

# BreedObject

What can we do to address sustainability now?

Brad Walmsley

# Brief History

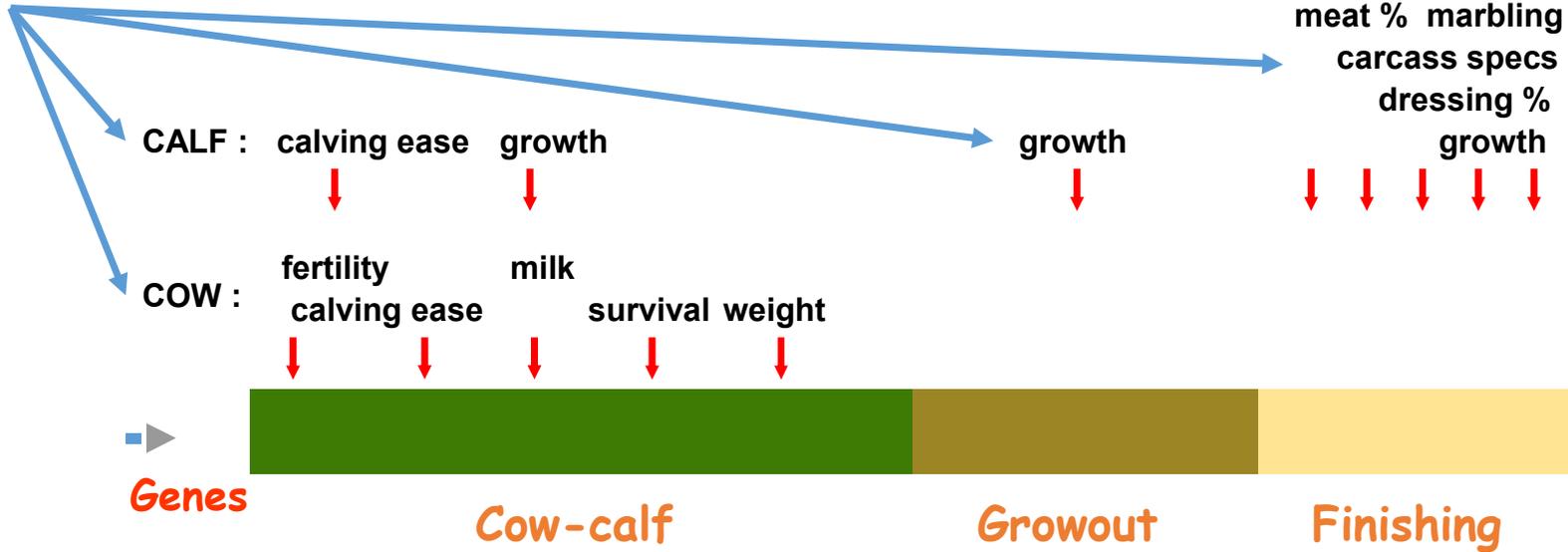
- First developed early 1990's (published 1992)
  - Built from production system research 1980's
- Always included feed costing
  - Continual refinement of animal requirements and feed costing
- Always directed at full profit equation

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

# What Impacts Profit?

whole **commercial production system**  
(cow herd to slaughter)

feed cost

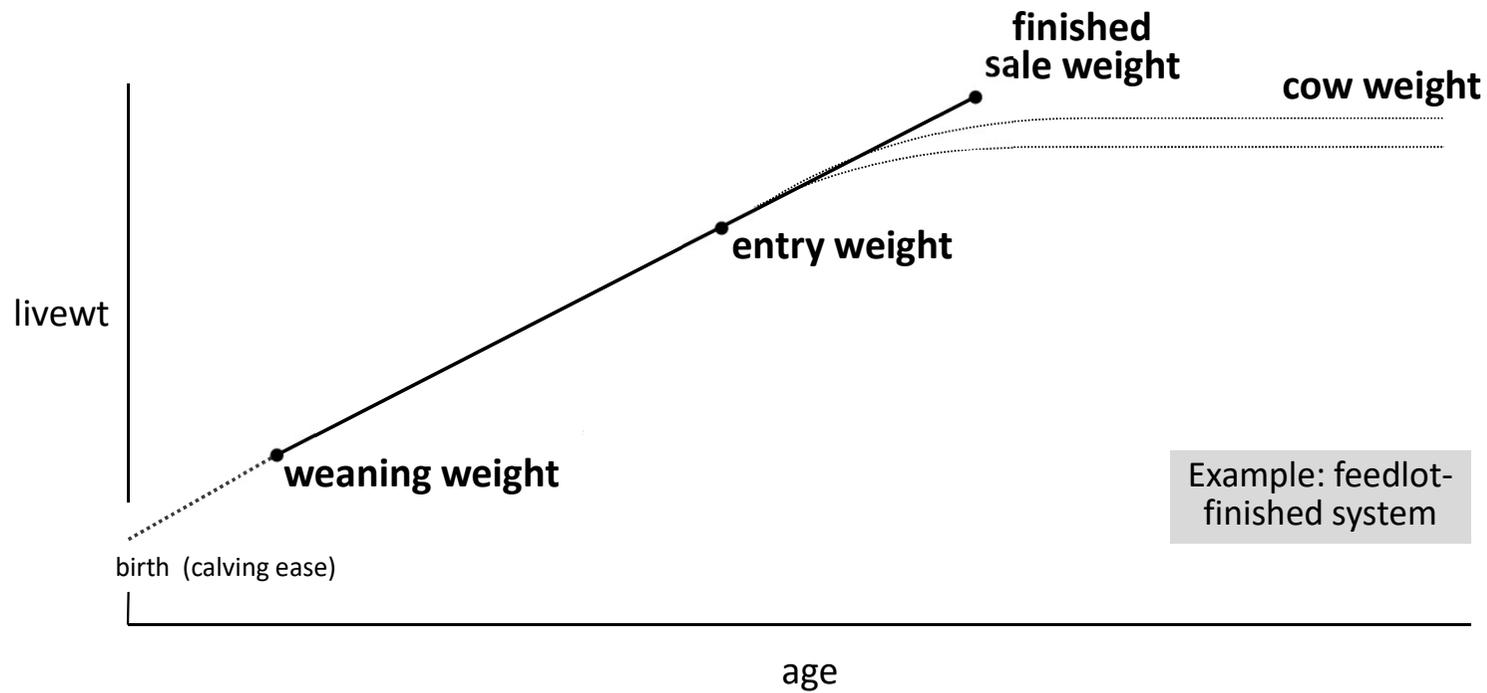


# What is Feed Cost? – No GHG Emissions

$$\text{Feed Cost} = \sum^{\text{FP}} \left( \text{Daily Feed Intake} \right) * \text{Feed Price}$$

