



Updates and Improvements to RAAA Selection Indexes

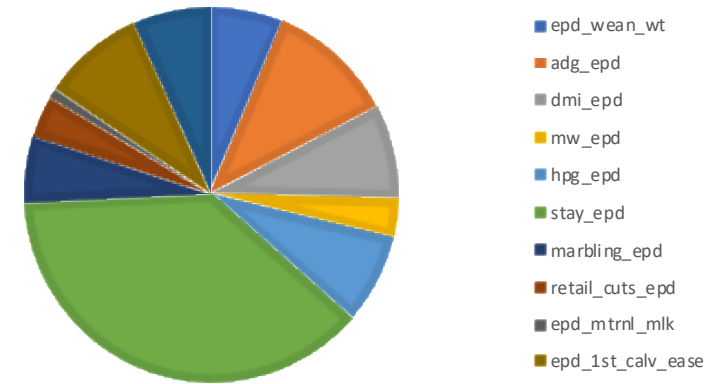
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RAAA Director of Breed Improvement

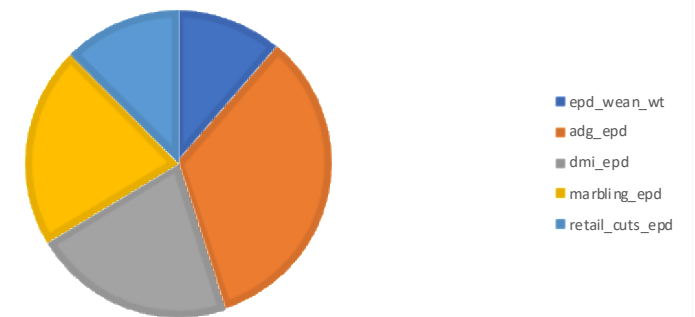
RAAA Selection Index History

- RAAA first introduced generalized selection indexes in 2014
 - HerdBuilder Maternally focused All Purpose Index
 - Traits included: Stayability, Heifer Pregnancy, Calving Ease Direct, Calving Ease Maternal, Weaning Weight, Milk, Average Daily Gain, Metabolic Mature Weight, Yield Grade, Marbling, and Dry Matter Intake
 - Expressed as \$ per exposure
 - GridMaster weaning to harvest terminal index
 - Traits included: Weaning Weight, Average Daily Gain, Yield Grade, Marbling, and Dry Matter Intake
 - Expressed as \$ per exposure

