

**(SOME) INDEXES ASSUME YOU RETAIN
OWNERSHIP BUT YOU SELL AT
WEANING: A CONUNDRUM IN THE
SOUTHEAST**

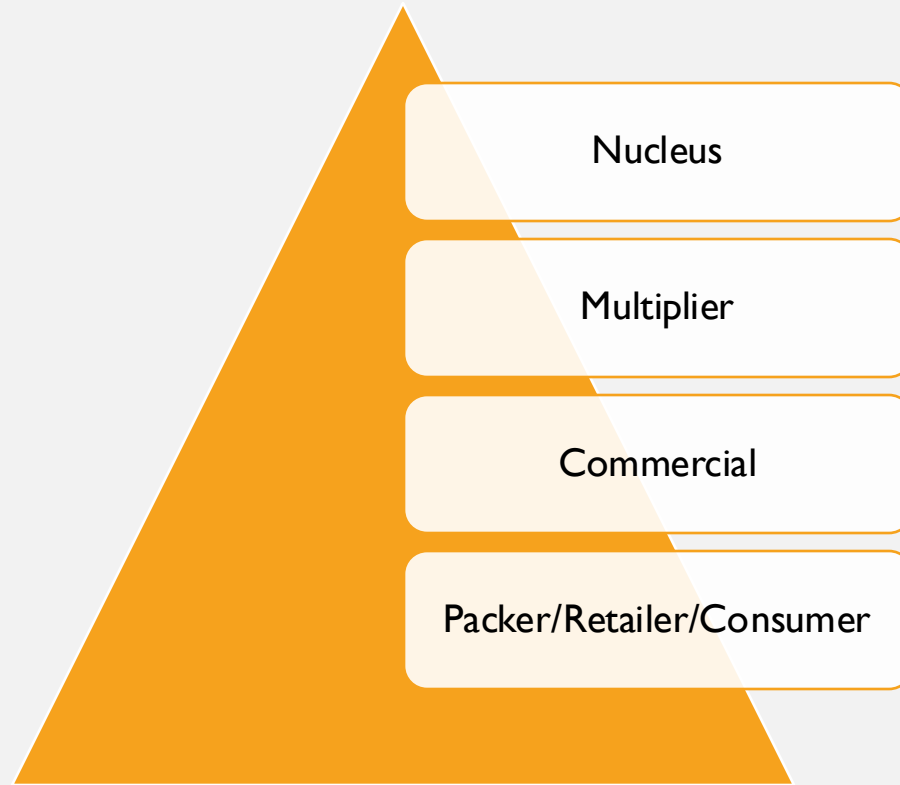
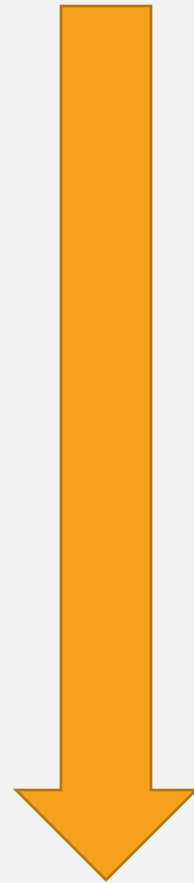
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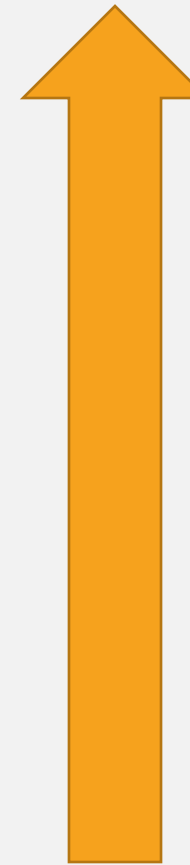
University of Nebraska-Lincoln

SIMPLIFIED BREEDING PYRAMID

Genetics



Economic signal



There is substantial lag in both directions

FOUNDATION

- EPD enable directional change
- Progress is conditioned on objectives
- Economic selection indexes
 - Should be designed to select for increased commercial level net profit
 - Difference between index values of two bulls = Expected difference in net profit per (exposure, calf marketed) given assumptions of the index

WHY DO WE NEED SELECTION INDEXES?