FP = Feeding Period

# Growing Animal

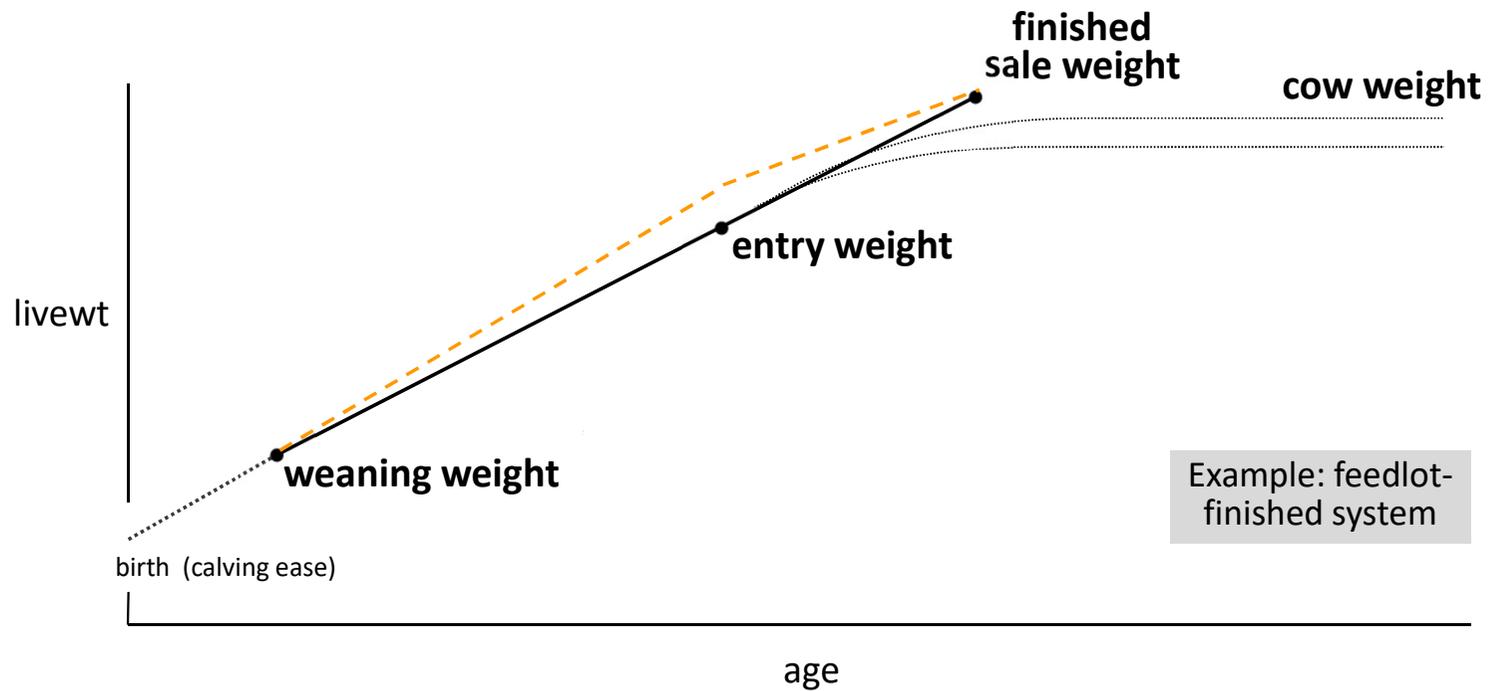


Example: feedlot-finished system

(Barwick et al. 2018)



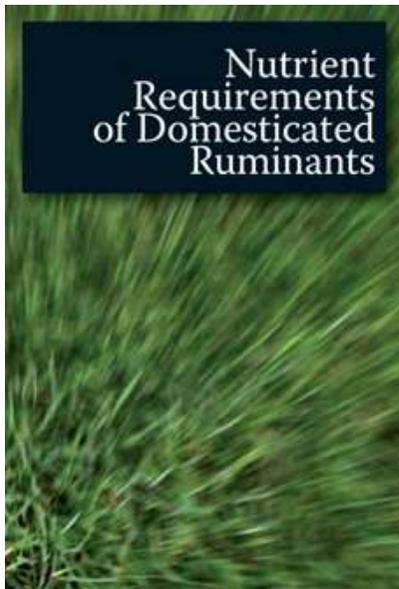
# Growing Animal



(Barwick et al. 2018)



# Feed Requirement

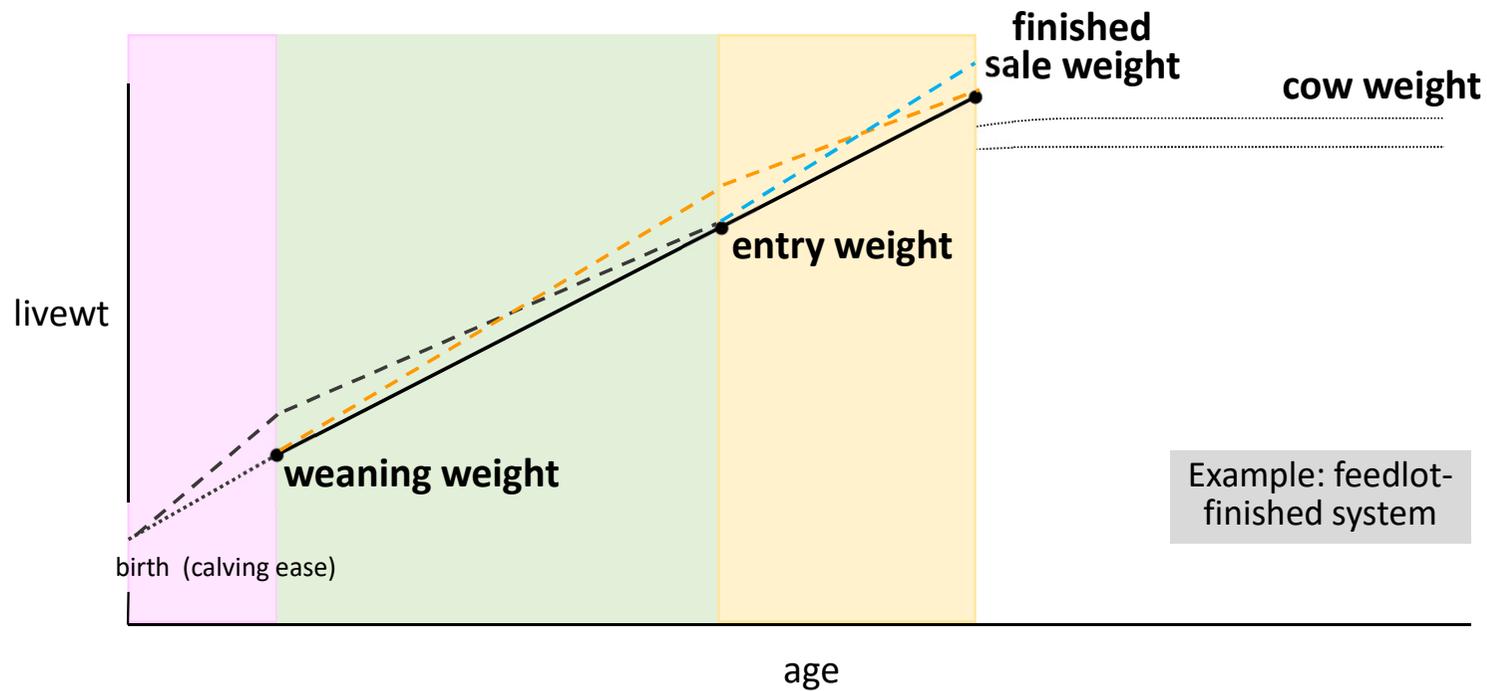


Freer 2007

- Robust Modelling systems
- Constructed to prevent bias
- Flexible to cater for diversity