OLD HERDBUILDER IMPORTANCE

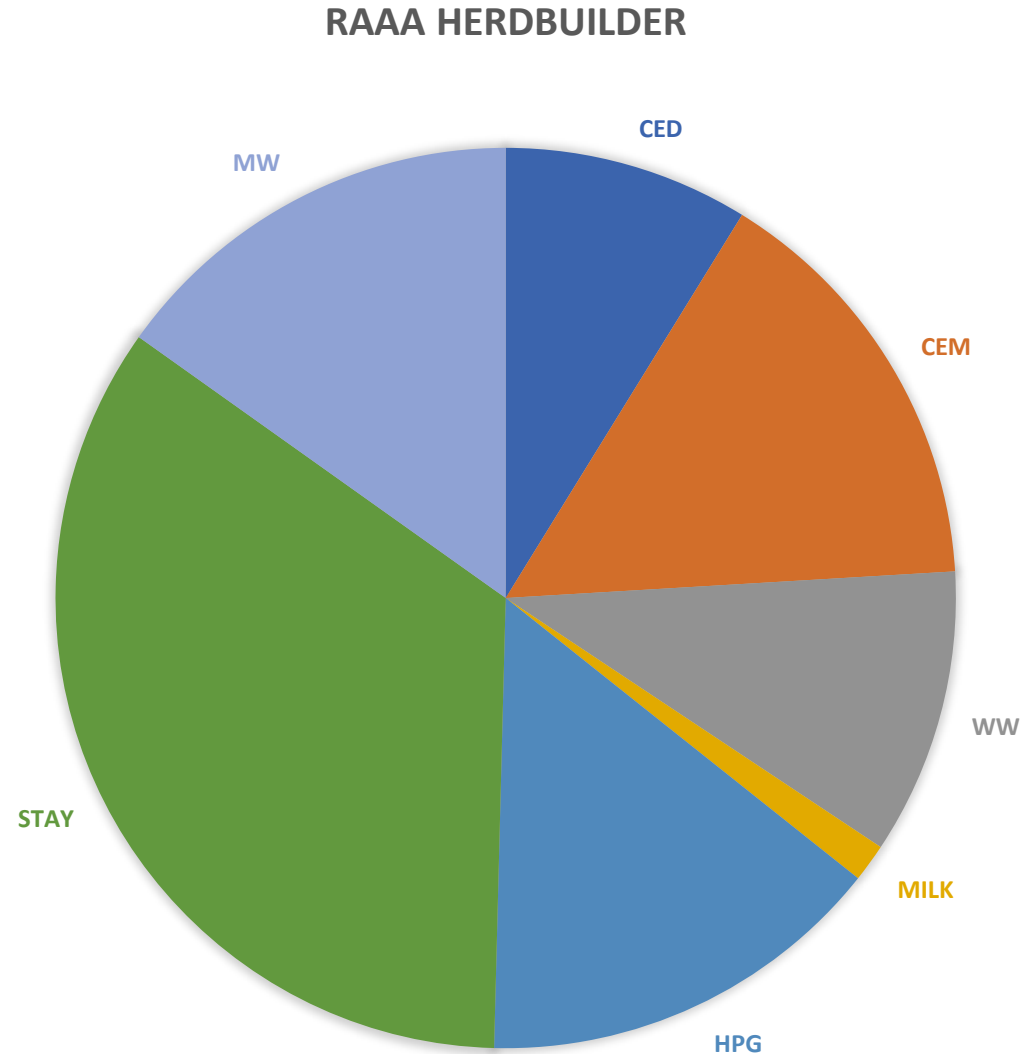


OLD GRIDMASTER IMPORTANCE



Updated Selection Indexes

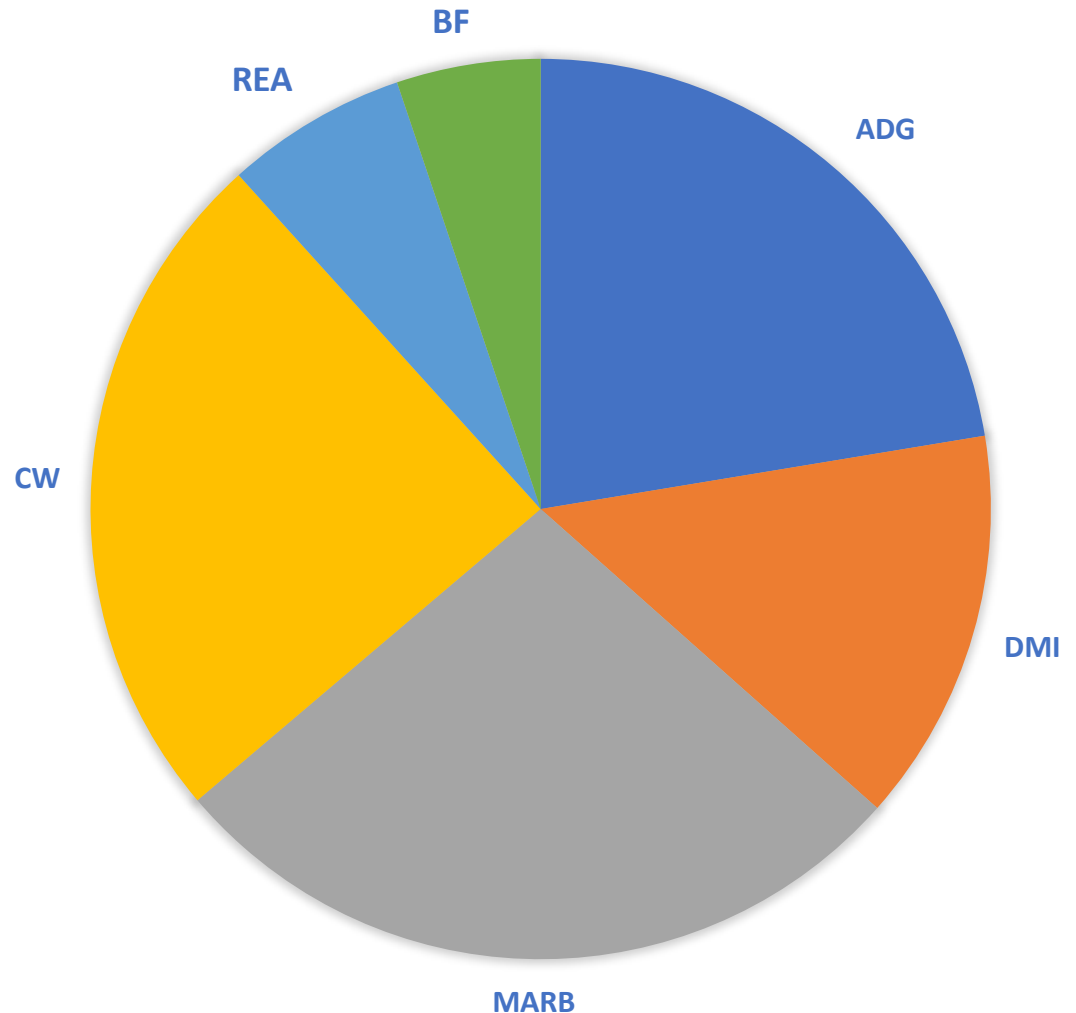
- HerdBuilder
 - A maternal index that encompasses traits that are economically important from conception to weaning. Within in this index heifers will be retained, and all non-replacements will be marketed at weaning.
 - Traits included: Calving Ease Direct, Calving Ease Maternal, Weaning Weight, Mature Weight, Heifer Pregnancy, and Stayability
 - Expressed in \$ per calf born



