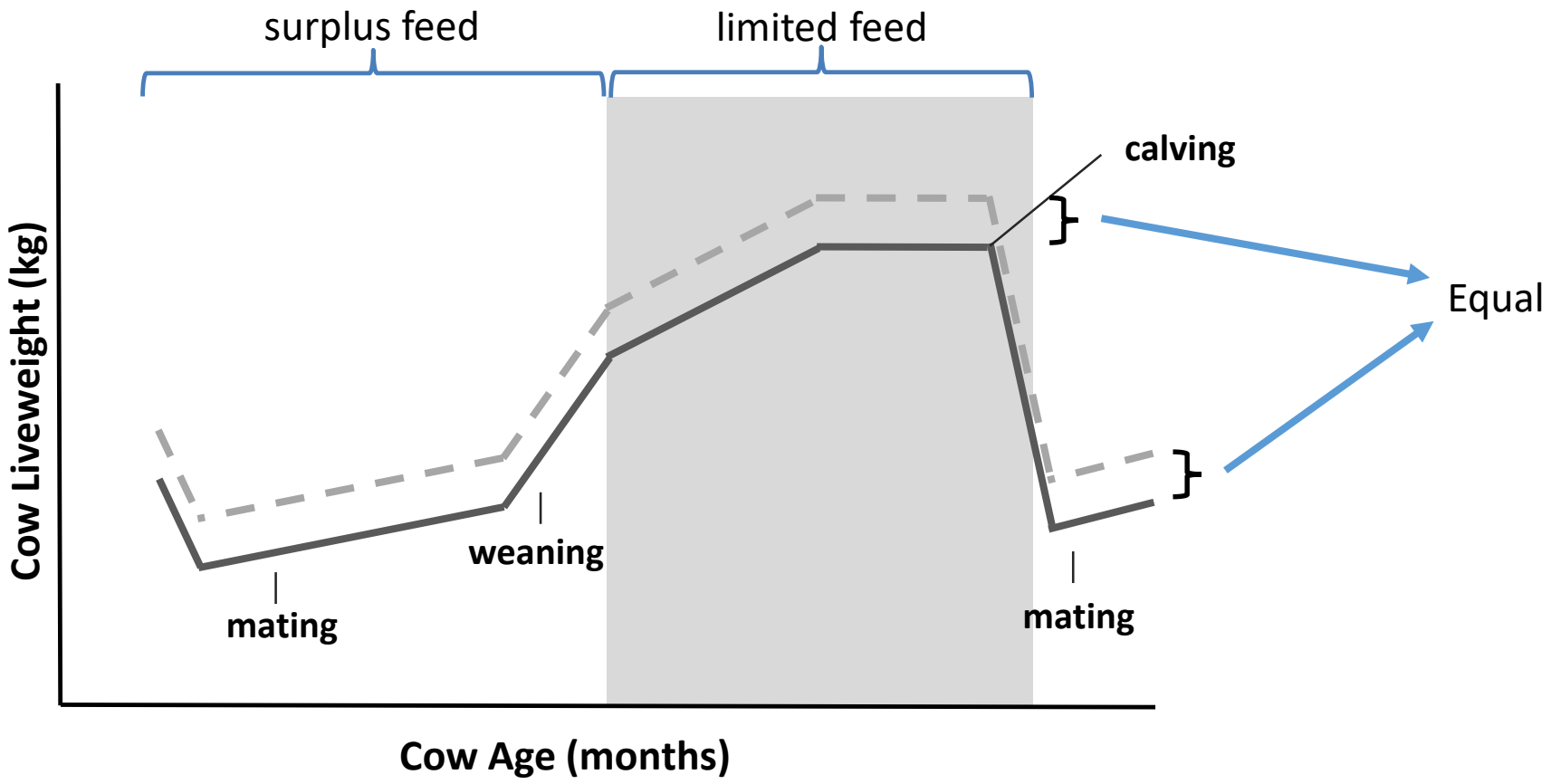


Cow Weight Pattern - Previously



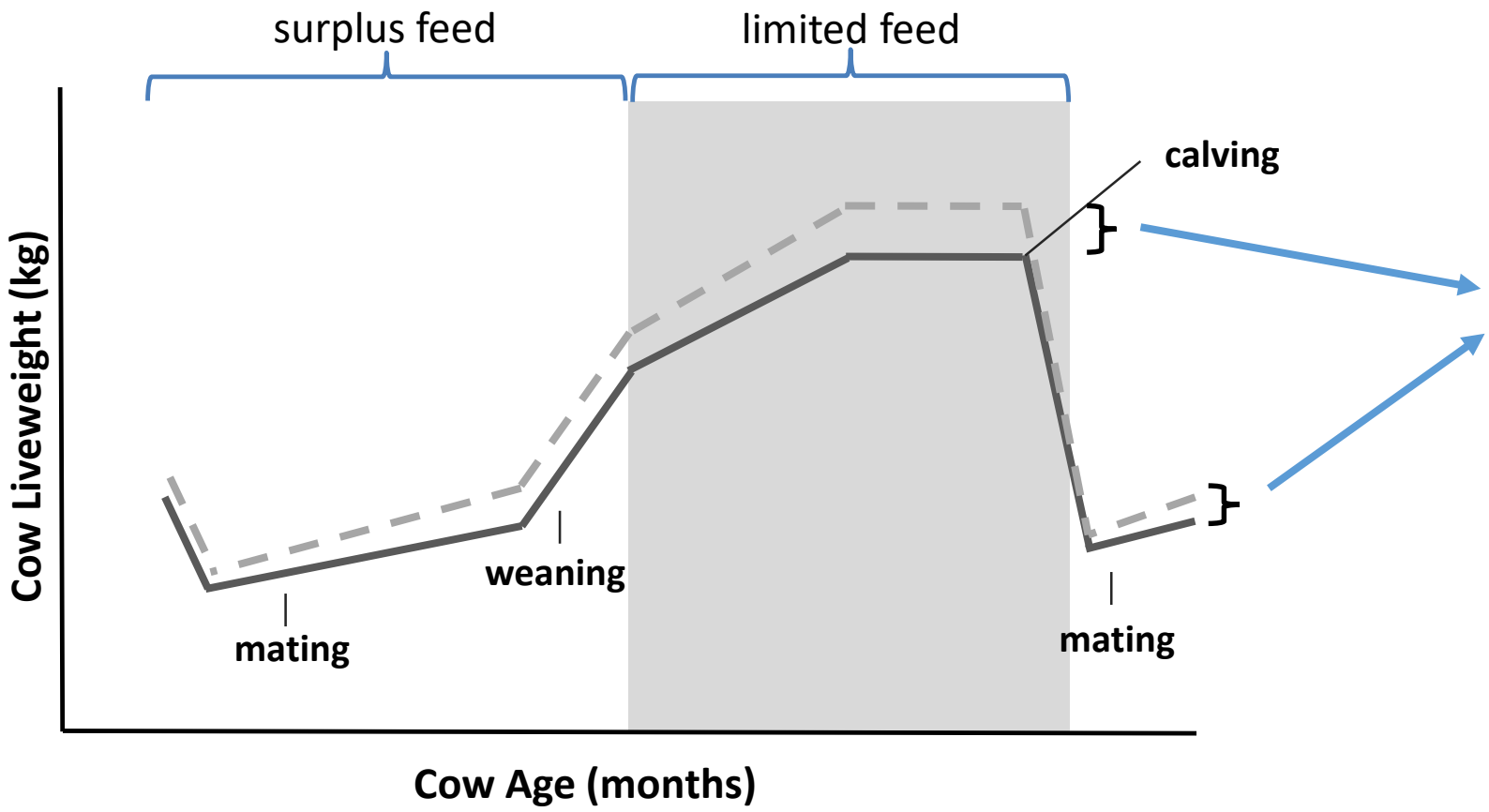
Cow Weight Pattern - Previously

Cow weight change constant **throughout** the annual cycle



Cow Weight Pattern - Now

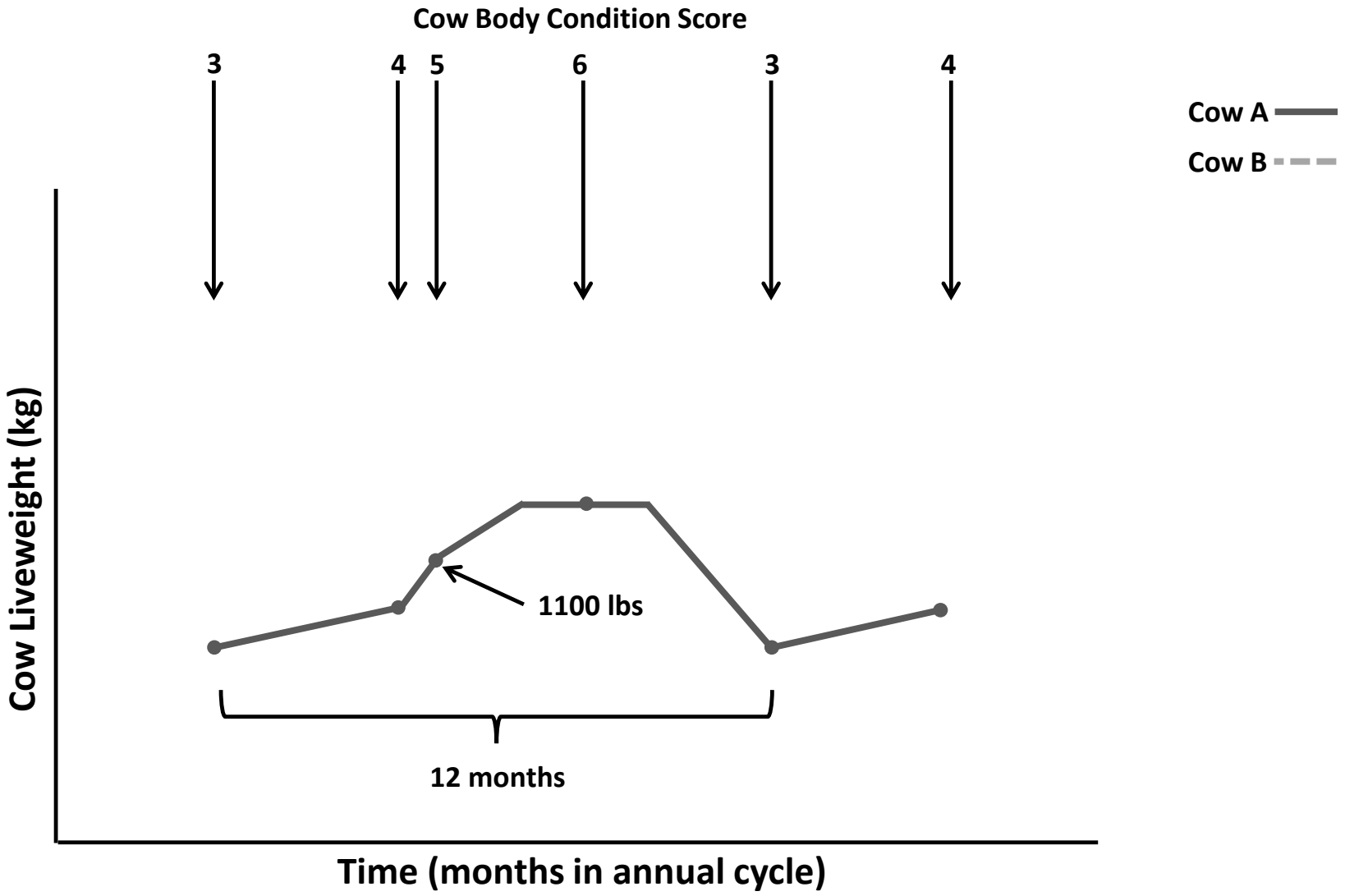
Cow weight change varies **throughout** the annual cycle