**CRITICAL**

# Growing Animal



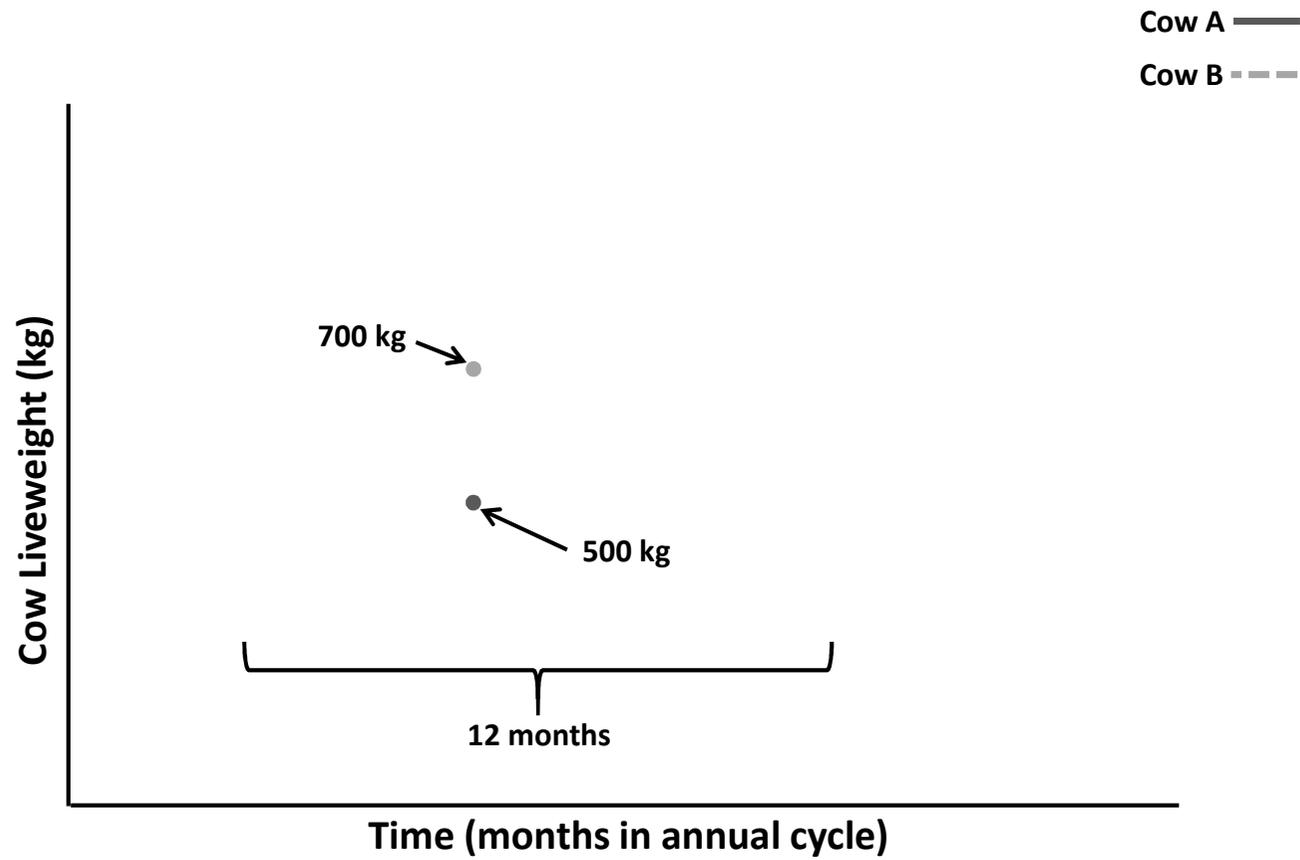
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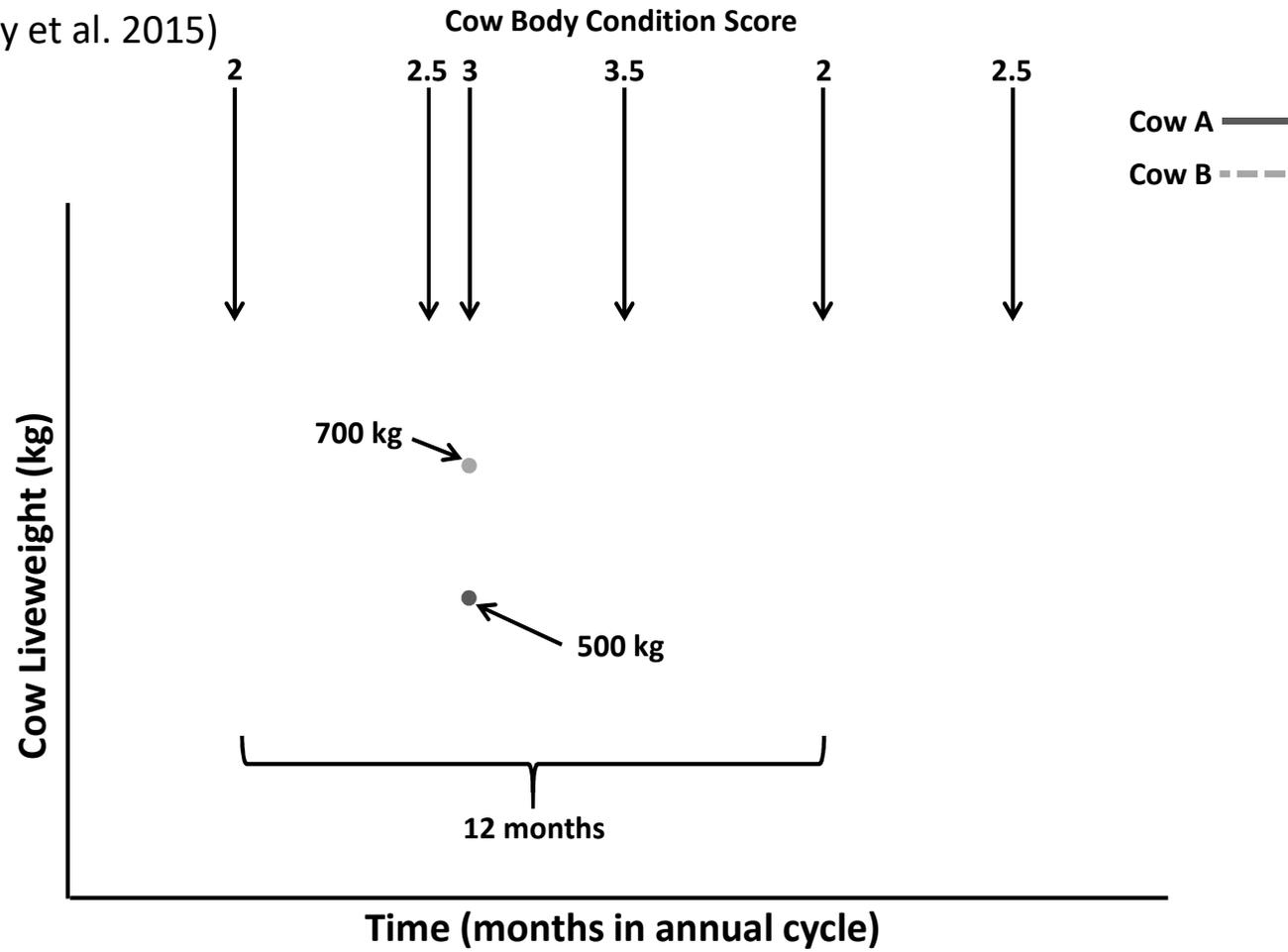
# Cow Weight

(Walmsley et al. 2015)