Updated Selection Indexes

- GridMaster
 - This index represents the profitability differences in animals not retained as replacements through the post weaning and harvest phases of production.
 - Traits included in the model: Average Daily Gain, Carcass Weight, Dry Matter Intake, Marbling, Back Fat, Rib Eye Area
 - Expressed in \$ per calf born

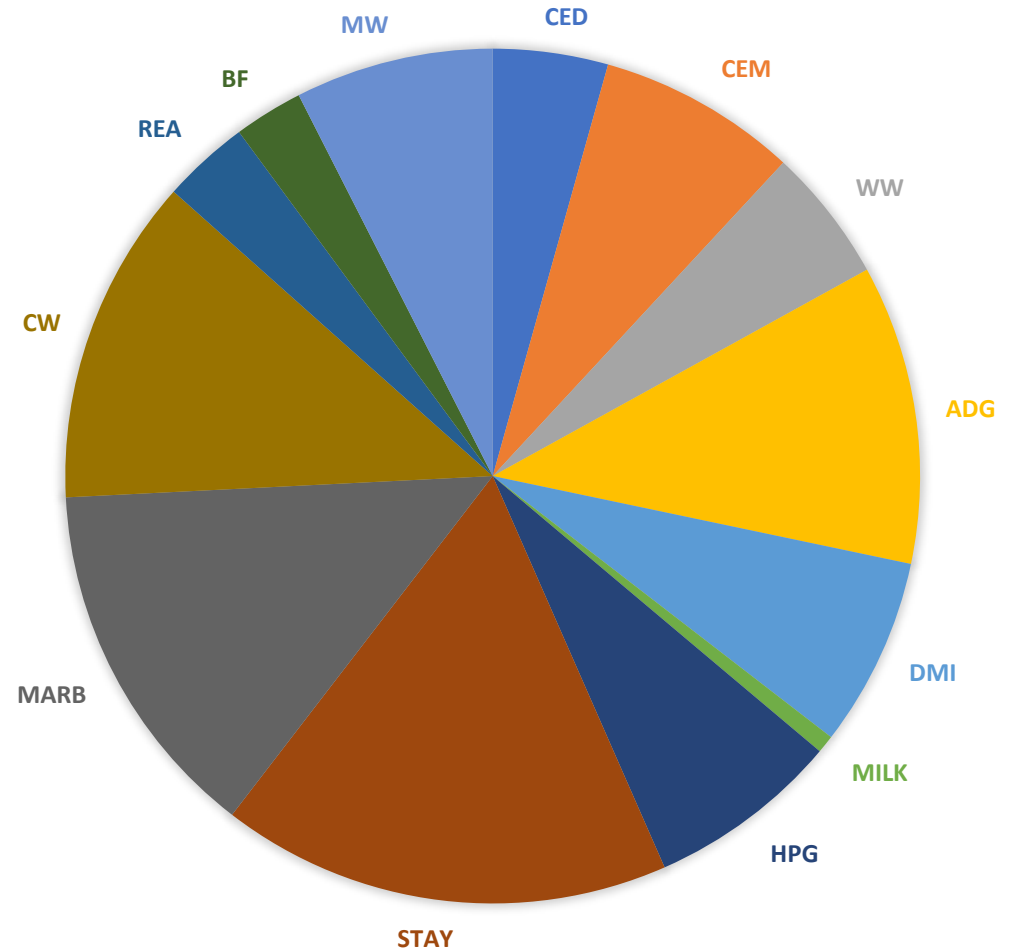
RAAA GRIDMASTER IMPORTANCE GRAPH



Updated Selection Indexes

- ProS- Profitability and Sustainability
 - This index is an all-purpose index that combines traits across the entire beef supply chain. Within this index, replacements are retained from within the herd and all non-retained progeny are marketed on a quality-based grid. The resulting index is a combination of the breeding objectives in the HerdBuilder and GridMaster sub indexes (Pros = HB + GM).
 - Traits included in the index: Calving Ease Direct, Calving Ease Maternal, Weaning Weight, Milk, Mature Weight, Heifer Pregnancy, Stayability, Average Daily Gain, Carcass Weight, Dry Matter Intake, Marbling, Back Fat, Rib Eye Area.
 - Index is expressed as \$ per calf born