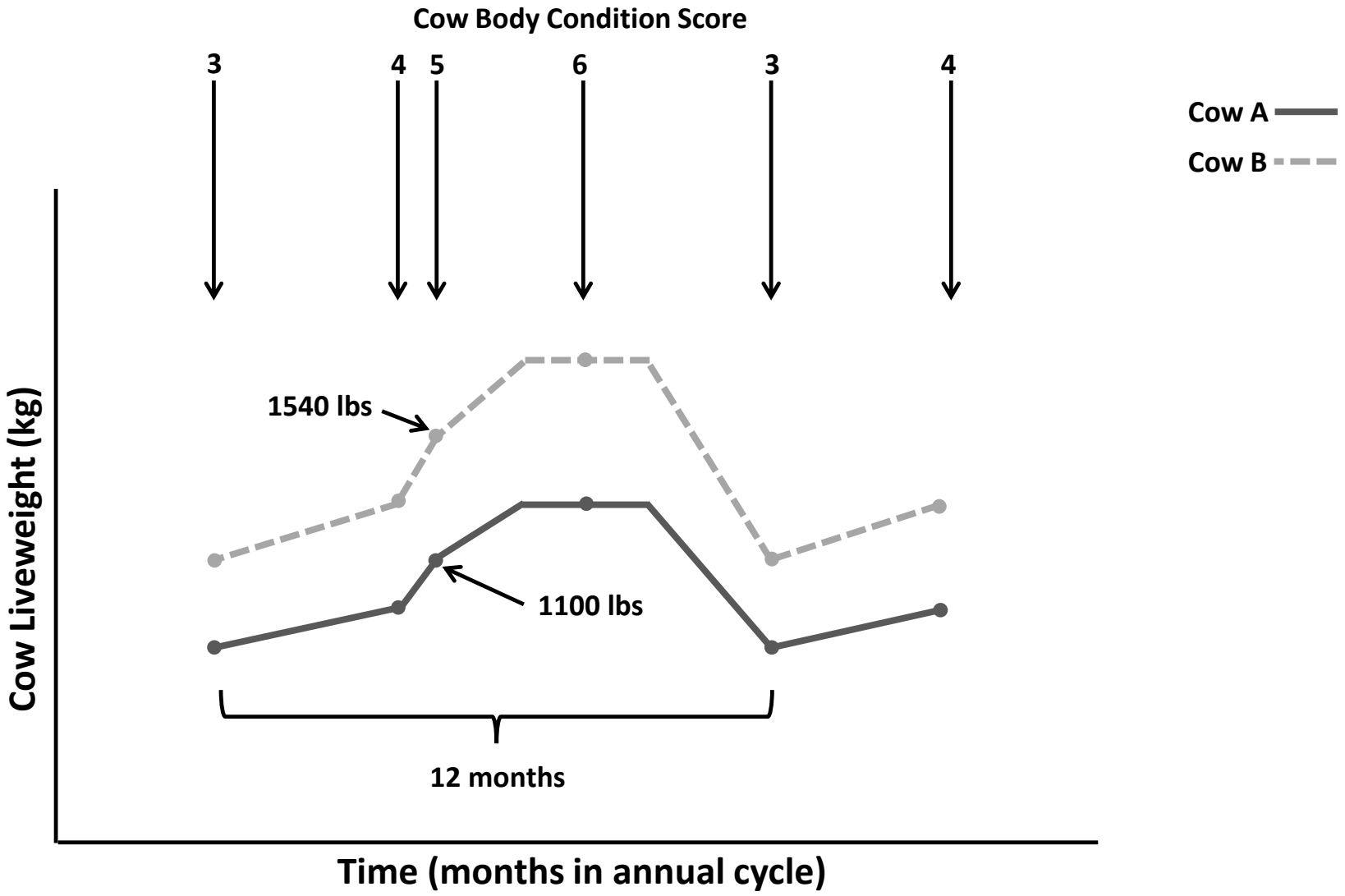
Temperate or Tropical Systems

Different

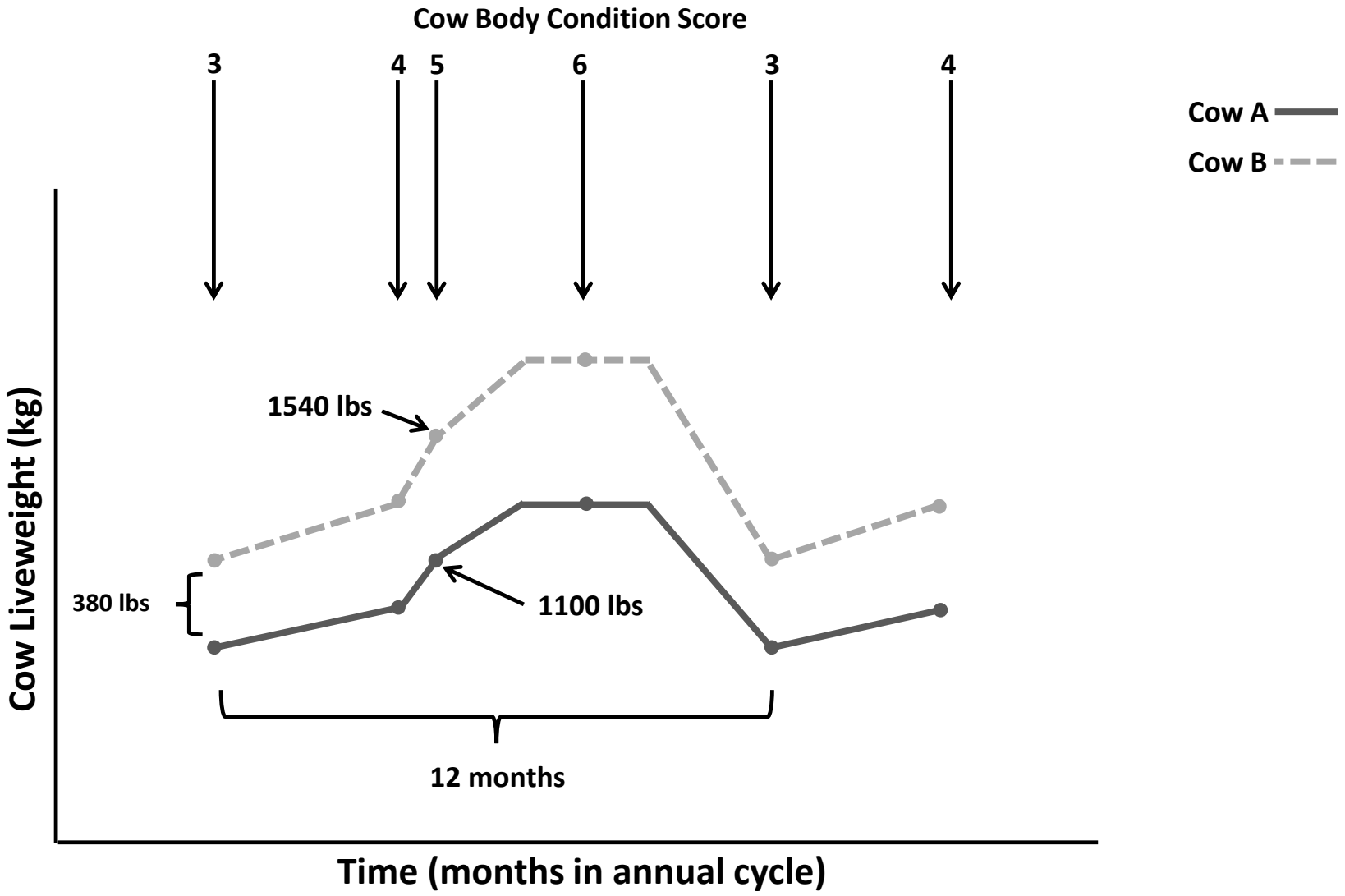
Cow Weight - Now



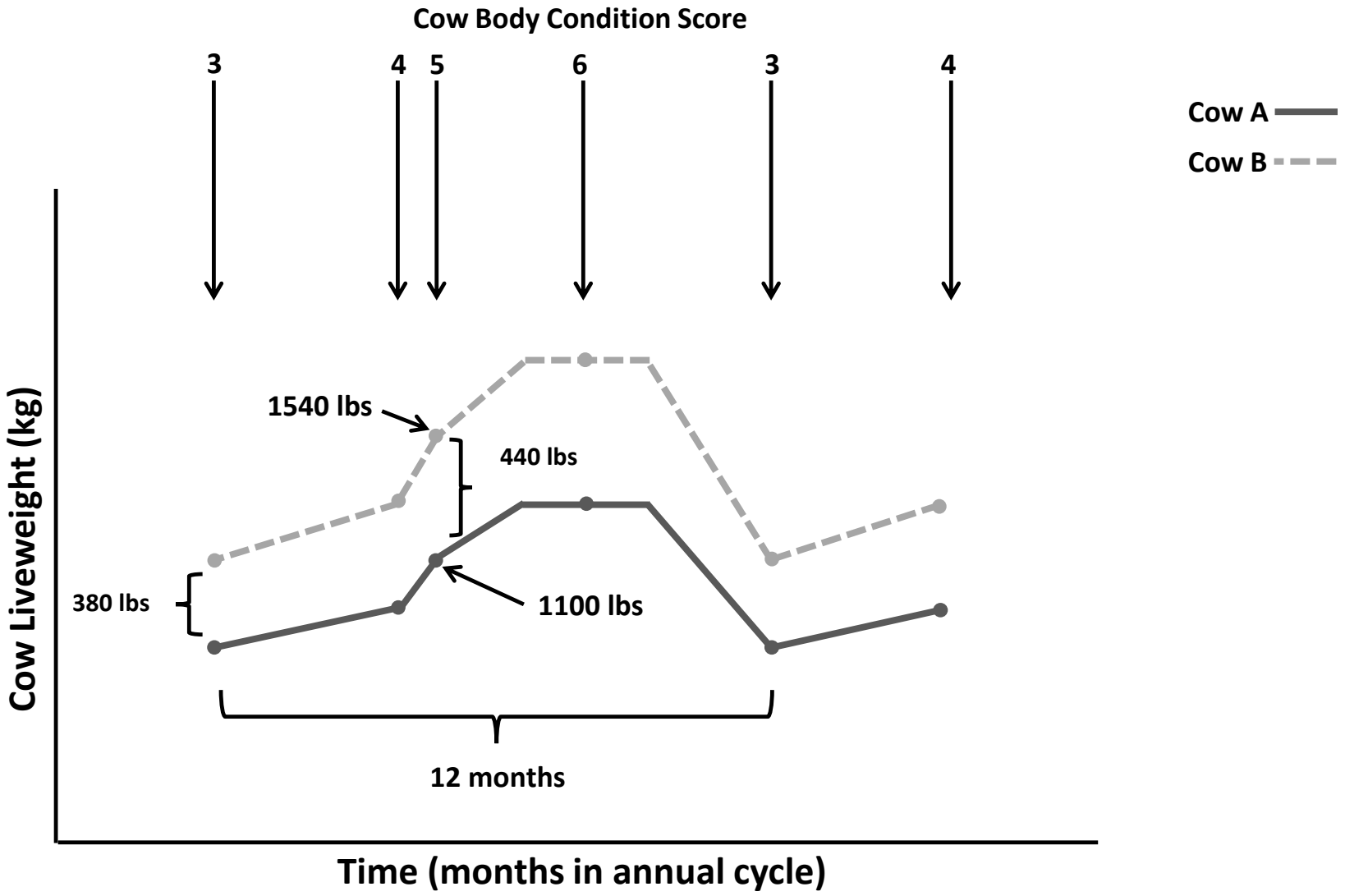
Cow Weight - Now



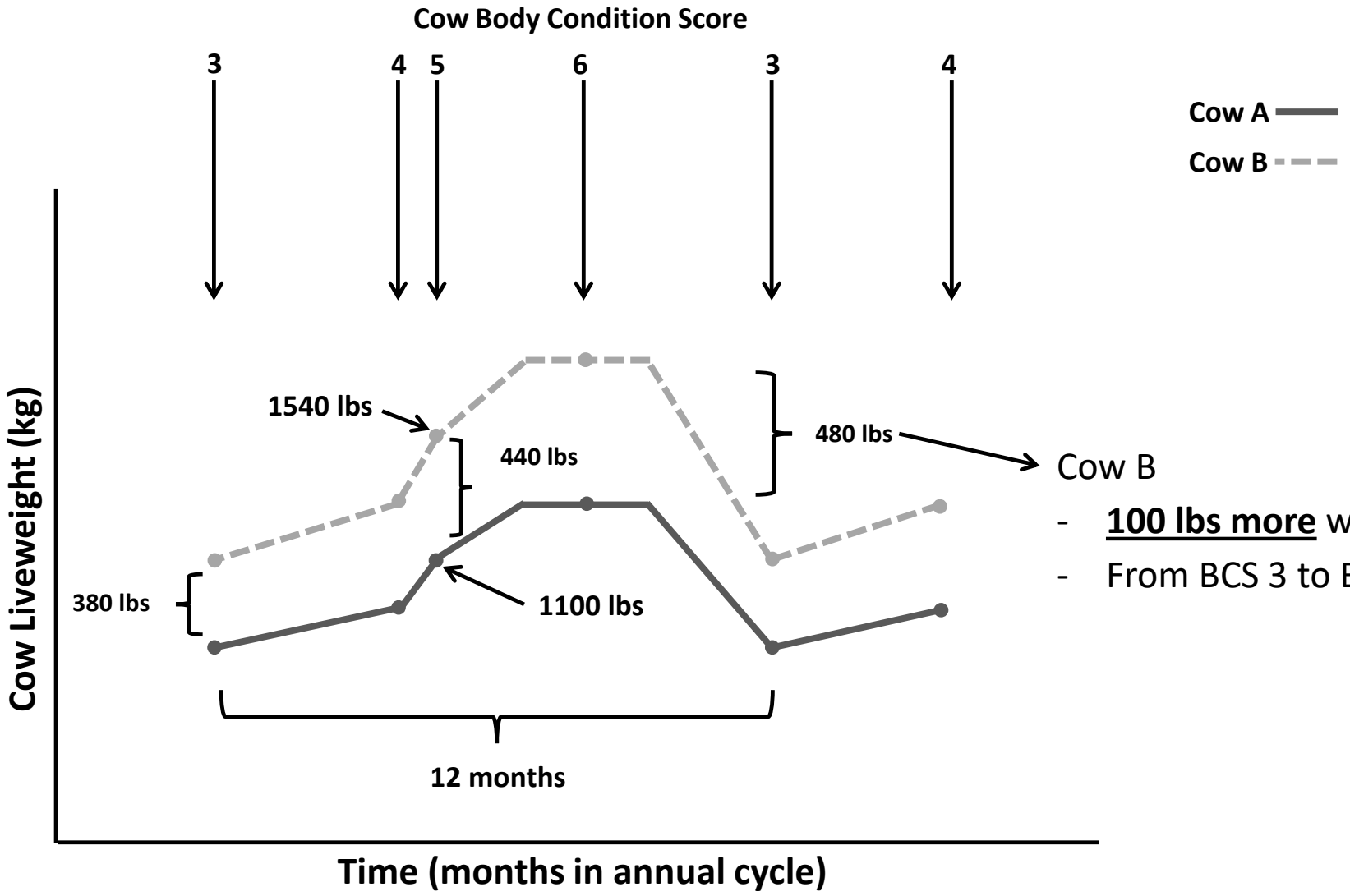