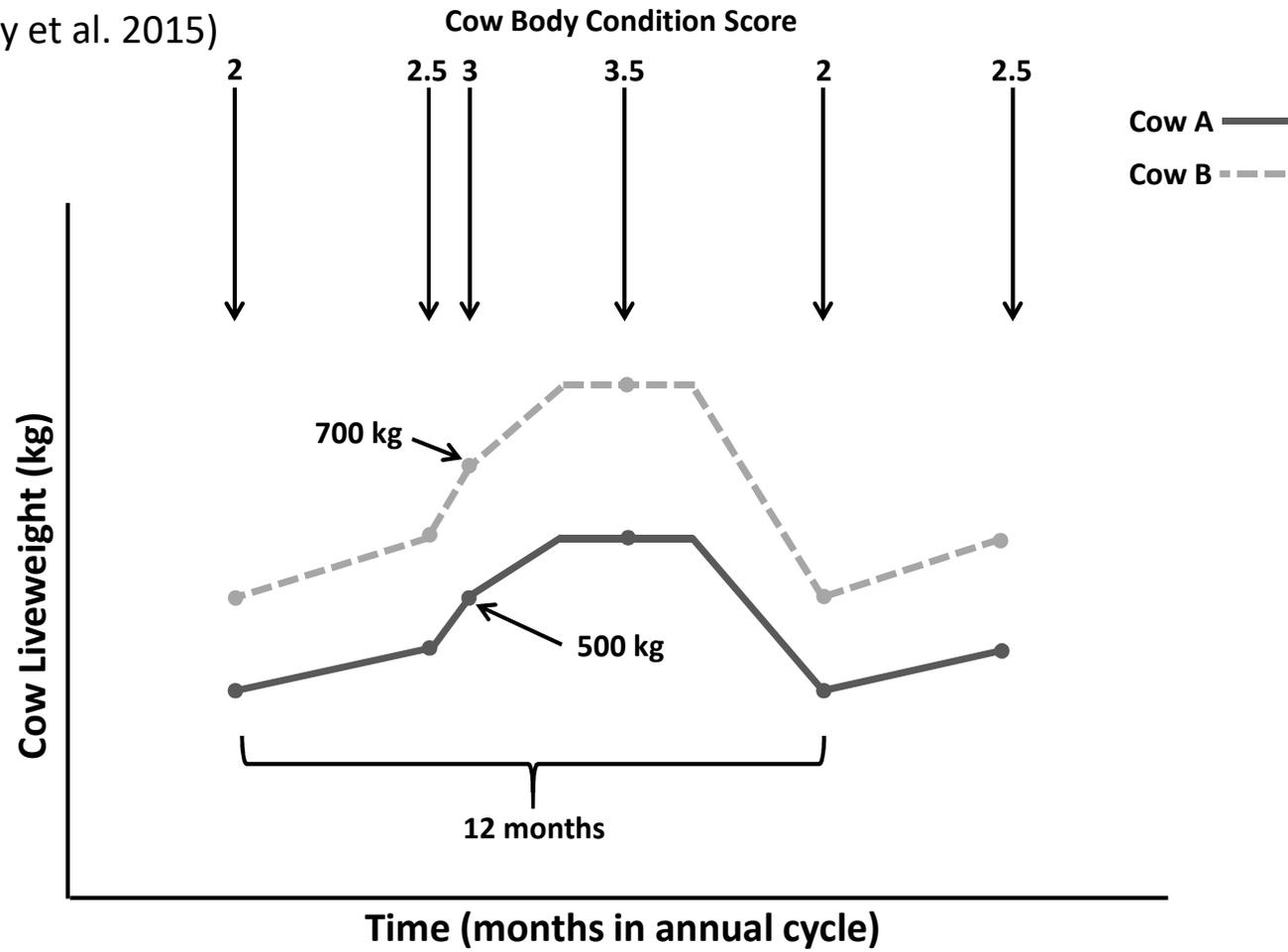
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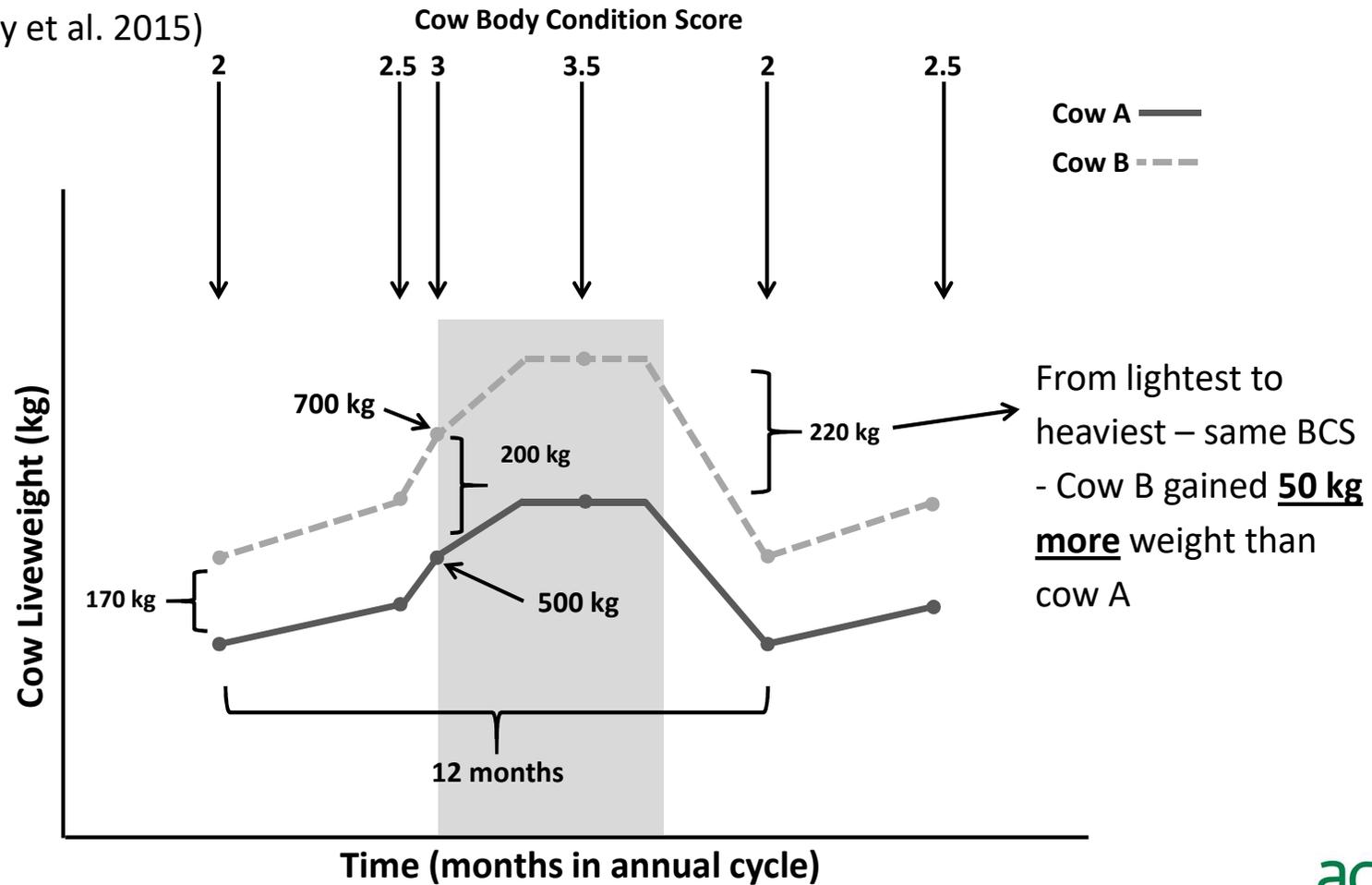
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(Walmsley et al. 2015)



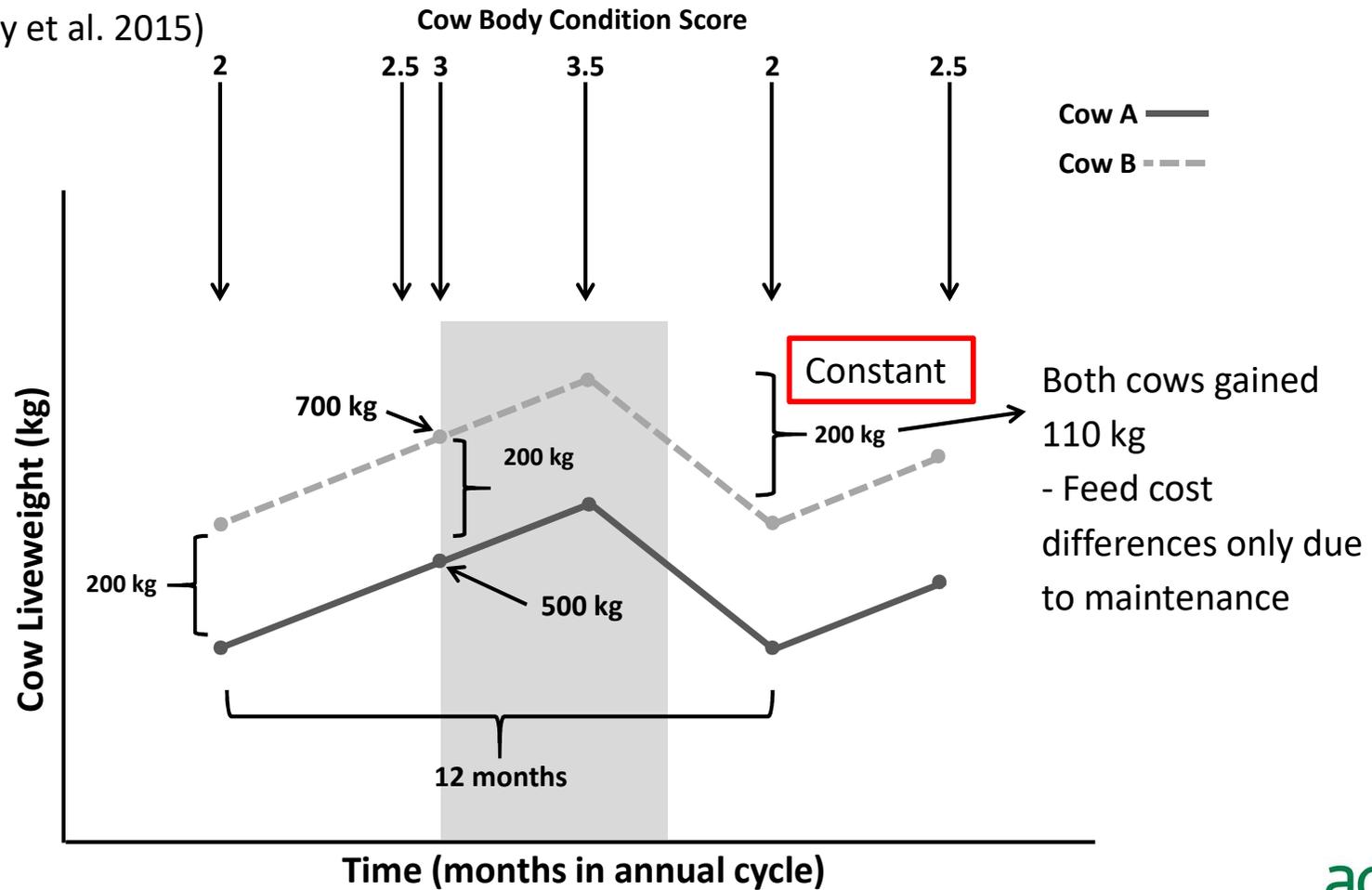
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(Walmsley et al. 2015)