“There is no easily accessible, objective way for breeders, particularly breeders in the beef and sheep industries where ownership is diverse and production environments vary a great deal, to use these predictions intelligently.”

-- R. M. Bourdon, 1998

COMMON ADVICE

- Use economic selection indexes
- More detailed advice includes conditioning the choice of index on your breeding objective
 - This may or may not be possible given the indexes offered by breed associations

SAMPLE OF INDEXES ON OFFER

Terminal

- \$B, \$F, \$G (Angus)
- TI (Simmental)
- CHB\$ (Hereford)
- MTI (Limousin)
- EPI and FPI (Gelbvieh)
- Charolais
- GridMaster (Red Angus)
- \$T (Beefmaster)

General Purpose

- \$M, \$C (Angus)
- API (Simmental)
- BMI\$, BII\$, CEZ\$ (Hereford)
- HerdBuilder (Red Angus)
- \$Cow (Gelbvieh)
- \$M (Beefmaster)

PROBLEM

- Indexes that assume the terminal endpoint is a carcass place selection emphasis on a different suite of traits compared to indexes that assume weaning is the point of sale.
 - Not only are there additional traits in a slaughter index, but the marginal economic value of weaning weight differs substantially
- Direct payments to cow-calf producers based on (assumed) post-weaning performance do not occur at scale in the U.S. Beef Industry
 - Value differentiation of feeder calves is not directly tied to genetics
 - There is market failure

PERVASIVE THOUGHTS

- But they all have to be fed
- The endpoint for all values is (eventually) a carcass
- If I want buyers to pay more for my cattle I need to select for post-weaning performance

QUESTIONS

- What enterprise should economic selection indexes be economically optimal for?
- Do selection decisions differ if the breeding goal is designed for a producer who sells at weaning and the index is for a breeding goal with a carcass endpoint?
- What are the options for producers who do sell calves at weaning?