PROFITABILITY AND SUSTAINABILITY INDEX IMPORTANCE



Index Update Process

- Model Inputs
 - Model Inputs were gathered from several sources
 - USDA
 - CattleFax
 - PCC
 - Used 5 year rolling averages for each input
 - Update each input once annually



Sensitivity to Model Inputs

- Increasing bred heifer price 25%

| | HB Updated Assumptions | GM Updated Assumptions | ProS Updated Assumptions |
|---------------------------|------------------------|------------------------|--------------------------|
| HB Original Assumptions | 0.996 | | |
| GM Original Assumptions | | 1.000 | |
| ProS Original Assumptions | | | 0.991 |

- Increasing CW prices by 25%

| | HB Updated Assumptions | GM Updated Assumptions | ProS Updated Assumptions |
|---------------------------|------------------------|------------------------|--------------------------|
| HB Original Assumptions | 0.985 | | |
| GM Original Assumptions | | 0.993 | |
| ProS Original Assumptions | | | 0.980 |

- Increasing both prices by 25%

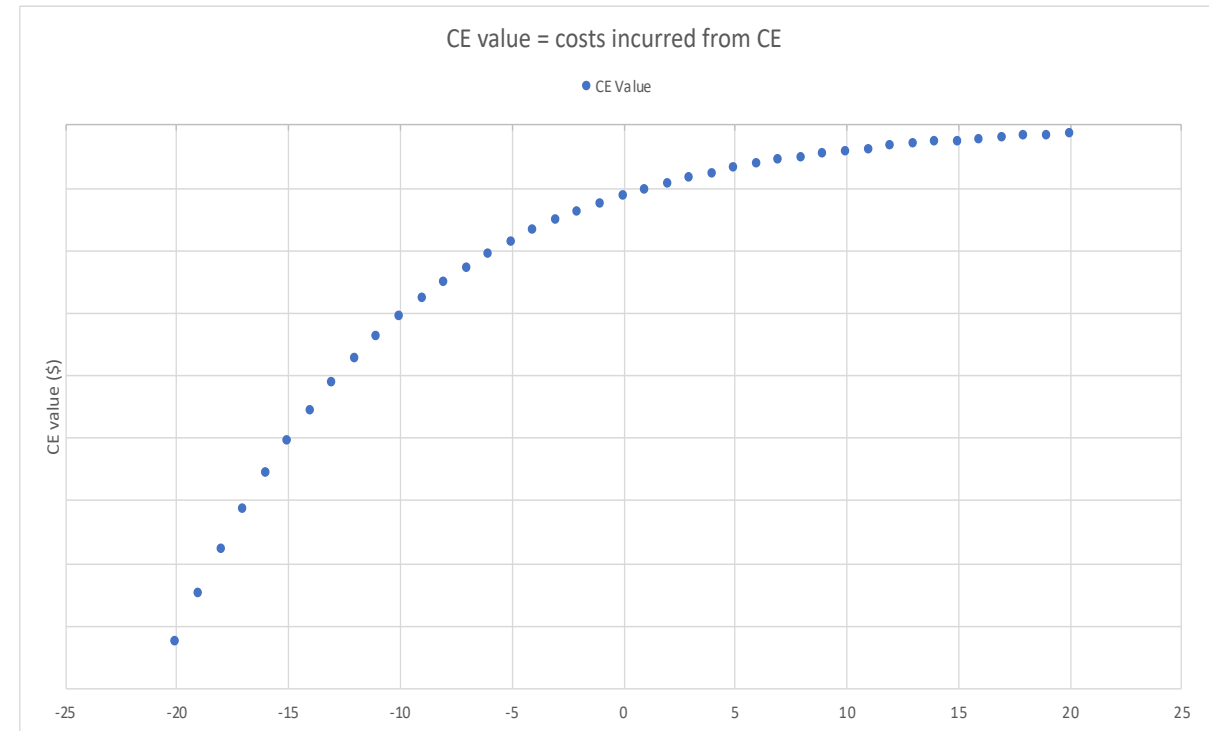
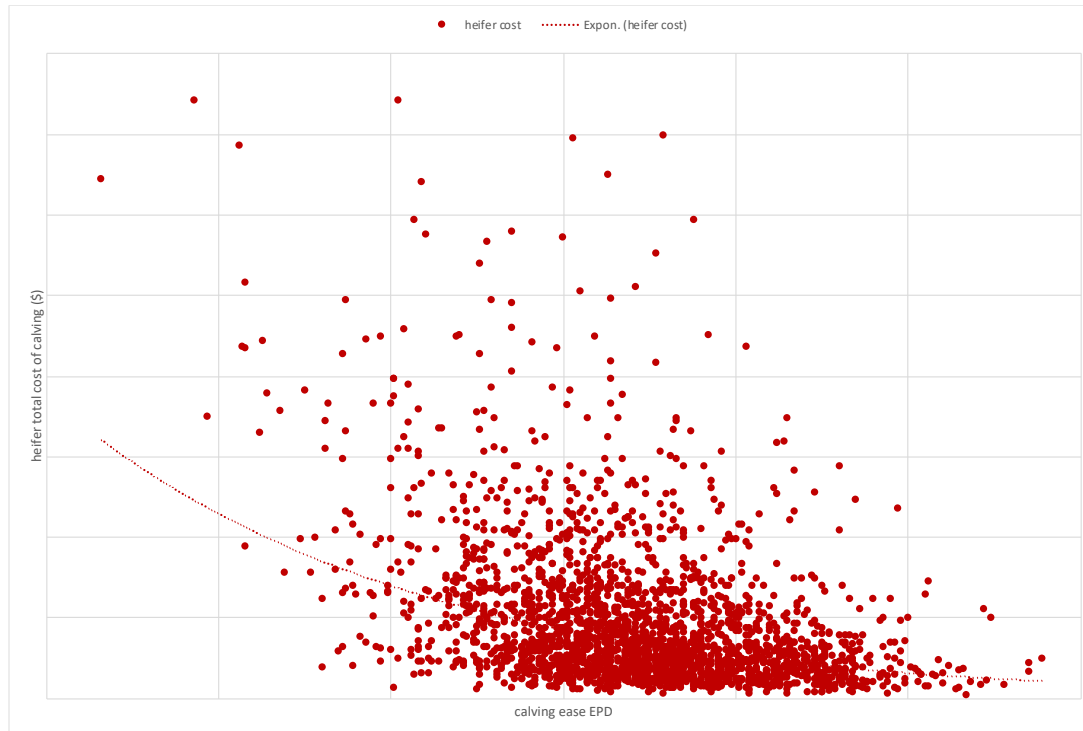
| | HB Updated Assumptions | GM Updated Assumptions | ProS Updated Assumptions |
|---------------------------|------------------------|------------------------|--------------------------|
| HB Original Assumptions | 0.988 | | |
| GM Original Assumptions | | 0.993 | |
| ProS Original Assumptions | | | 0.986 |