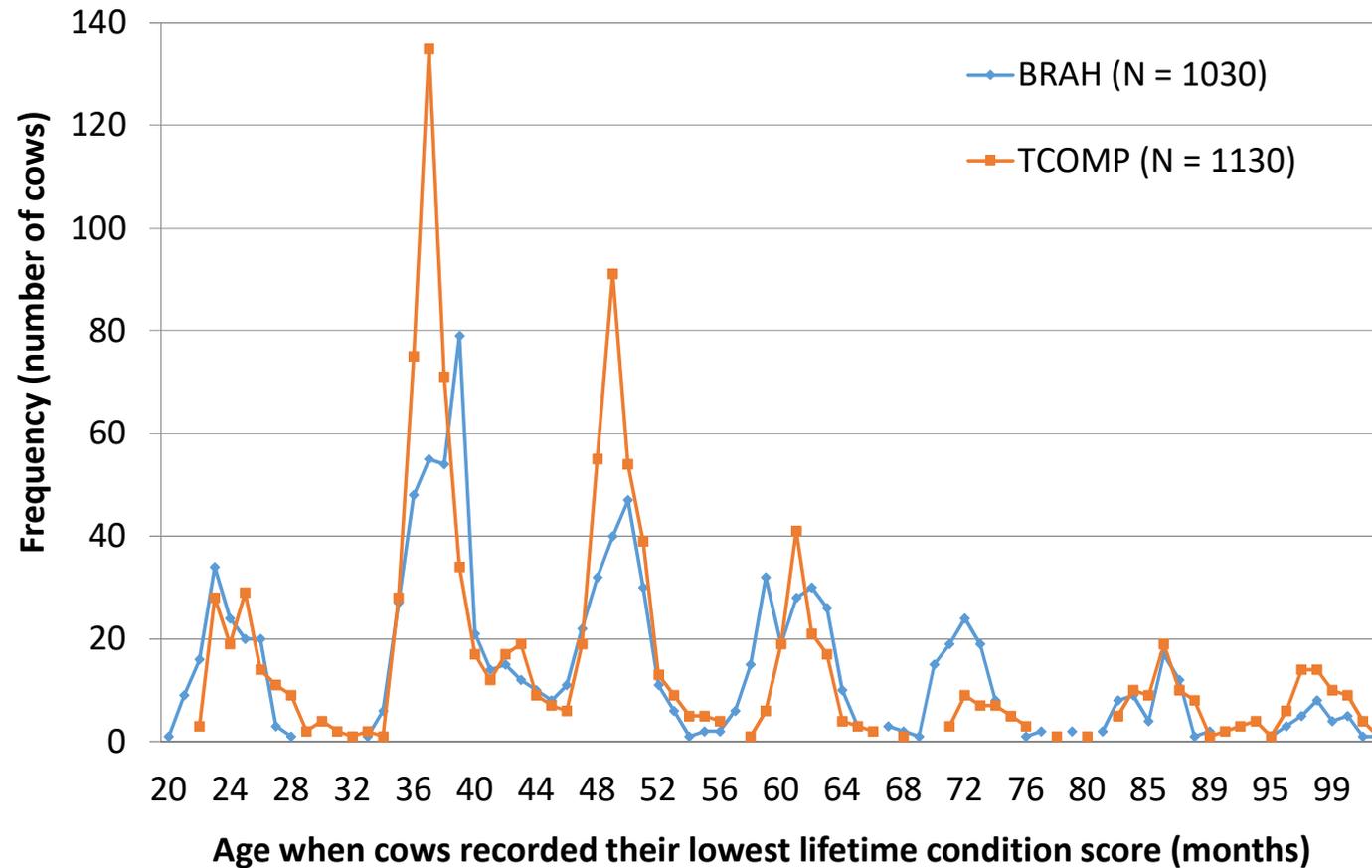


# Cow Weight

(Walmsley et al. 2015)