Cow Weight - Now



Cow Weight - Now



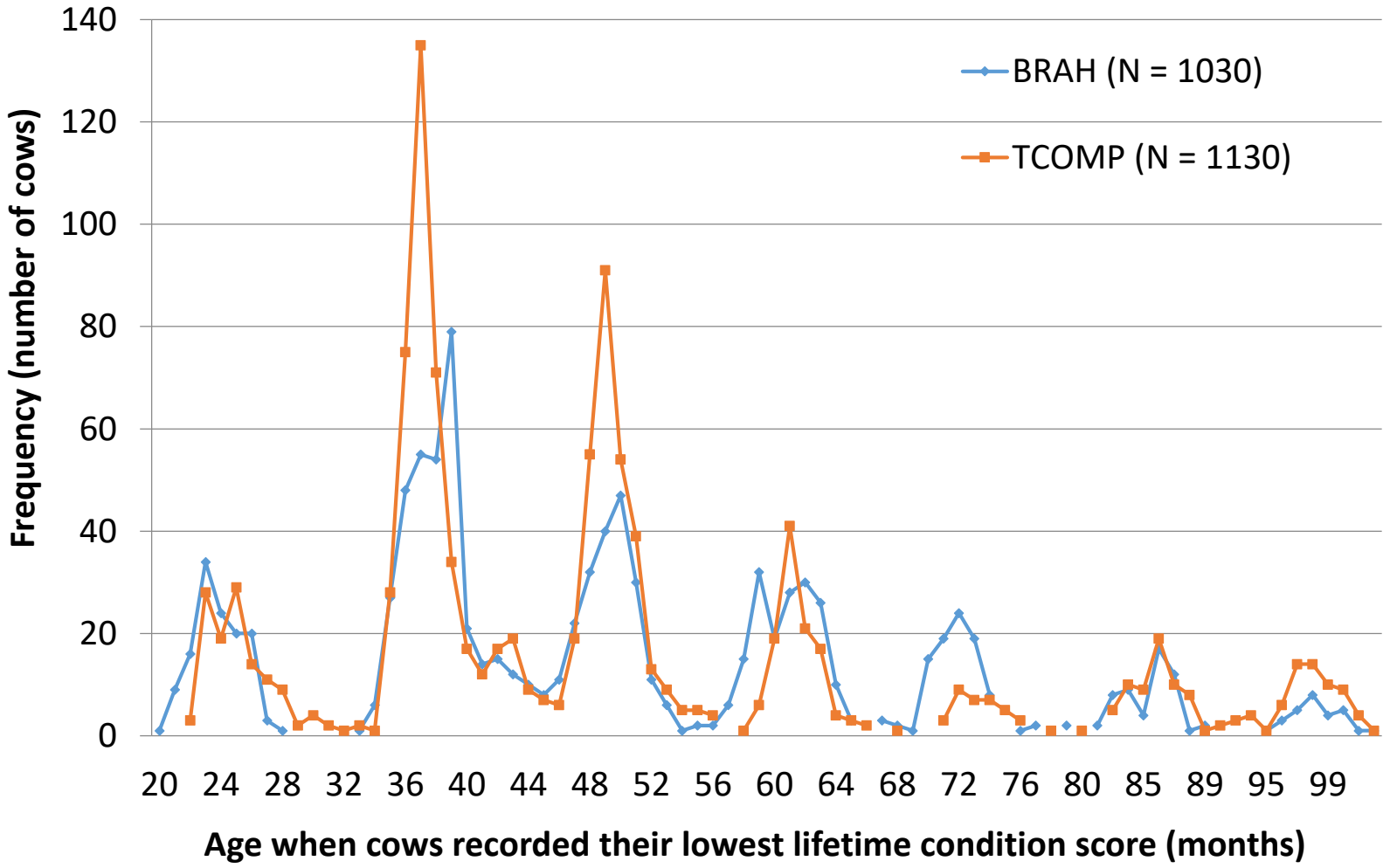
Cow Weight - Now



Cow B

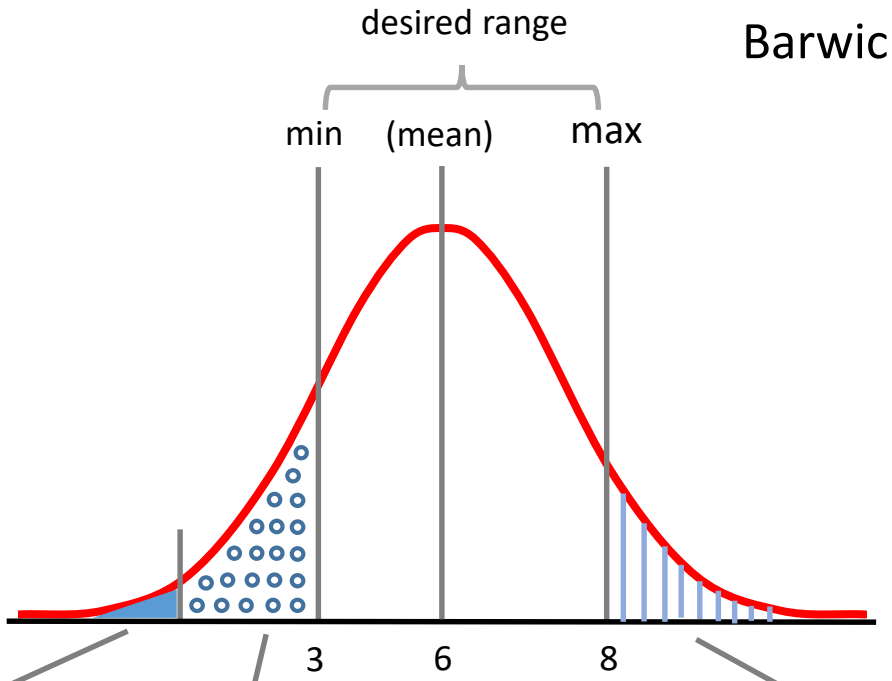
- **<u>100 lbs more</u>** weight than cow A
- From BCS 3 to BCS 6