Updates to models used for economic weight calculations

- Incorporation of non-linear models for calculation of economic weights
 - Traits with non-linear calculations of economic weights
 - Calving Ease Direct
 - Calving Ease Maternal
 - Milk
 - Carcass Weights
 - Marbling
 - Back Fat
 - Rib Eye Area

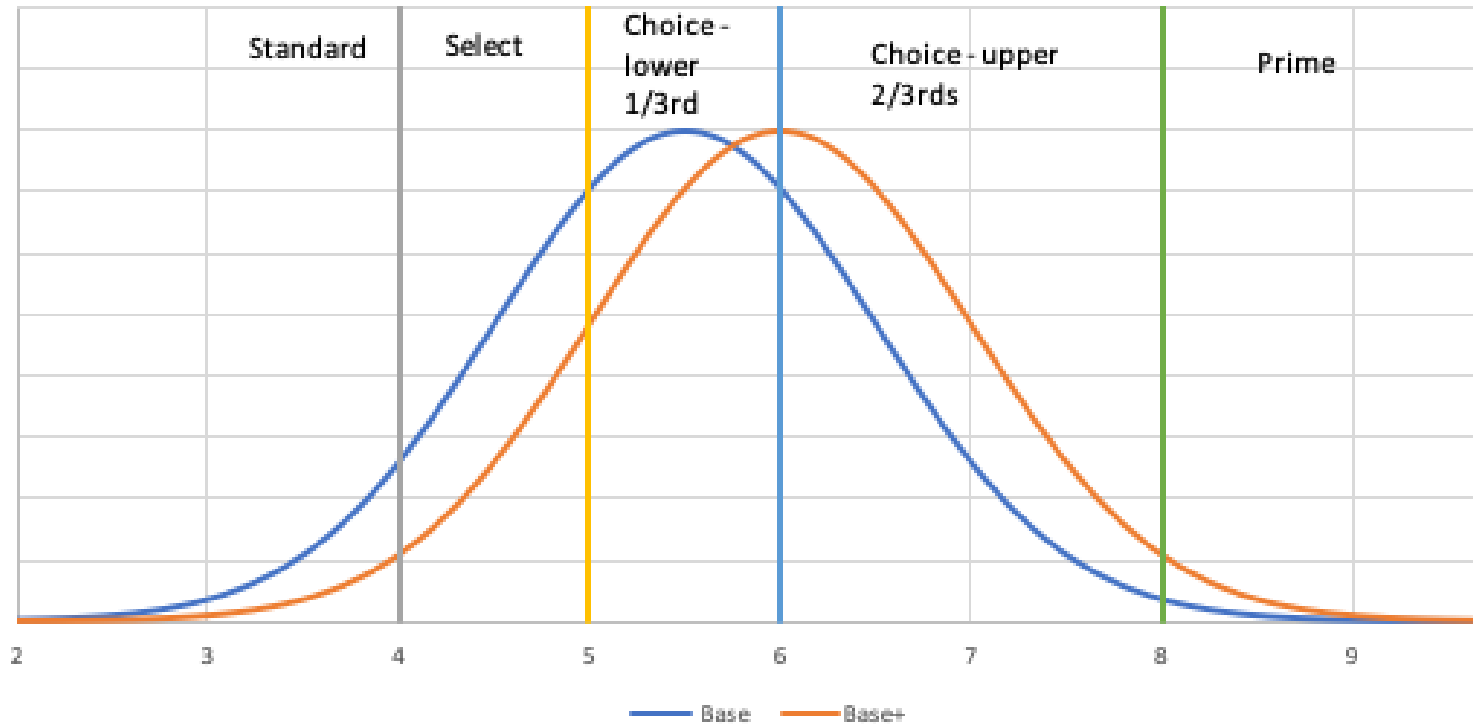
Example of Non-Linear Calculation

- Calving Ease
 - As we approach higher levels of calving ease, we see that the benefit of pushing the values to a higher level diminishes.



Examples of Non-Linear Coefficient Carcass Traits

Marbling distribution and Quality Grade Thresholds



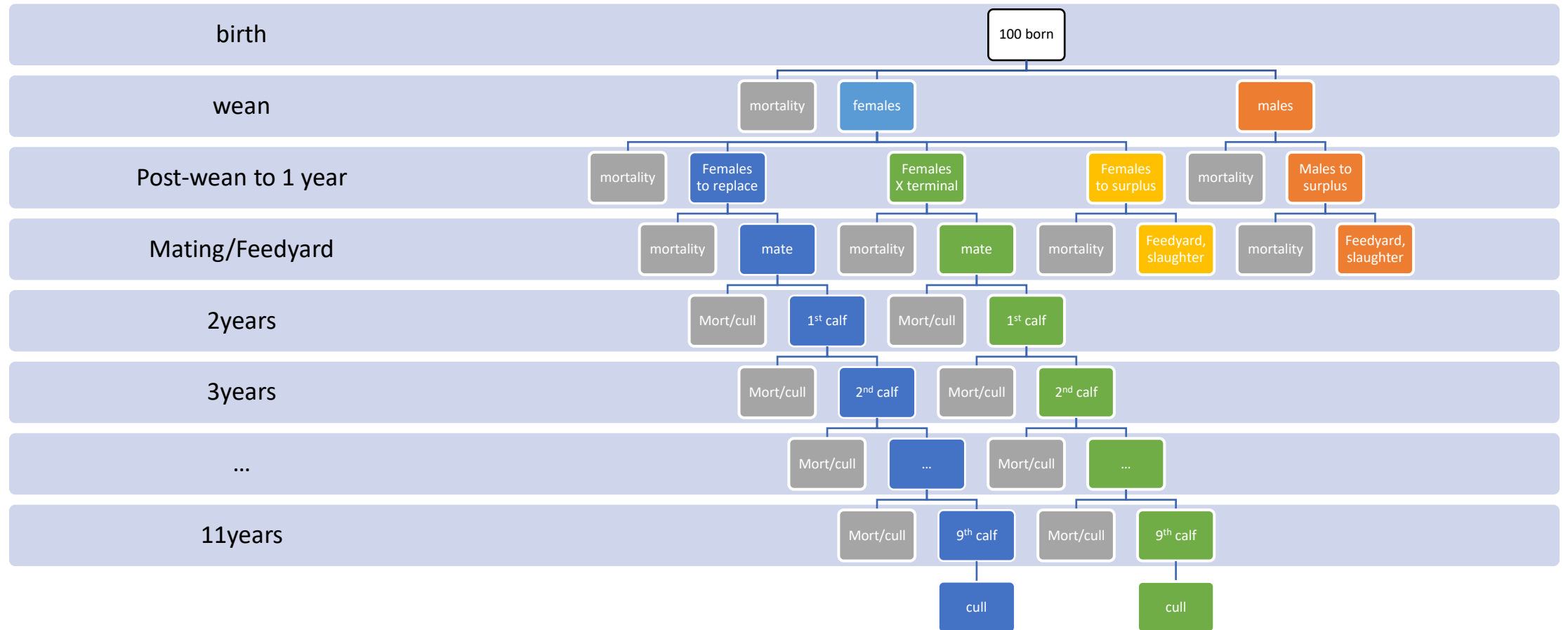
- Assumes an underlying normal distribution of results.
 - Deviation of EPD compared to a base animal EPD moves distribution.
 - Percentage of animals falling into different price categories are then valued based on differences in prices for different categories or thresholds.
 - More closely resembles the way that cattle are valued in marketplace.
 - Applied for different QG, YG, and Heavy discount thresholds.