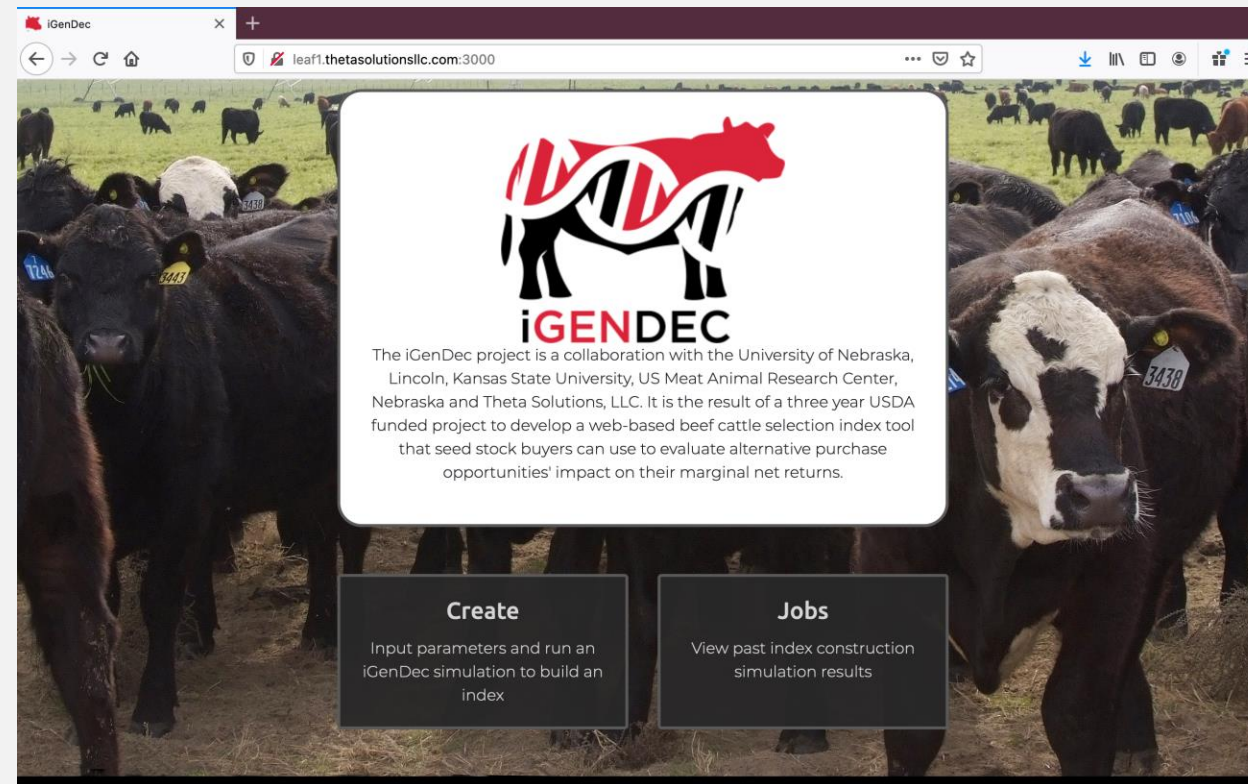
OPTIONS

- Weaning index
- Weaning index with ICL that move with genetic trends to reduce risk
- Carcass index
- Weaning index with carcass traits weighted proportional to direct revenue from post-weaning performance
- Retain ownership of calves

OPTIONS

- Weaning index
- Weaning index with ICL that move with genetic trends to reduce risk
- Carcass index
- Weaning index with carcass traits weighted proportional to direct revenue received from feeder calf buyer
- Retain ownership of calves

iGENDEC SOFTWARE



The screenshot shows a web browser window with the URL `leaf1.thetasolutionsllc.com:3000`. The page features a background image of a herd of black and white cattle in a field. In the center, there is a white box containing the iGenDec logo, which is a stylized cow silhouette with a red and white DNA double helix running through its body. Below the logo, the text reads: "The iGenDec project is a collaboration with the University of Nebraska, Lincoln, Kansas State University, US Meat Animal Research Center, Nebraska and Theta Solutions, LLC. It is the result of a three year USDA funded project to develop a web-based beef cattle selection index tool that seed stock buyers can use to evaluate alternative purchase opportunities' impact on their marginal net returns."

At the bottom of the page, there are two dark grey buttons with white text:

- Create**: Input parameters and run an iGenDec simulation to build an index
- Jobs**: View past index construction simulation results

<https://beefimprovement.org/resource-center/igendec/>

BREEDING OBJECTIVES

- Two sale points with replacements retained
 - Weaning and feedlot (carcass)
- Six planning horizons (2-, 5-, 10-, 20-, 30-, and 50-yr)
- Three breeding systems
 - Purebred Angus
 - Simmental-Angus bulls mated to Simmental-Angus Cows
 - Simmental Bulls mated to Hereford-Angus Cows