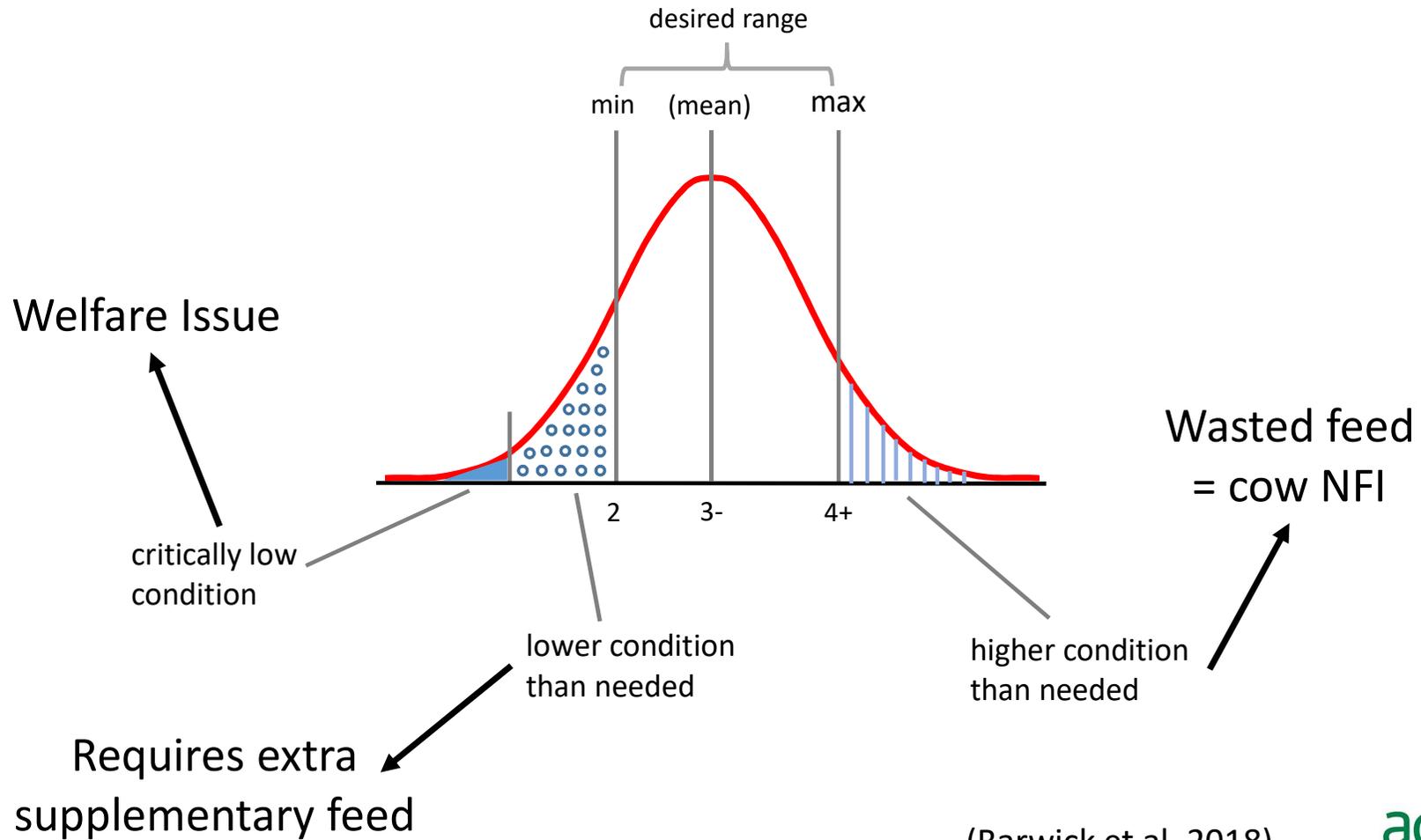
# Cow Condition Score



Source: M. Wolcott



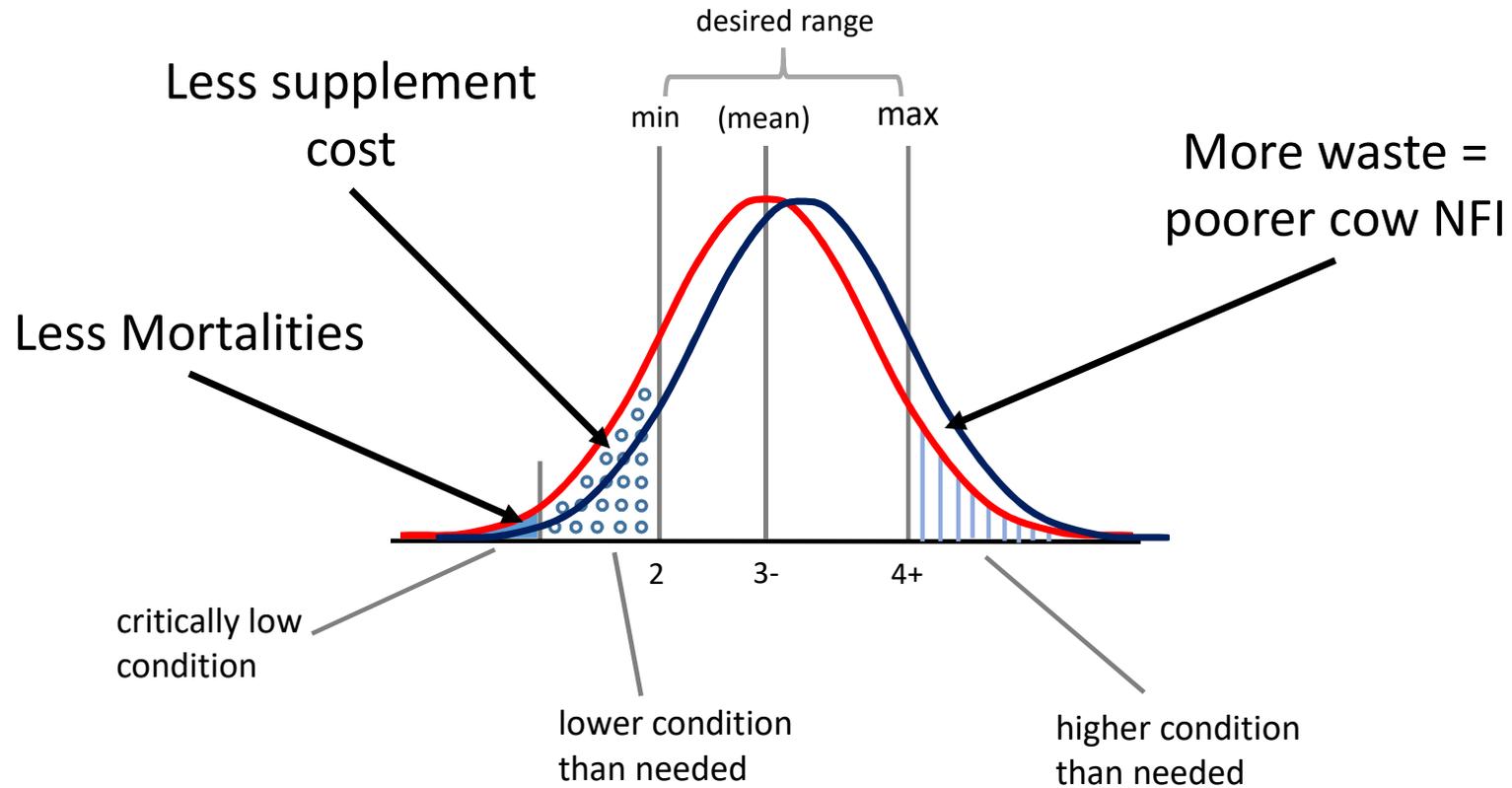
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(Barwick et al. 2018)



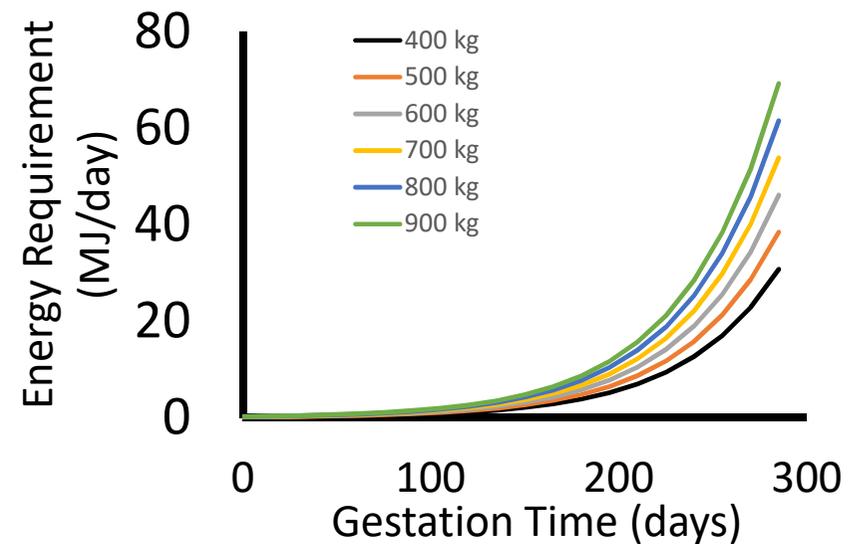
# Cow Condition Score



(Barwick et al. 2018)

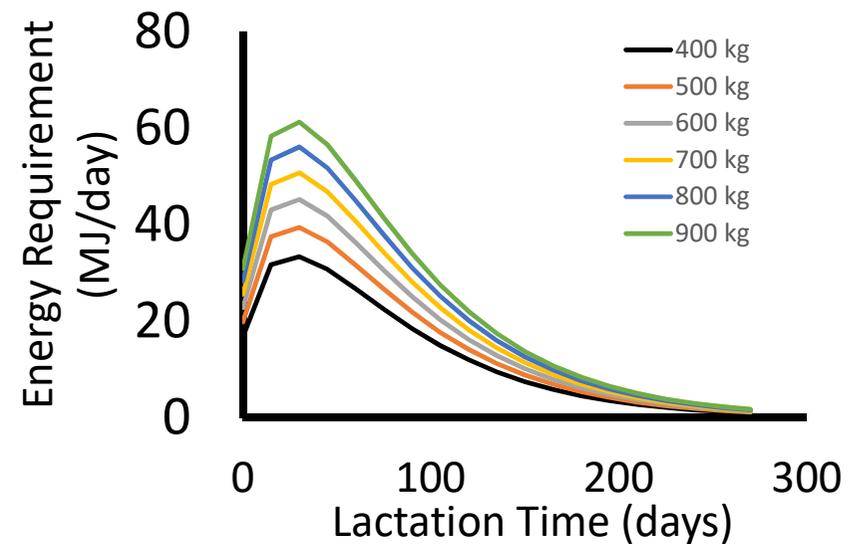
# Cow Weight → Requirements

- Total Requirement
  - Maintenance
  - Weight change
  - Body Condition
  - Gestation