Age at Lowest Cow Condition Score



Cow Condition Score

Barwick et al 2018 Journal of Animal Science



Welfare Issue

critically low condition

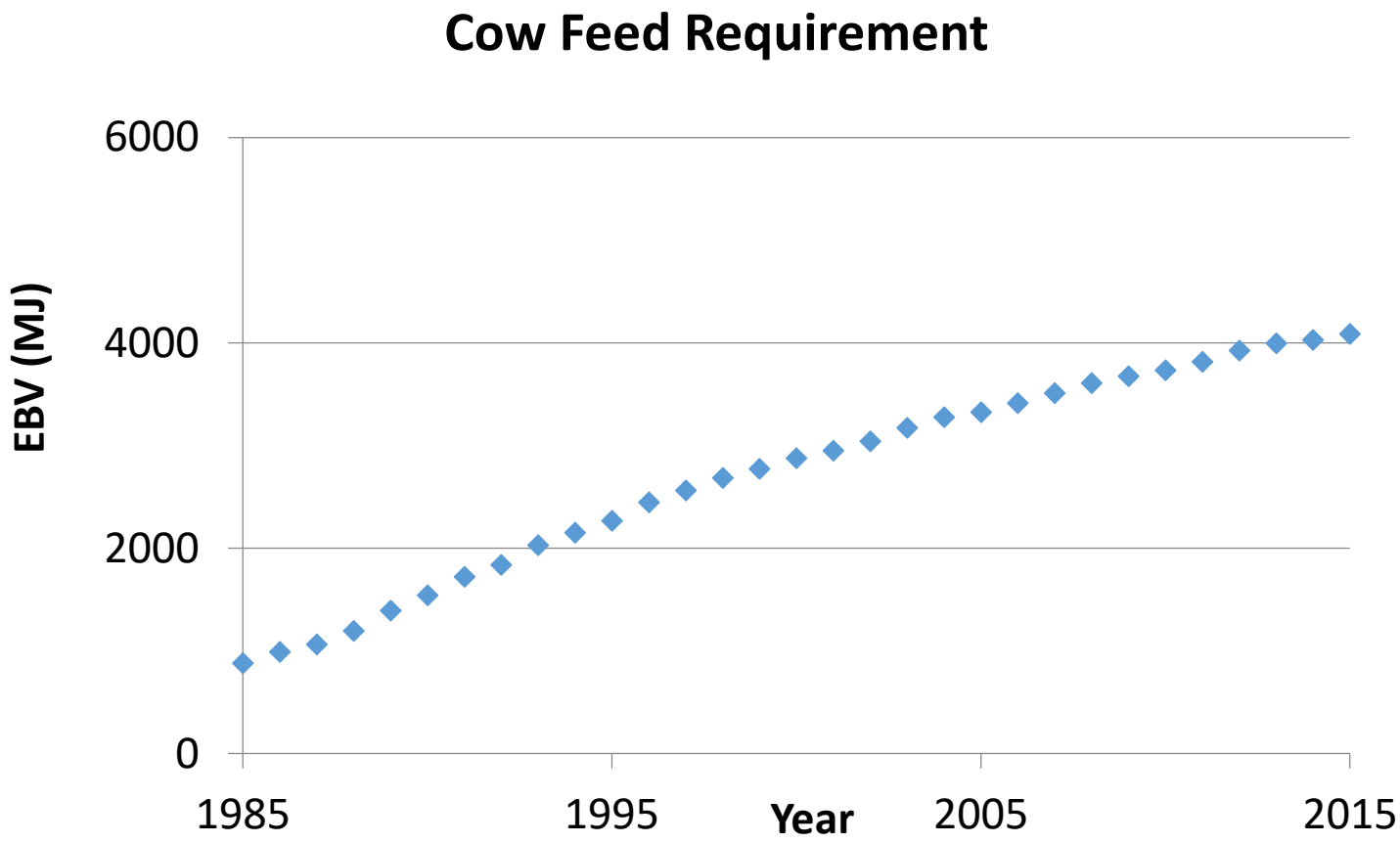
lower condition than needed

Requires extra supplementary feed

higher condition than needed

Wasted feed = cow NFI

Cow Feed Requirement



~ 0.88 kg DM/day

Walmsley et al 2017 Association for the Advancement of Animal Breeding and Genetics

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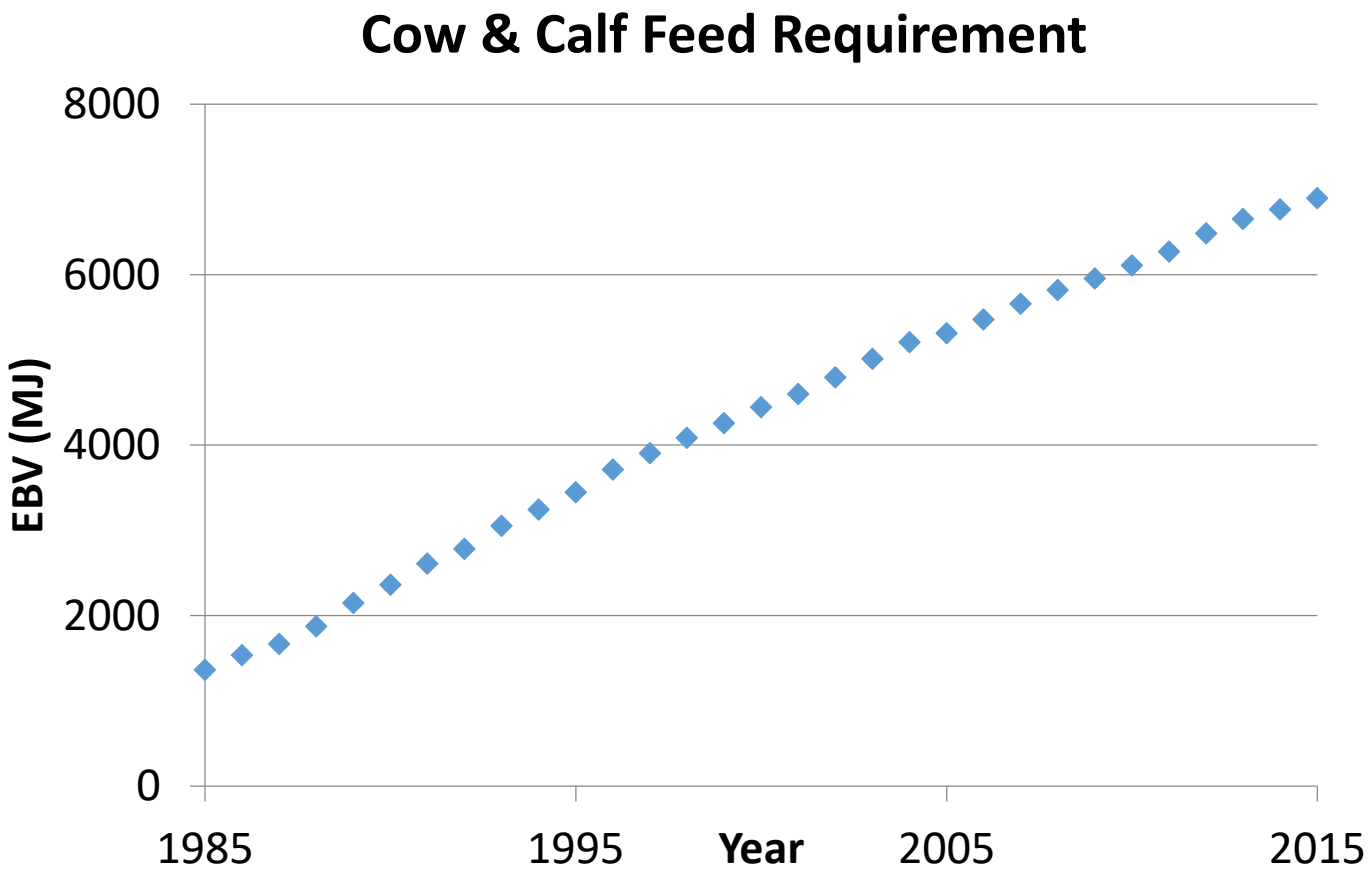
Cow/calf Feed Requirement



~ 1.52 kg DM/day

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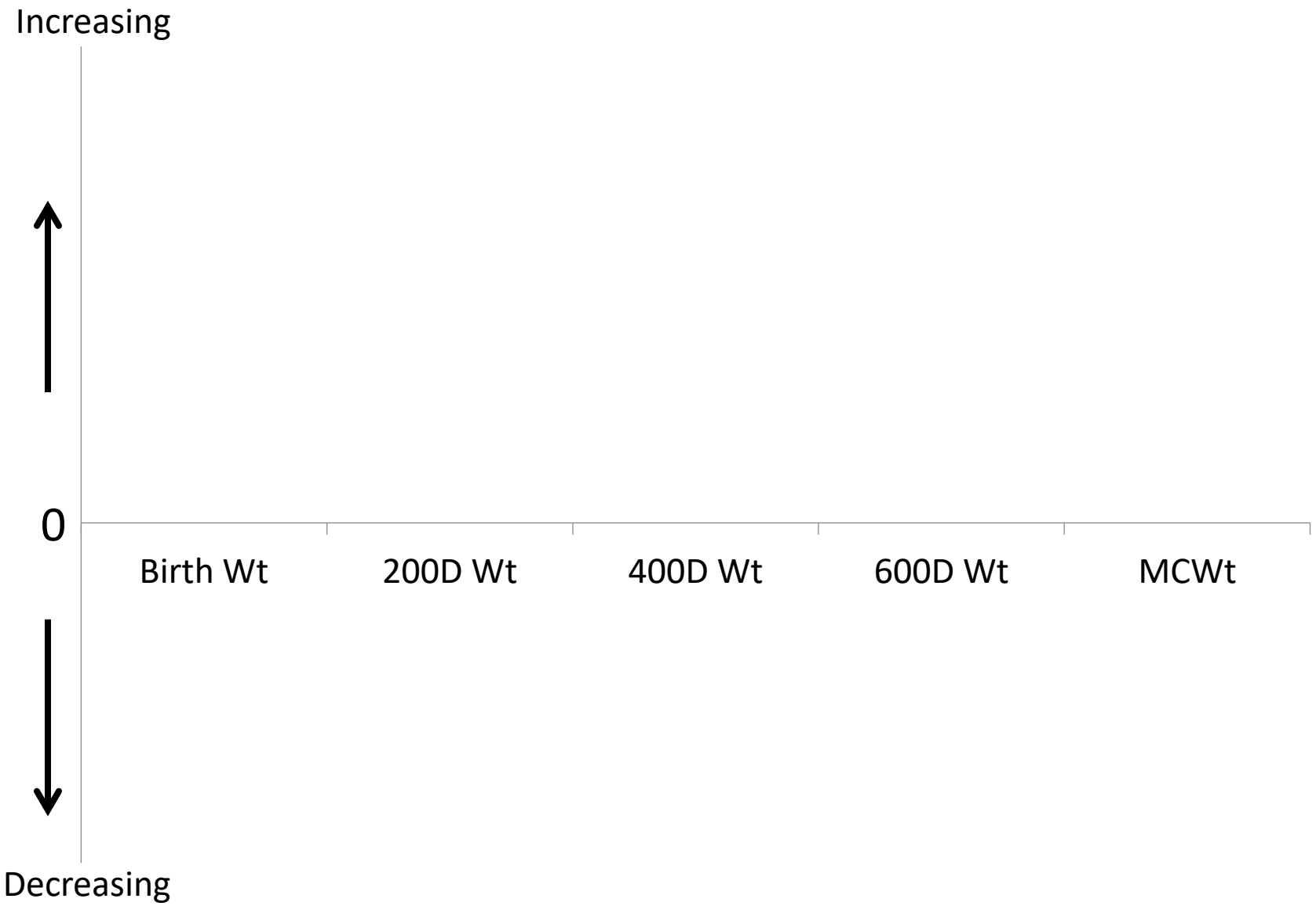
Growth responses – Feed price