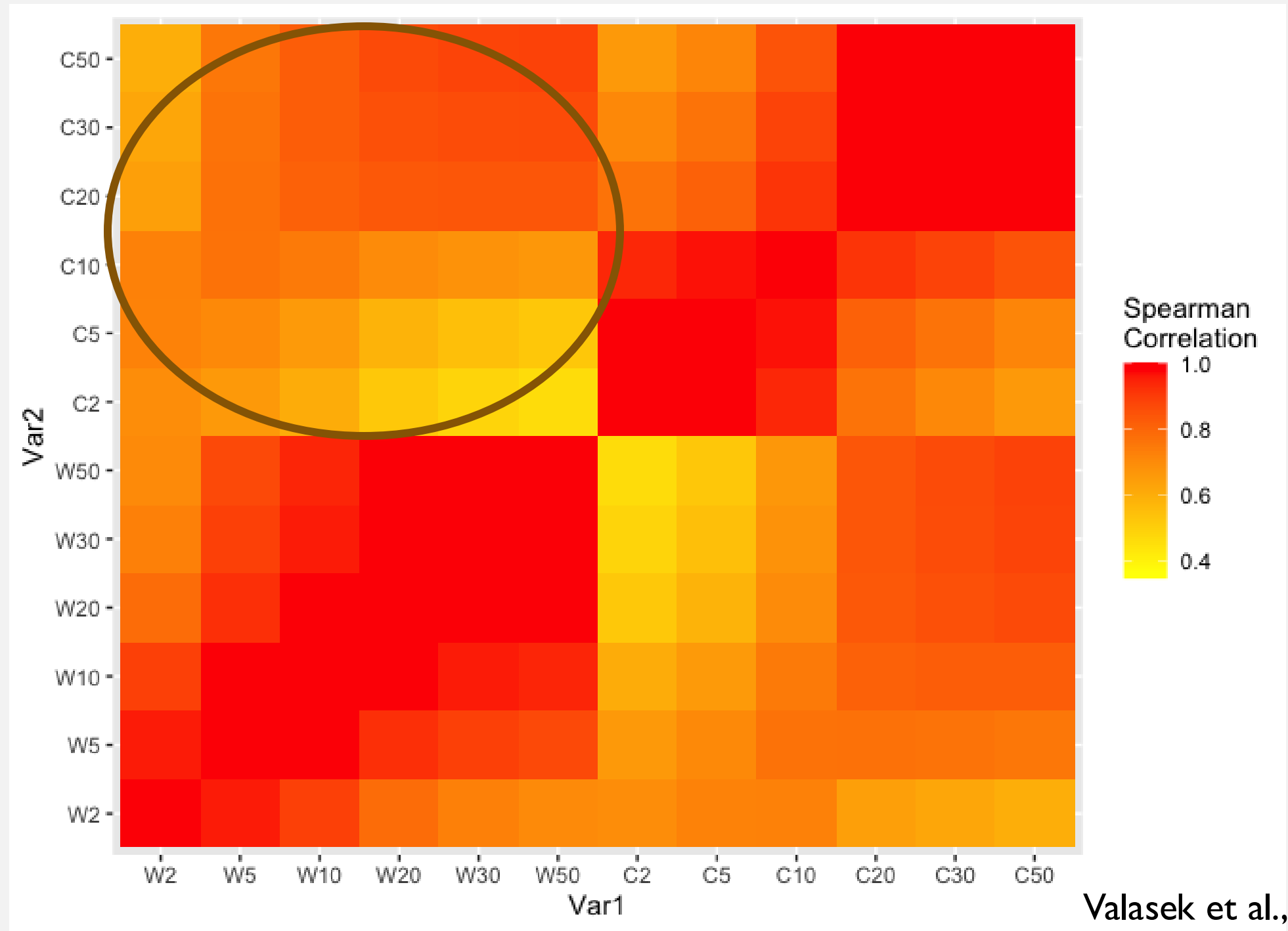
INDEX TRAITS

Trait	Endpoint	
	Weaning	Carcass
Weaning Weight-Direct (WW-D)	✓	✓
Weaning Weight-Maternal (WW-M)	✓	✓
Mature Weight (MW)	✓	✓
Stayability (STAY)	✓	✓
Heifer Pregnancy (HP)	✓	✓
Calving Ease-Direct (CE-D)	✓	✓
Calving Ease-Maternal (CE-M)	✓	✓
Hot Carcass Weight (HCW)		✓
Ribeye Area (REA)		✓
Fat Depth (FAT)		✓
Marbling Score (MS)		✓
Feed Intake (FI)		✓

COMPARING RANKS OF BULLS

PLANNING HORIZON AND ENDPOINT

Average rank correlation
between endpoints
= 0.71 (0.1)



**COMMONALITY OF BULLS SELECTED
BETWEEN ENDPOINTS
(JACCARD INDEX)**

PH	Top 0.5%	Top 1%	Top 5%
2	12.5 ± 2.6	12.8 ± 4.2	22.1 ± 6.9
5	9.6 ± 3.7	11.1 ± 4.9	21.3 ± 7.5
10	10.1 ± 4.1	15.1 ± 4.4	25.1 ± 5.1
20	19.9 ± 2.7	24.7 ± 3.9	38.9 ± 4.0
30	24.6 ± 4.5	30.6 ± 2.8	44.7 ± 0.7
50	31.1 ± 4.9	36.5 ± 3.3	48.8 ± 1.7

DIGGING DEEPER

- Previous work showed:
 - Rank of selection candidates differed but was “high”
 - Bulls actually selected would differ
- Questions remain:
 - What is the opportunity cost of using an index that does not match the breeding objective?
 - What are the alternatives to contemplate post-weaning merit when animals are sold at weaning?