Discounted Genetic Expressions and Model Structure

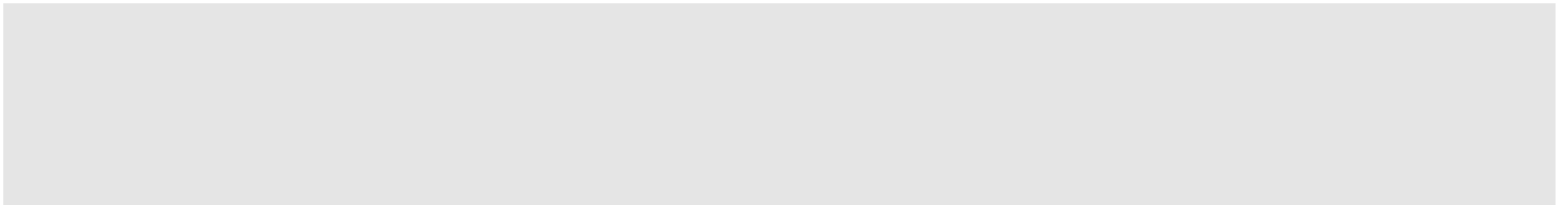
- Assumptions
 - 100 calves are born over a sire's lifetime
 - Sires genetics disseminate through a self replacing herd with a proportion of cows mated to terminal sires
 - Higher percentage of replacements come from Red Angus sired animals
 - Non-replacement calves enter feedlot and slaughter systems
 - Accounts for differences in times of expression of different traits