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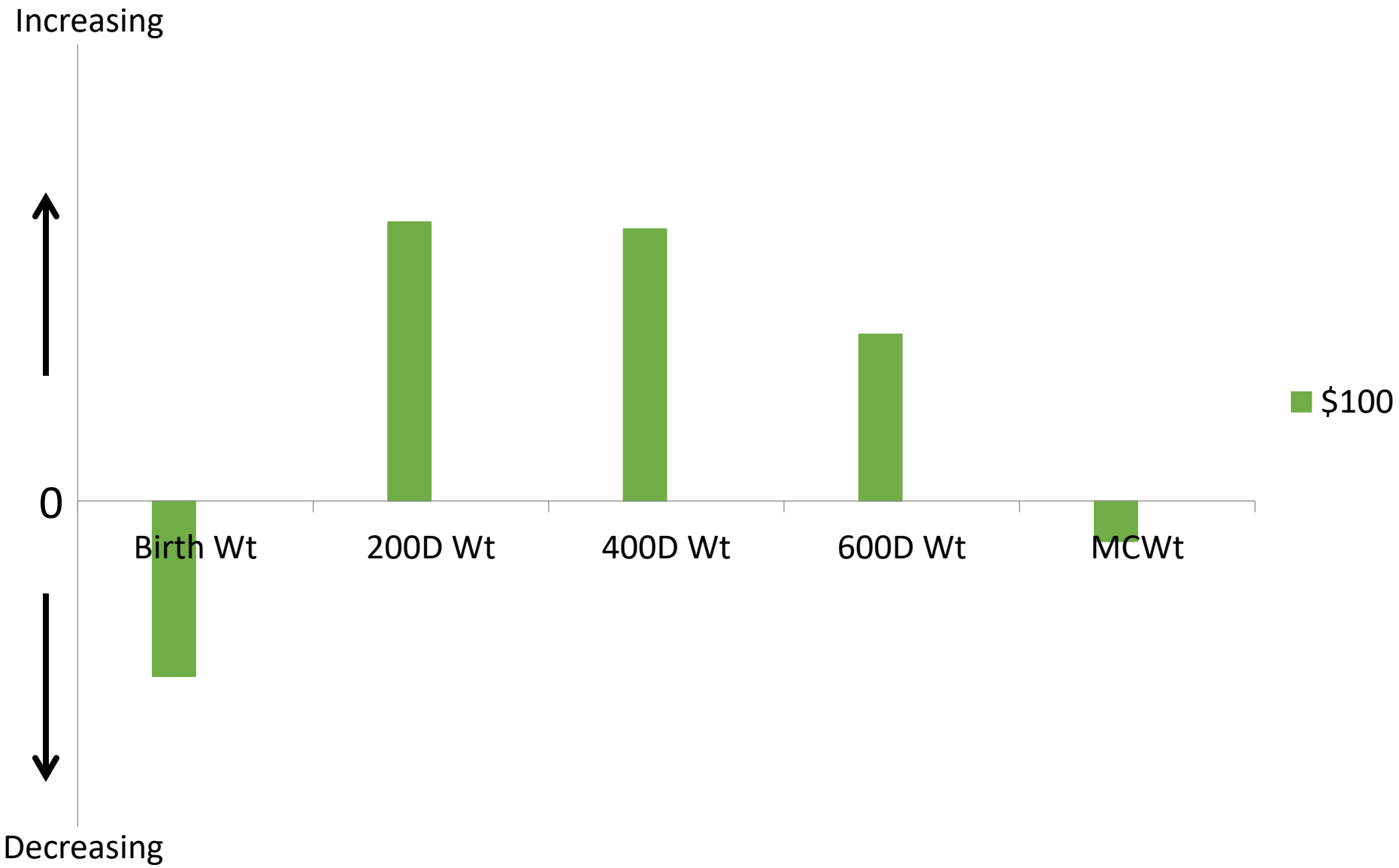

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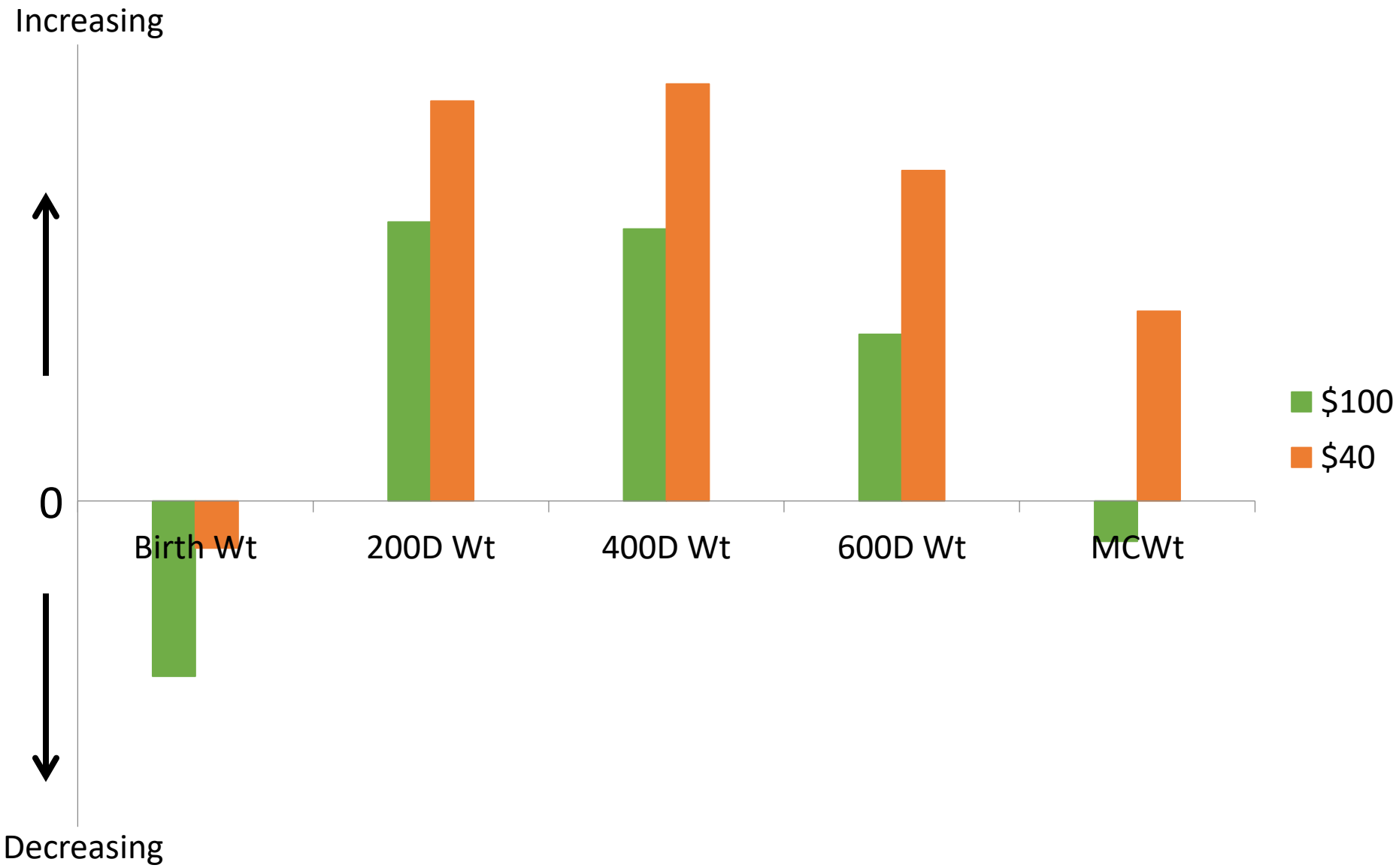

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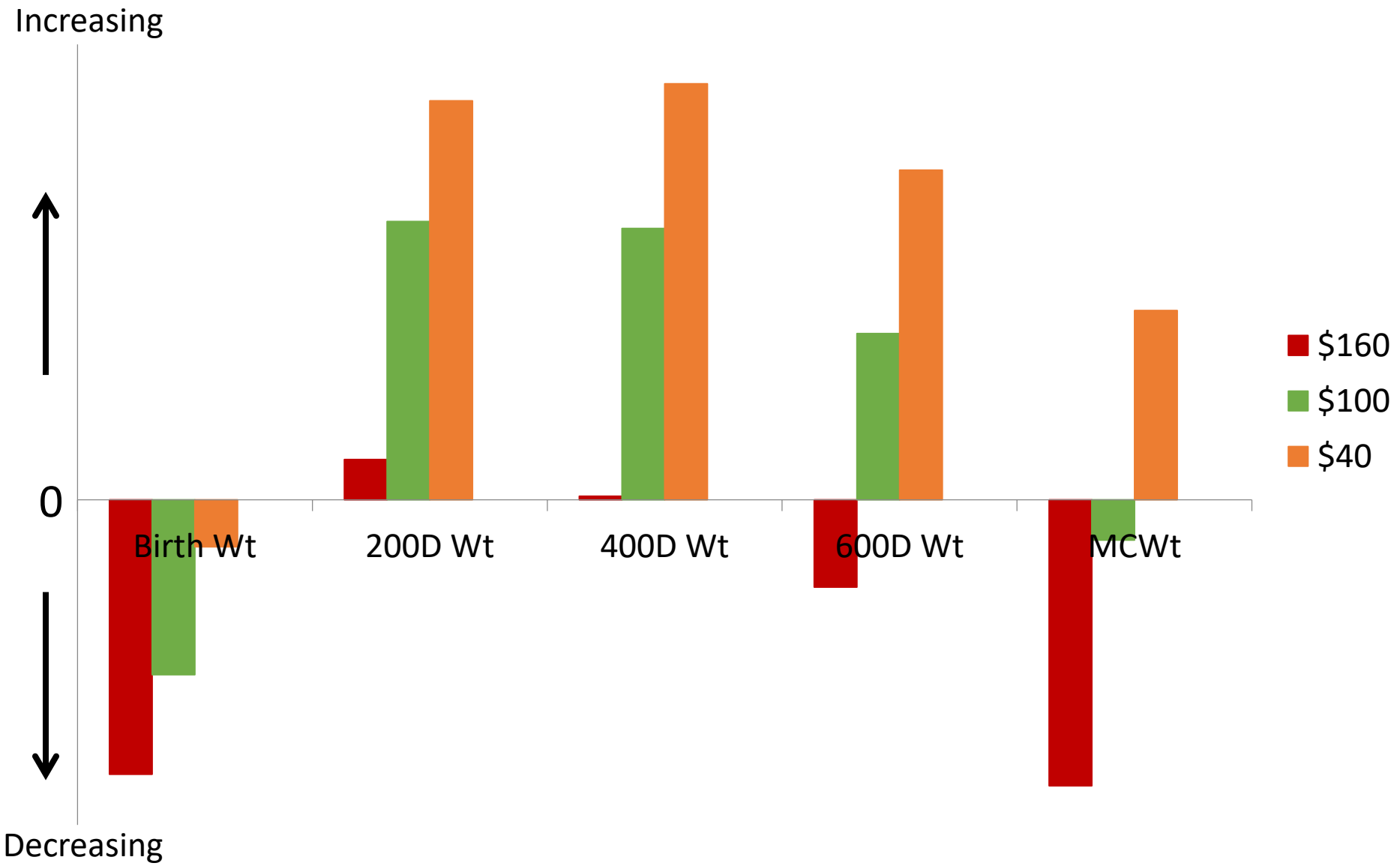