# Cow Weight → Requirements

- Total Requirement
  - Maintenance
  - Weight change
  - Body Condition
  - Gestation
  - Lactation



# Putting Index Together

- Derive economic values
  - Index weights on EBVs

## **COW**

calving ease

Days-to-calving

Weaning  $wt_m$  (milk)

Liveweight

## **Calf**

Calving ease

Weaning  $wt_d$

Entry  $wt$  (when a feedlot phase)

Finished sale livewt

**RFI-p**

**RFI-f**

Fat depth

Dressing %

Carcase meat %

Carcase marbling

# GHG Conversions



Feed Intake<sub>est</sub>

$$MP = 20.7 * DMI - \text{pasture} \quad [\text{Charmley et al 2015}]$$

$$MP\% = 9.90 - 1.54 * LOI - 0.02 * DE \quad [\text{Johnson et al 1993}]$$

$$CO_2\text{-eq.} = 28 * MP$$

[Edenhofer et al 2014] 

# What is Feed Cost? – With GHG Emissions

$$\begin{aligned} \text{Feed Cost} = & \sum^{FP} \left( \text{Daily Feed Intake} \right) * \text{Feed Price} \\ & + \\ & \sum^{FP} \left( \text{Daily Feed Intake} \right) * \text{CH}_4 \text{ Coef} \\ & * \text{CO}_2\text{-e Price} \end{aligned}$$

FP = Feeding Period

# Where are we now

Barwick et al. *Genet Sel Evol* (2019) 51:18  
<https://doi.org/10.1186/s12711-019-0459-5>



RESEARCH ARTICLE

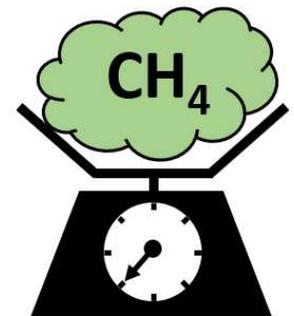
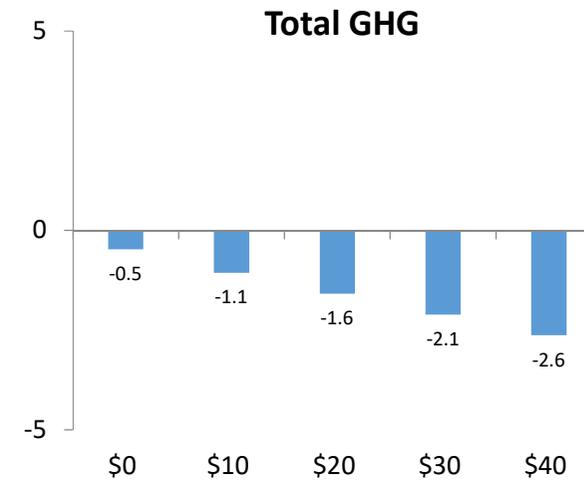
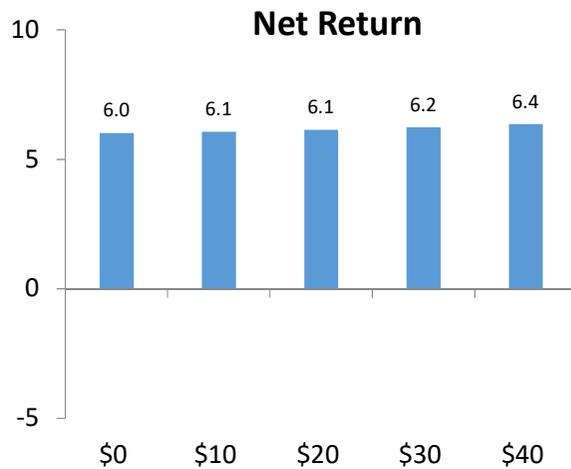
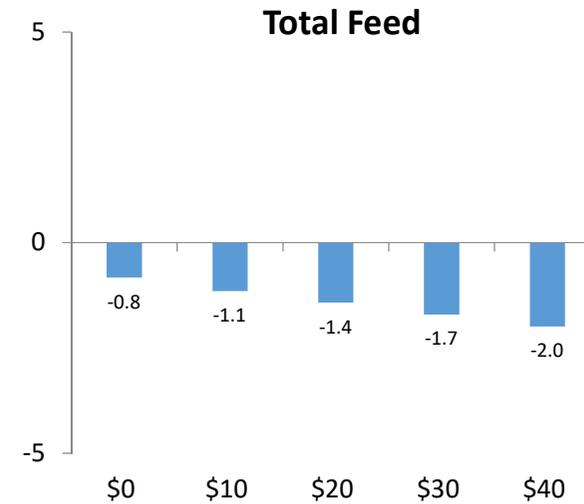
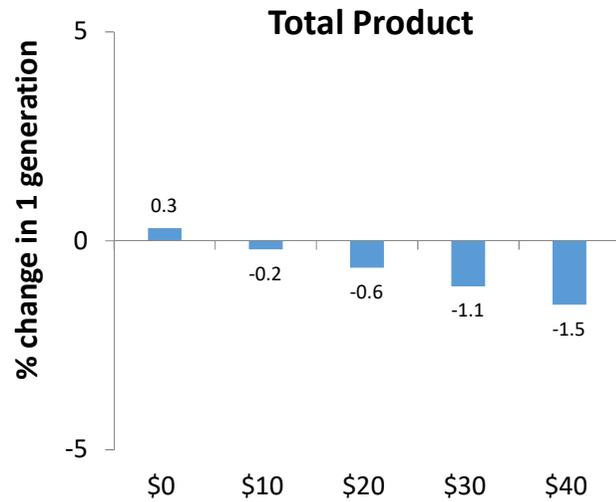
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## Methods and consequences of including reduction in greenhouse gas emission in beef cattle multiple-trait selection