Discounted Genetic Expressions and model structure



Comparison of Indexes

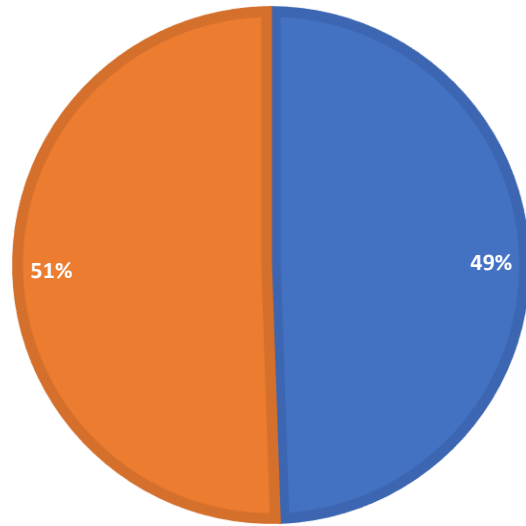


Importance

- Comparison of weighting factors in different phases of production

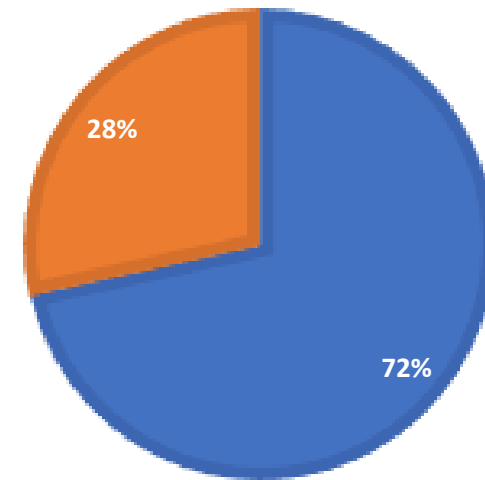
PROS IMPORTANCE

■ Conception to Weaning ■ Post Weaning To Harvest

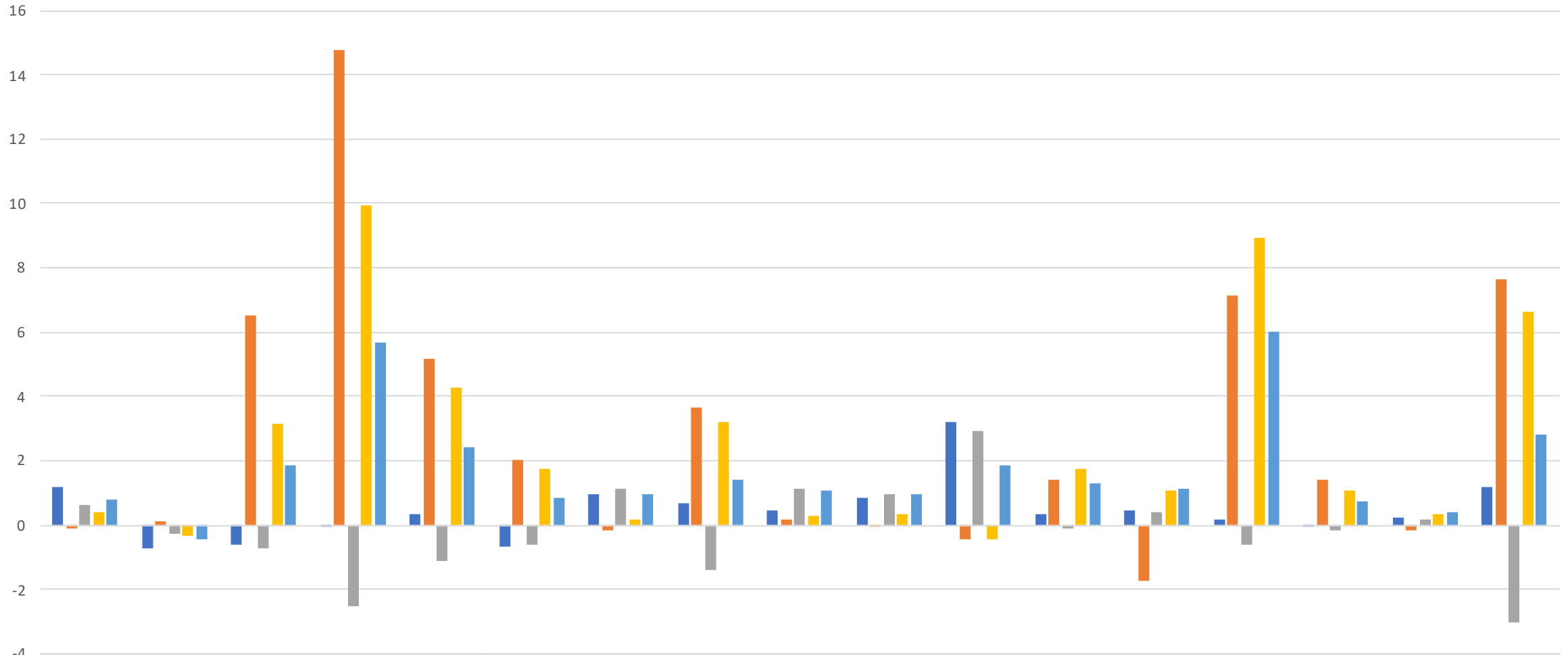


OLD ALL PURPOSE

■ Conception to Weaning ■ Post Weaning To Harvest



Response to selection after 1 SD of change in each index



| | epd_1st_calv_ease | epd_brth_wt | epd_wean_wt | epd_yrIngt | adg_epd x 100 | dmi_epd x 10 | epd_mtrnl_mlk | me_epd | hpg_epd | epd_mtrnl_1st_calv_ease | stay_epd | marbling_epd x 10 | retail_cuts_epd x 100 | carc_wt_epd | rib_eye_epd x 10 | back_fat_epd x 100 | MW |
|--------|-------------------|-------------|-------------|------------|---------------|--------------|---------------|--------|---------|-------------------------|----------|-------------------|-----------------------|-------------|------------------|--------------------|----|
| Old_HB | 1 | -0.7 | -1 | 0 | 0.3 | -0.6 | 1 | 1 | 0 | 1 | 3 | 0.3 | 0.4 | 0 | 0.0 | 0.2 | 1 |