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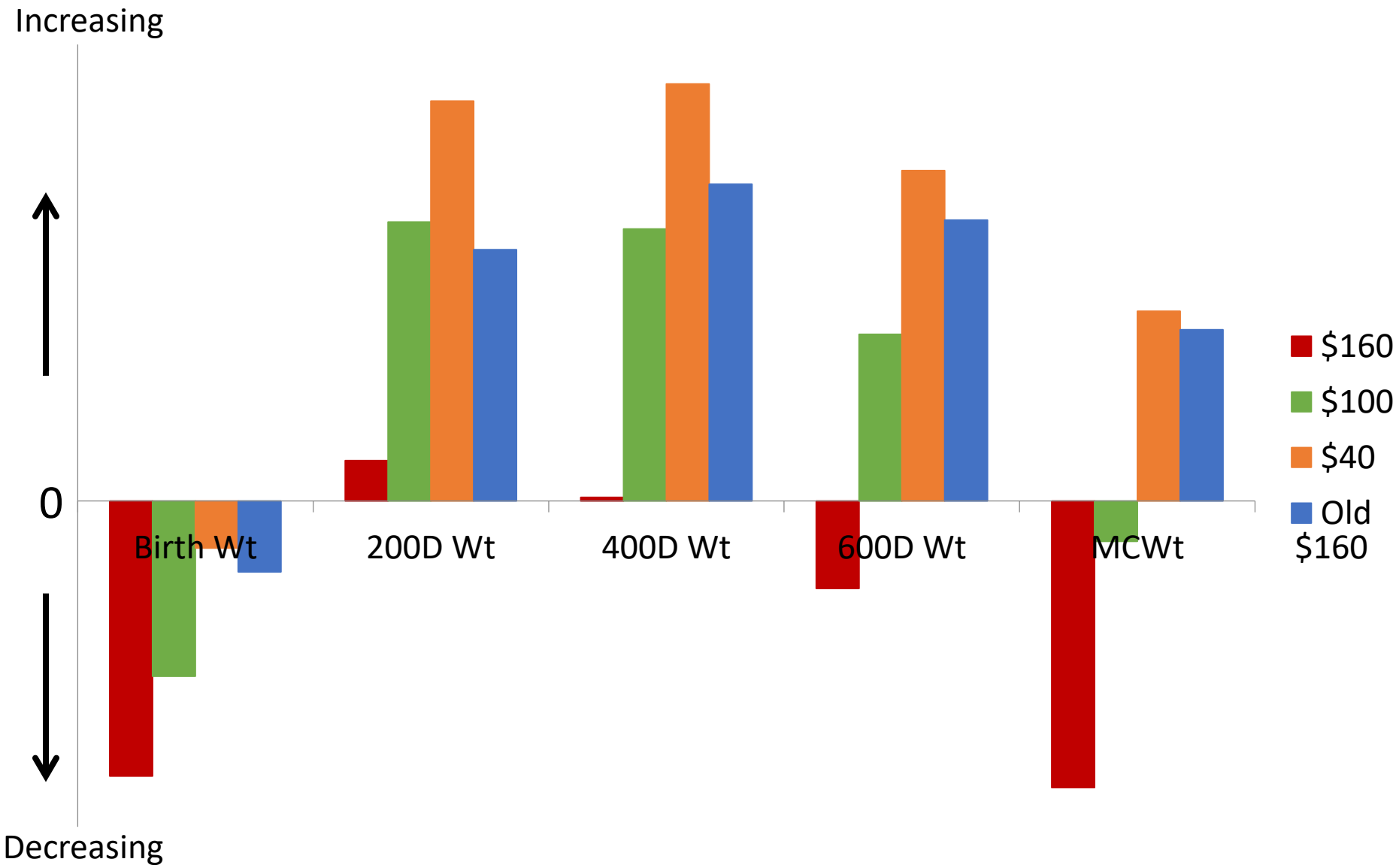
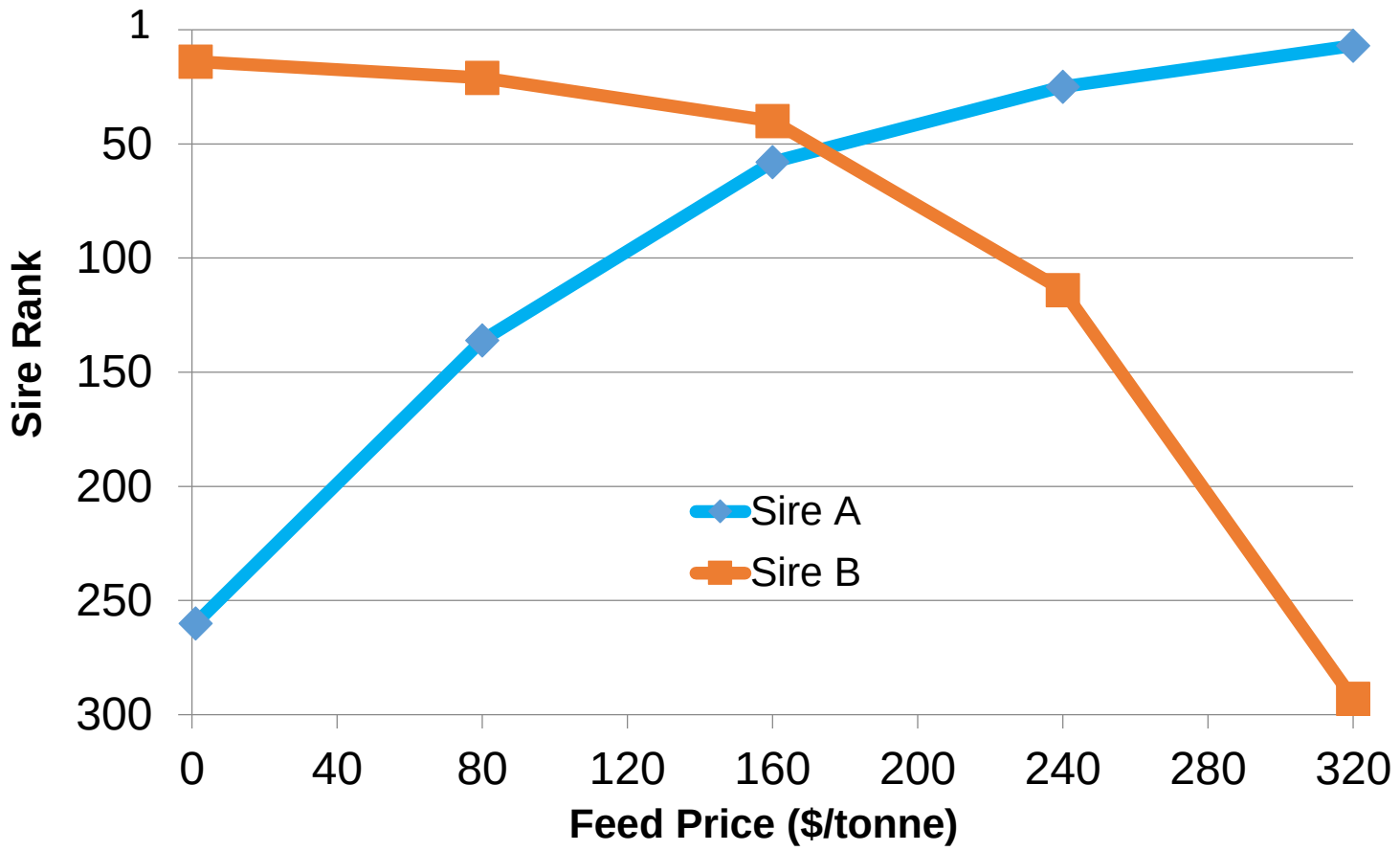


Bull Rankings



Walmsley et al 2018 World Congress on Genetics Applied to Livestock Production

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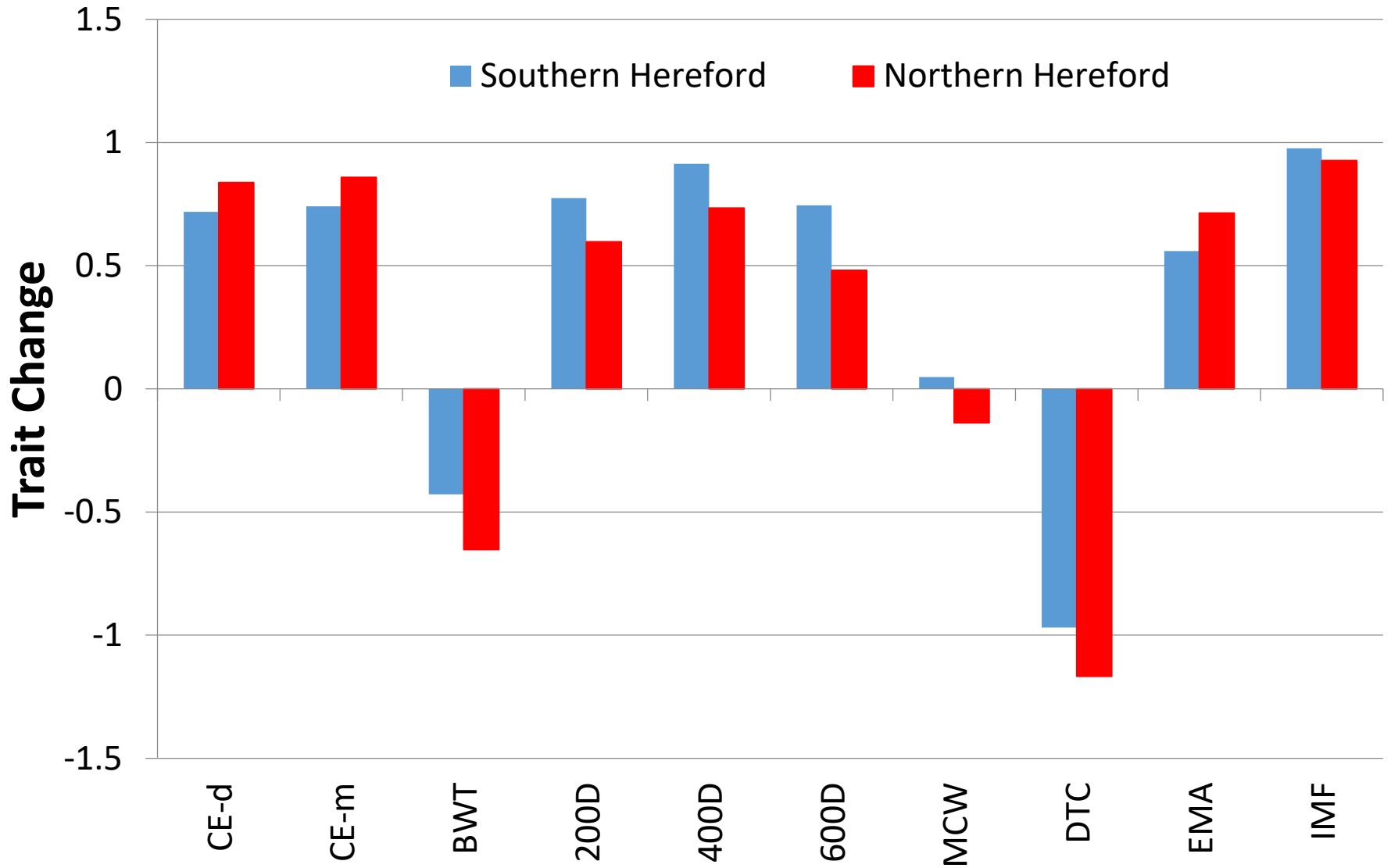
Hereford Expected EBV Changes