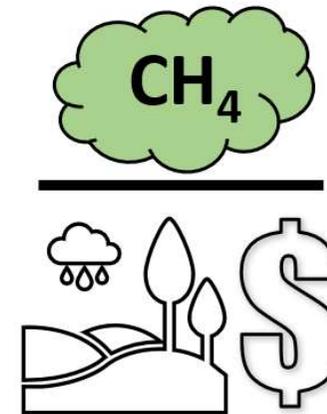
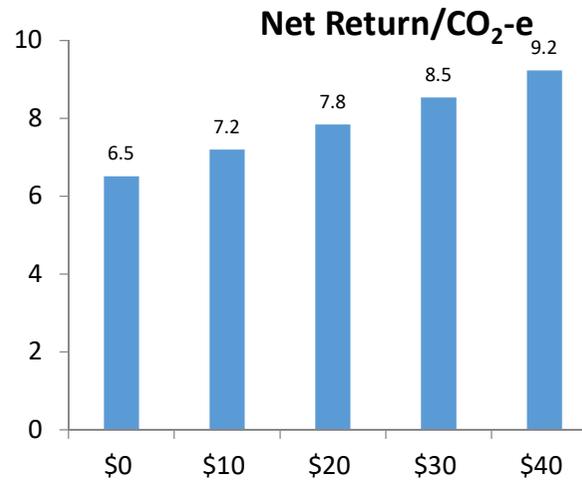
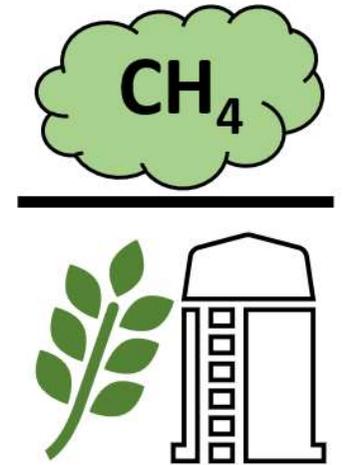
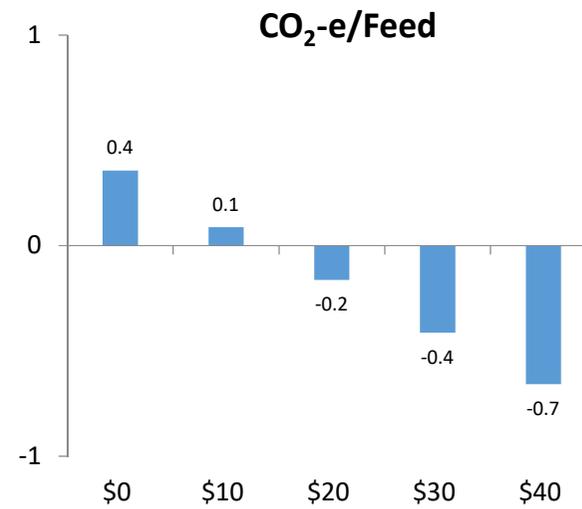
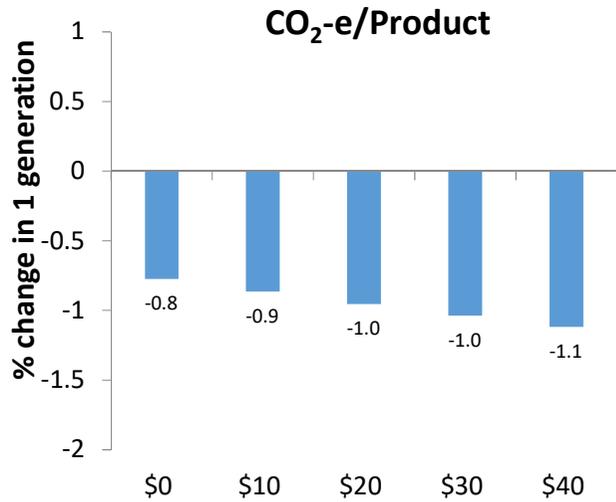
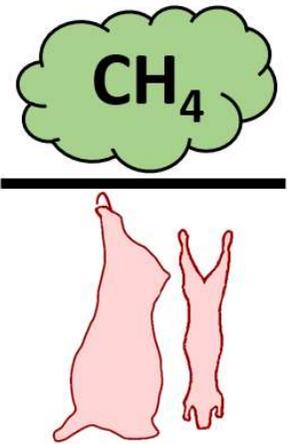


Stephen A. Barwick<sup>1\*</sup> , Anthony L. Henzell<sup>1</sup>, Robert M. Herd<sup>2</sup>, Bradley J. Walmsley<sup>1</sup> and Paul F. Arthur<sup>3</sup>

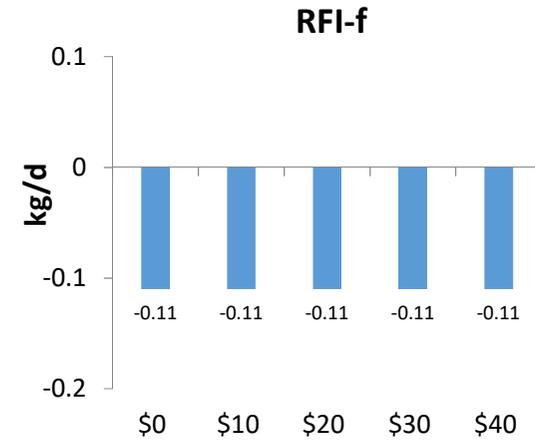
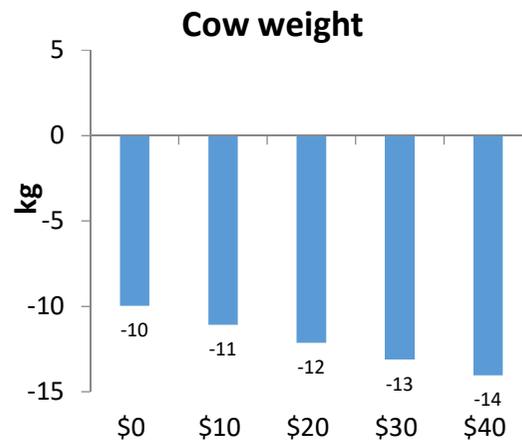
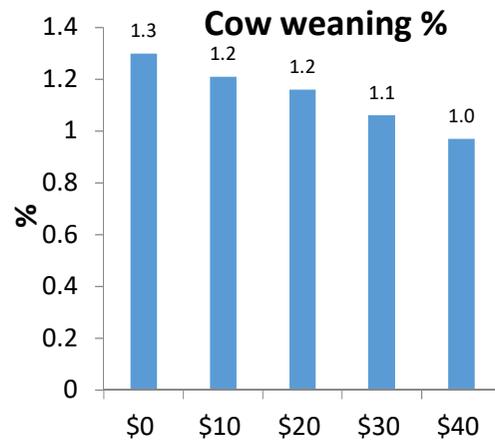
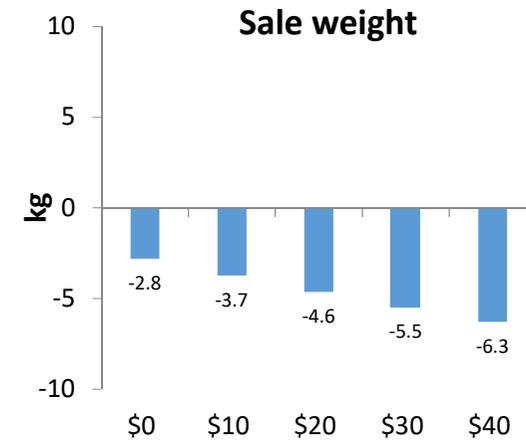
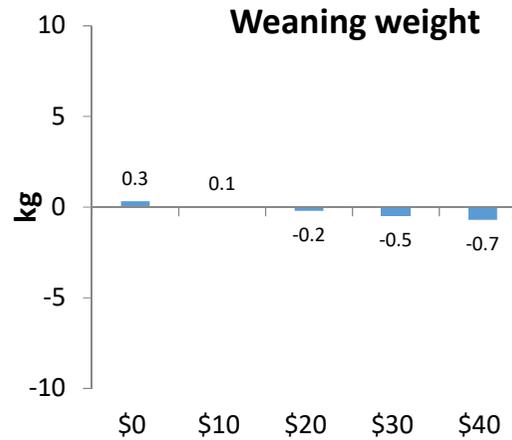
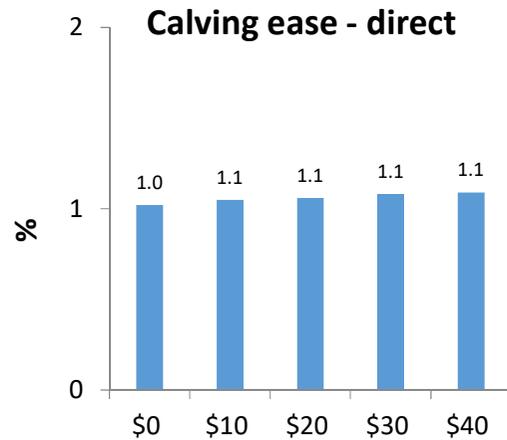
# Product – Feed – GHG - Profit Changes



# Accounting for CO<sub>2</sub>-e



# Trait changes



# Conclusions

- Developments to deal with sustainability
- Can address methane (sustainability) in absence of methane EBVs
- EBV better for methane (sustainability)

Phenotypes Needed!!!!