| Old_GM | 0 | 0.1 | 6 | 15 | 5.2 | 2.0 | 0 | 4 | 0 | 0 | 0 | 1.4 | -1.7 | 7 | 1.4 | -0.1 | 8 |
| HB | 1 | -0.3 | -1 | -3 | -1.1 | -0.6 | 1 | -1 | 1 | 1 | 3 | -0.1 | 0.4 | -1 | -0.1 | 0.2 | -3 |
| GM | 0 | -0.3 | 3 | 10 | 4.3 | 1.7 | 0 | 3 | 0 | 0 | 0 | 1.8 | 1.0 | 9 | 1.1 | 0.3 | 7 |
| ProS | 1 | -0.4 | 2 | 6 | 2.4 | 0.9 | 1 | 1 | 1 | 1 | 2 | 1.3 | 1.1 | 6 | 0.7 | 0.4 | 3 |

Do these indexes align better with what breeders have been doing?

| | Slope | SD of Index | SD improvement per Year | Time to make 1 SD of improvement |
|--------|-------|-------------|-------------------------|----------------------------------|
| ProS | 2.11 | 24.76 | 0.09 | 11.73 |
| Old_HB | 0.81 | 27.40 | 0.03 | 33.85 |

Take Away differences with index updates

- Moving from publishing 2 indexes to 3
- HerdBuilder used to contain post weaning traits but will now cover traits from conception to weaning
- Updated all purpose index (ProS) will see a larger influence of traits after weaning affect resulting index values
- Increased spread in terminal index values
- Shift in mean of index values
- Indexes expressed as \$ per calf born instead of \$ per exposure



Questions