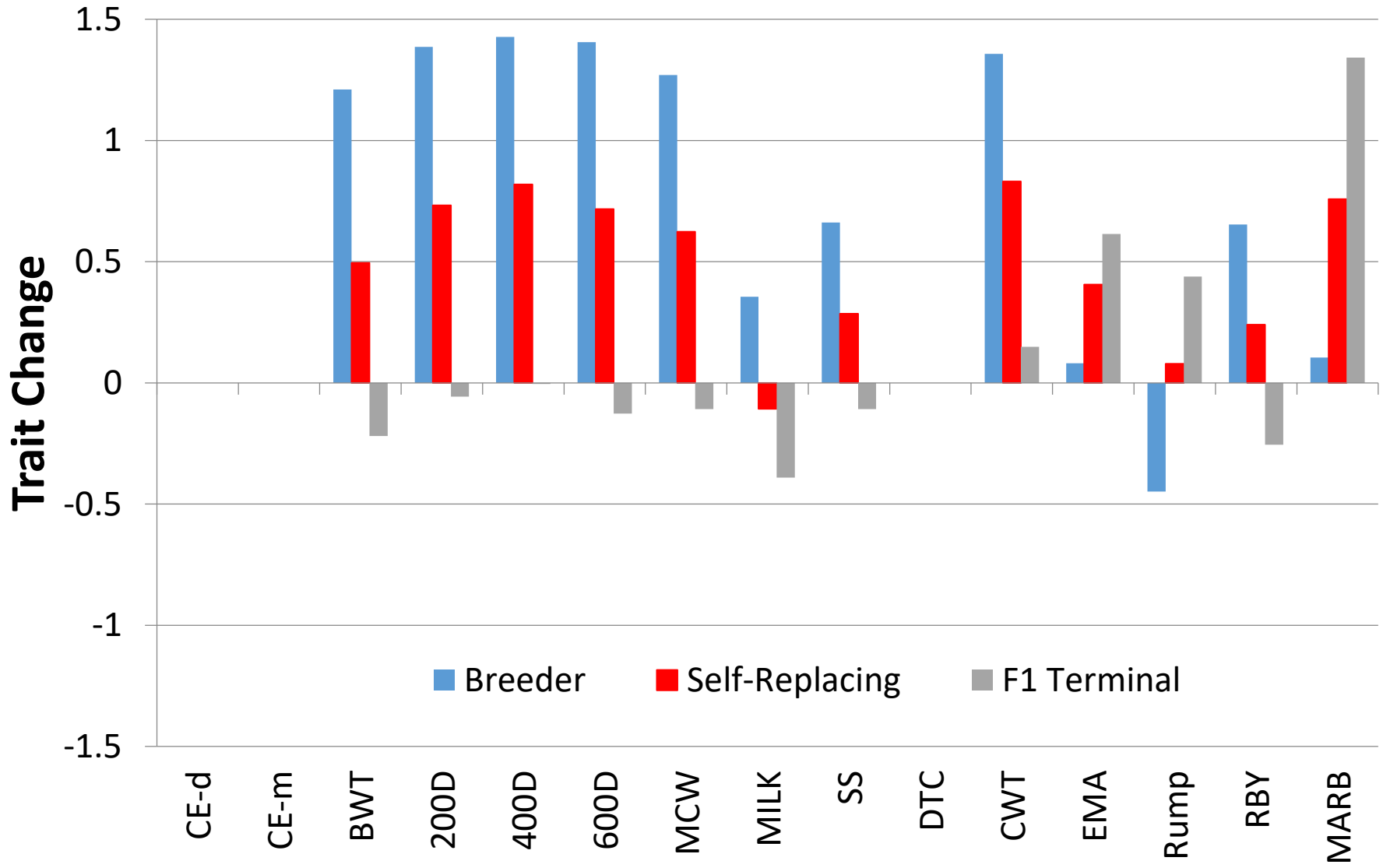


New Features: BreedObject Version 6

Continued…

- Methane modelling
- Enhanced market specifications valuing
  - Non-linear for all traits, if appropriate

Wagyu Expected EBV Changes



New Features: BreedObject Version 6

Continued…

- Methane modelling
- Enhanced market specifications valuing
  - Non-linear for all traits, if appropriate
- Culling effects via specific traits

Todays Objectives

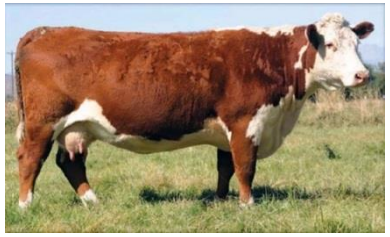
- Brief BreedObject History
- BreedObject Developments
- Plans for the Future

Future

- Redevelopment of the Feeding Standards
  - Work began 2019
  - Integration into indexes when complete

- Across-breed indexes
  - Will be driven by outputs from Repronomics and Southern Multibreed projects







Barwick et al 2020 Journal of Animal Breeding and Genetics

Future

“Indexes are complicated. 2 animals, same index, Different EBVs”

- Alternatives:

  Whole Indexes or Sub-indexes or Something else

- Development of DeSireBull

Traditional Index

$$Index_W = b_1EBV_1 + b_2EBV_2 + \ldots + b_nEBV_n$$

Where:

b is the index weight (economic importance) &

EBV is multi-trait BLUP EBVs, from traits 1 to n

Trait Sub-Groupings

$$Subgroup_1 = b_1EBV_1 + b_2EBV_2$$

…

$$Subgroup_n = b_mEBV_m + \ldots + b_nEBV_n$$

$$Index_{SG} = Subgroup_1 + Subgroup_2 + \ldots + SubGroup_n$$

Sub-Grouping Example

$$Index_W = 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 55$$

$SG_1 = 1 + 2 + 3 + 4 = 10$ ← Fertility

$SG_2 = 5 + 6 + 7 = 18$ ← Growth

$SG_3 = 8 + 9 + 10 = 27$ ← Carcass

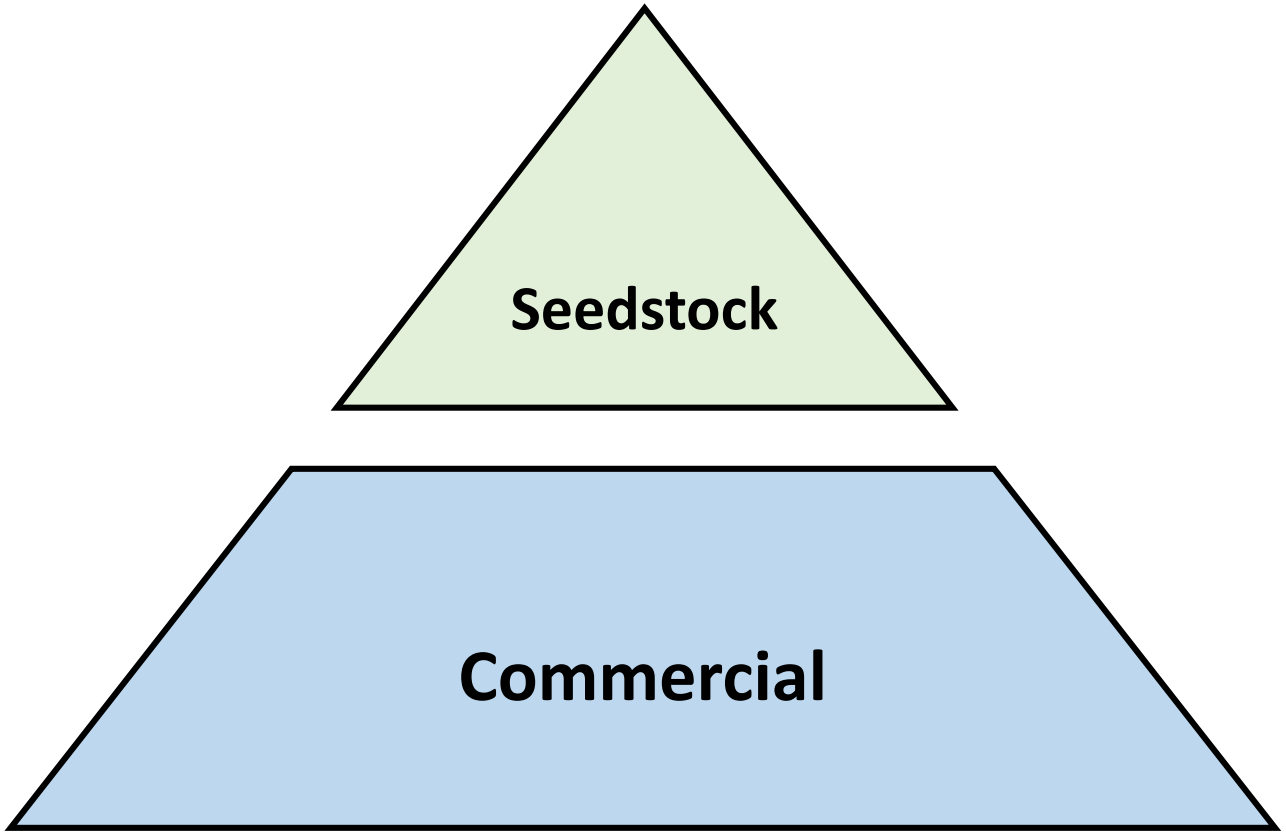
$$Index_{SG} = SG_1 + SG_2 + SG_3 = 55 = Index_W$$

Sub-Grouping Options

- Many grouping possibilities
- Logical Combinations
  - On-Farm
  - Off-Farm
  - Others???

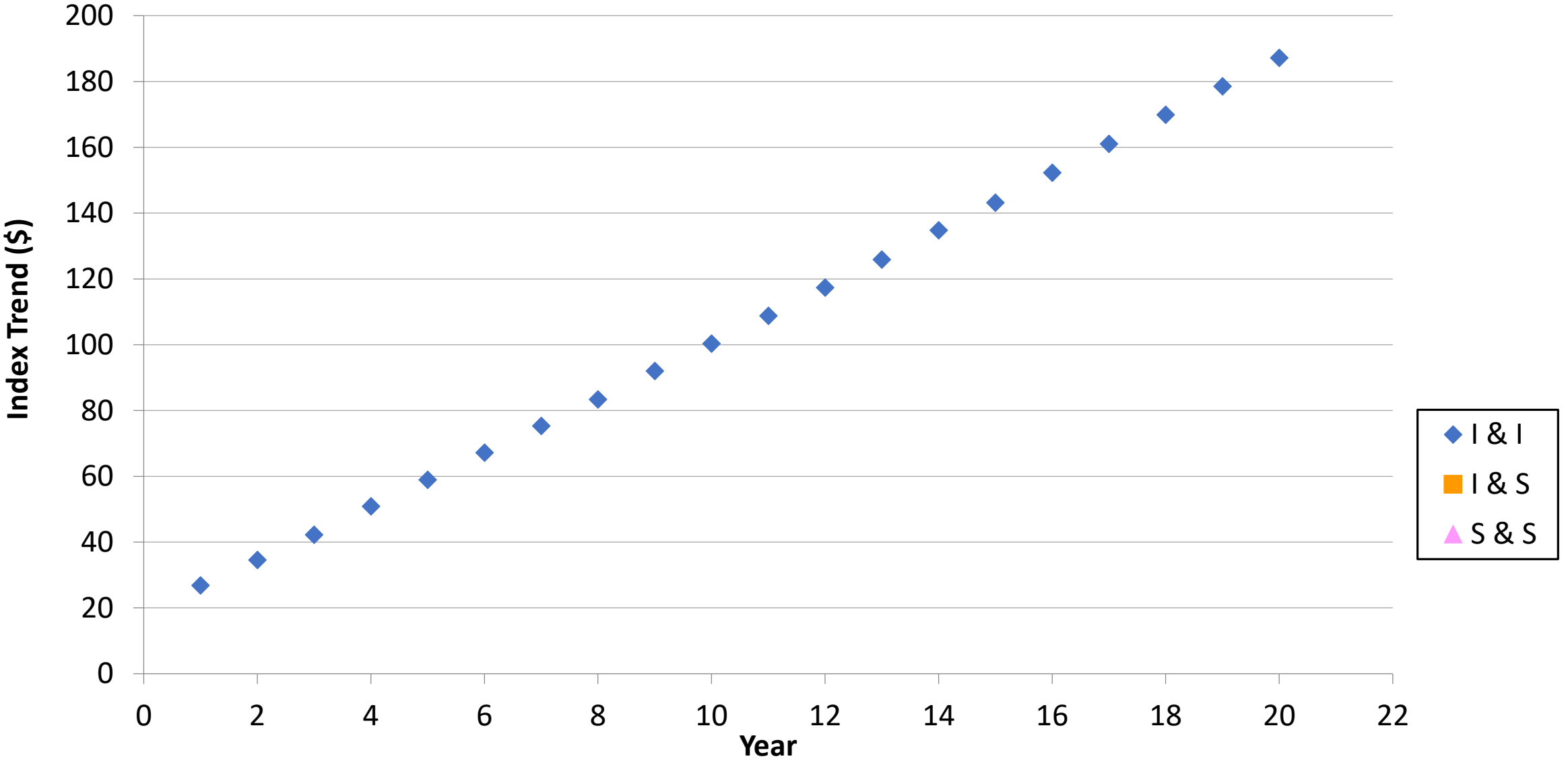
Group	Trait
On-Farm	Calving Ease (D & M) Weaning Weight Maternal (Milk) Entry Weight Scrotal Size Weaning Rate Cow Weight Efficiency - postweaning
Off-Farm	Sale Weight Efficiency – finishing Dressing % Yield % Fatness Marbling

Scenario Testing

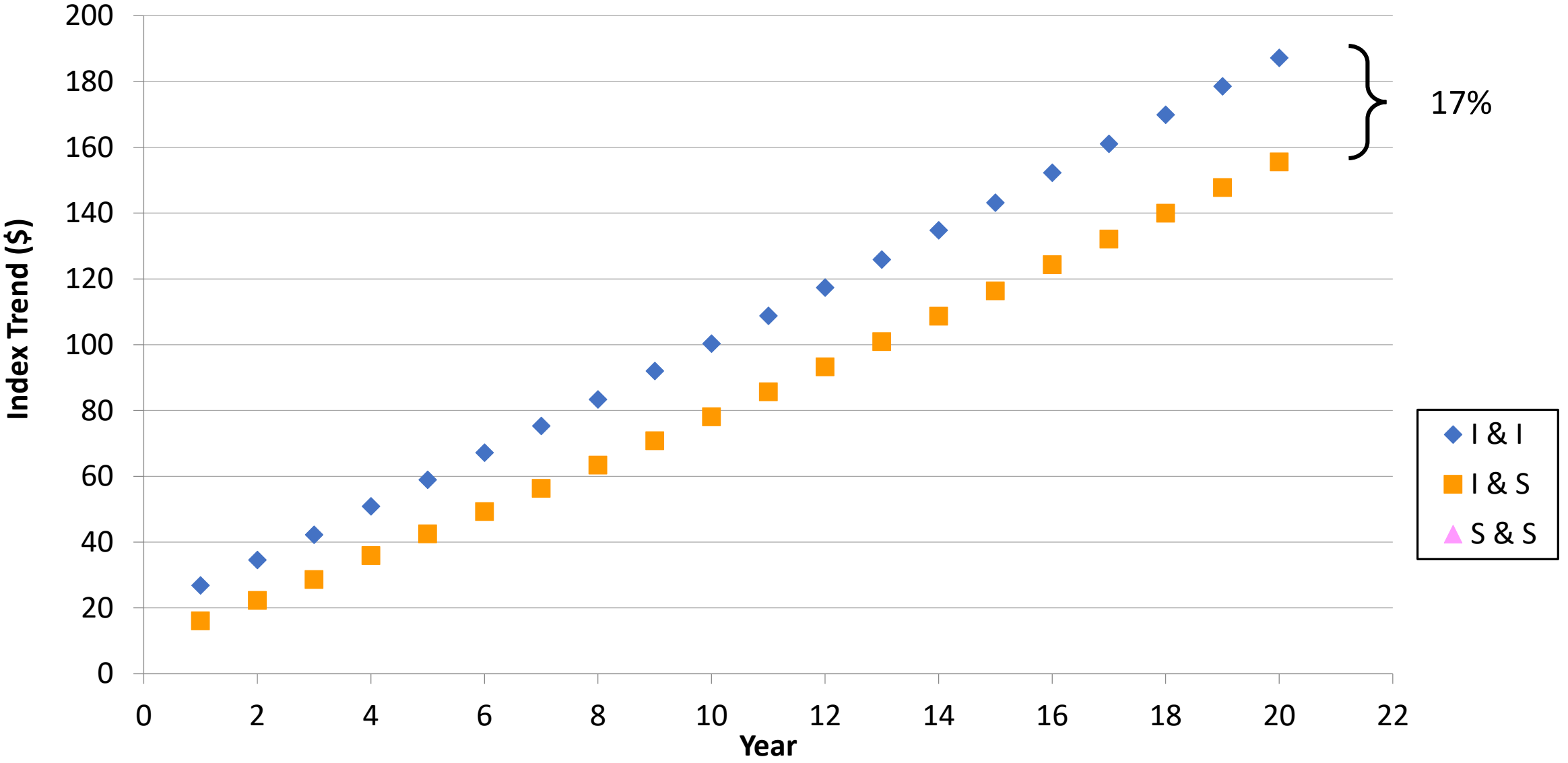


Scenario 1	Scenario 2	Scenario 3
I & I	I & S	S & S

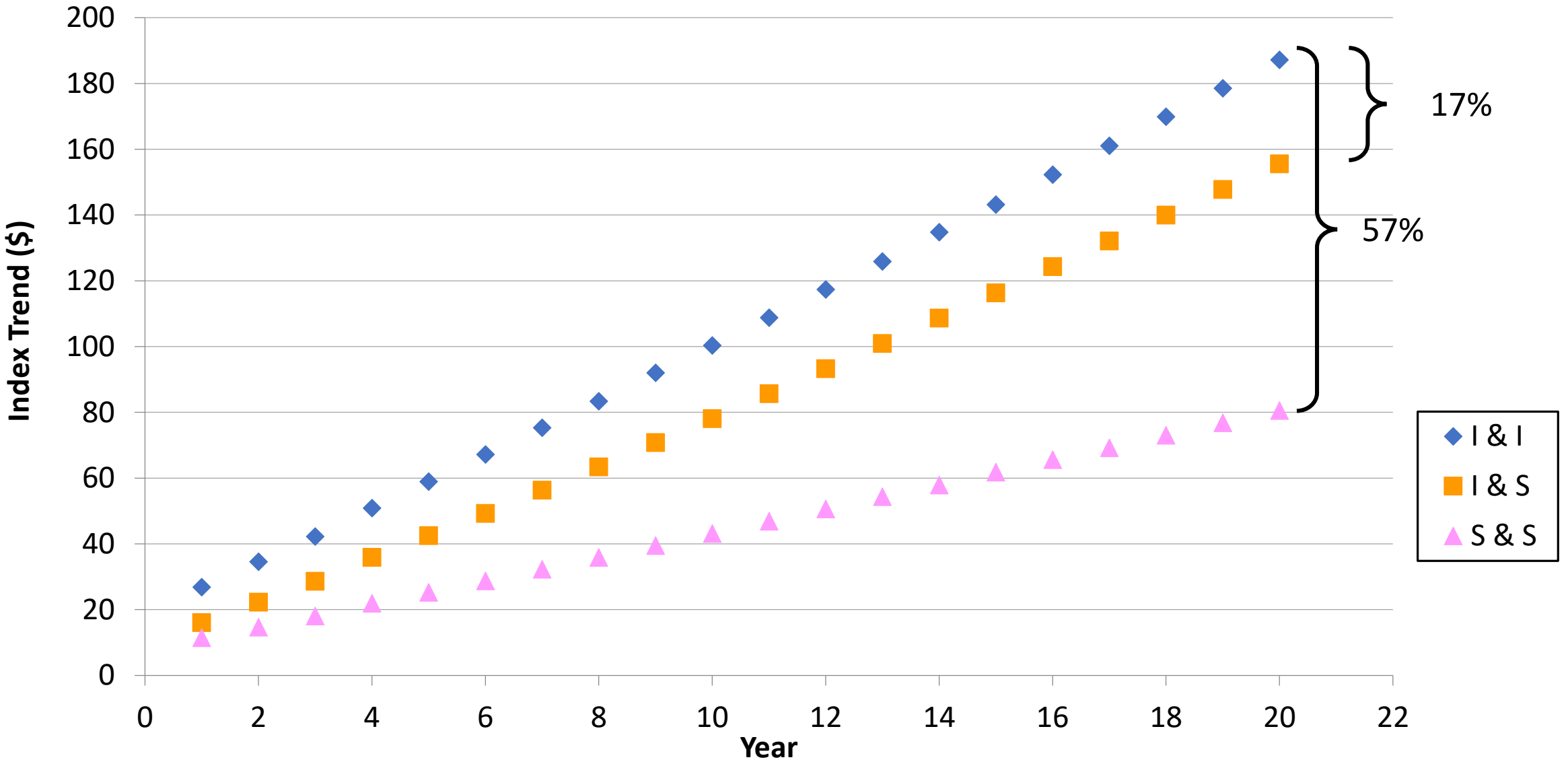
Genetic Change in Profitability



Genetic Change in Profitability



Genetic Change in Profitability



Learnings

- For profitability gains:
  - Critical seedstock selection occurs using indexes
  - Some scope for commercial bull buyers to use sub-groups
  - Best result achieved using selection indexes

Acknowledgements

- Steve Barwick
- Anthony Henzell
- Laura Penrose
- Sam Clark
- David Johnston
- Rob Banks
- Matt Wolcott

AUSTRALIAN WAGYU ASSOCIATION
the marbling breed

HEREFORDS Australia

mla
MEAT & LIVESTOCK AUSTRALIA

Angus AUSTRALIA

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Final Remarks

- Demonstratable positive impacts on beef profitability
- Better ability to describe commercial production realities
- Future developments planned for greater utility
- Key focus on “Commercial Profitability”