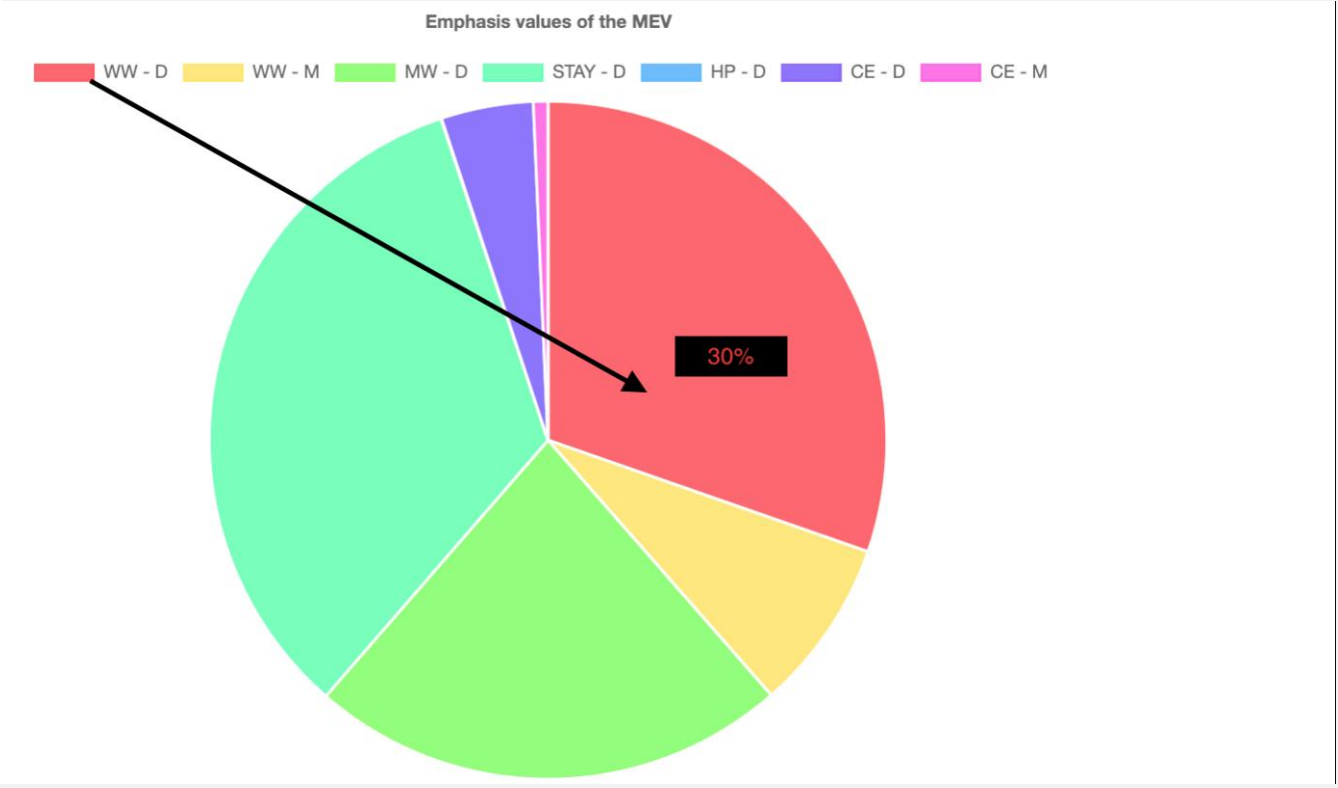
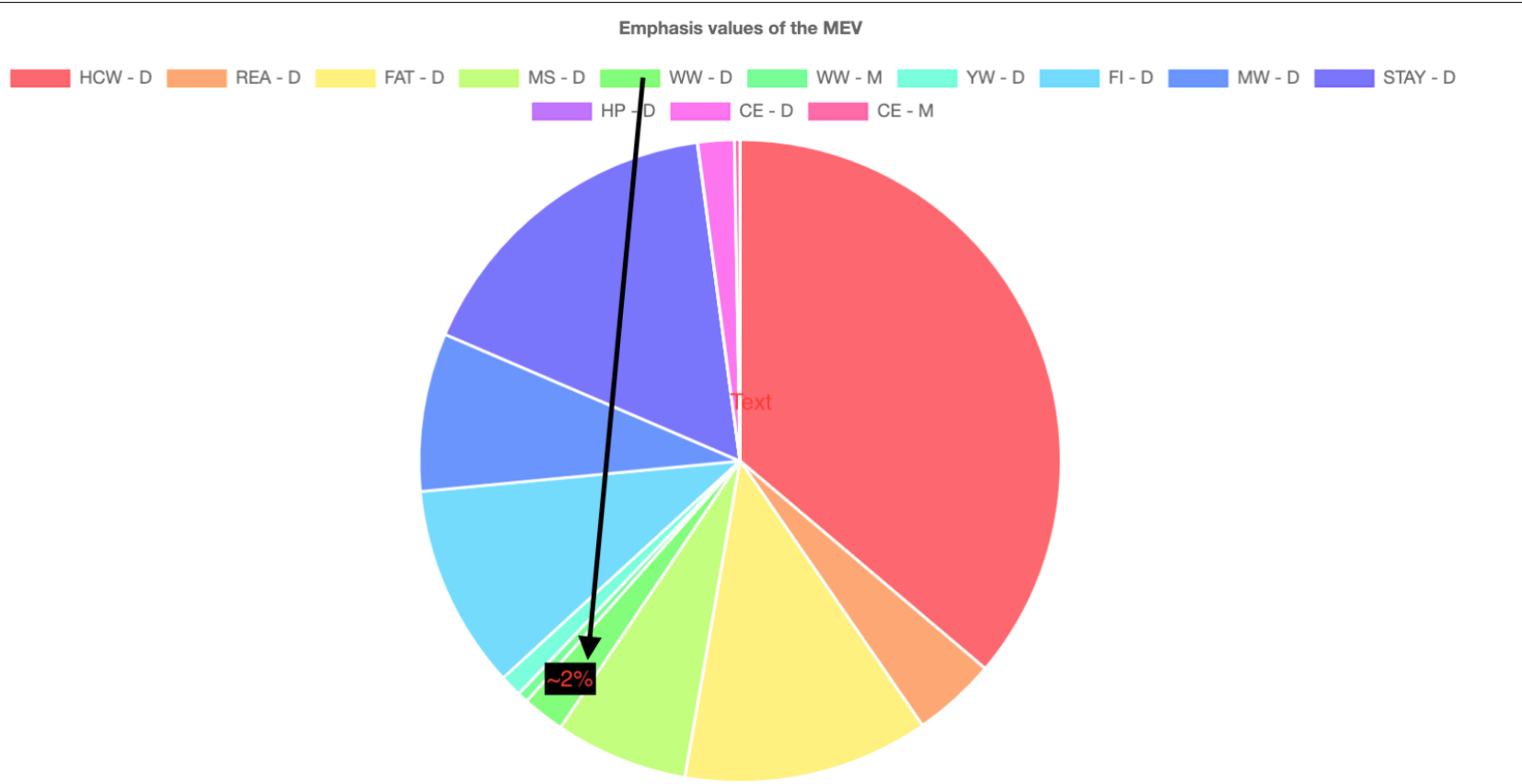
DETAILS OF SCENARIOS

- Purebred breeding system with a 20-yr. planning horizon
- Indexes and selection schemes investigated
 - Self-replacing index with animals sold at harvest
 - Self replacing index with animals sold at weaning
 - Self replacing index with animals sold at weaning and ICL imposed for marbling
 - Self replacing index with animals sold at weaning and ICL imposed for hot carcass weight
 - Only ICL used for traits in weaning index
 - More stringent ICL set for traits in weaning index

ICL DEFINED

- Weaning index with ICL for MS
 - Select on index and then impose ICL for MS in top 50% of breed
- Weaning index for ICL for HCW
 - Select on index and then impose ICL for HCW in top 50% of breed
- ICL for all weaning traits
 - Impose ICL for CED, CEM, STAY, MWT, WWd in top 50% of breed
 - Impose ICL for WWm between 25th and 75th percentile
 - Impose ICL for MS in top 50% of breed
 - Random selection (5x number of bulls needed before random selection)
- More stringent ICL for weaning traits
 - Impose ICL for CED, WWd, STAY in top 25% of breed
 - Impose ICL for MWT in top 50% of breed
 - Remove outliers for WWm

DIFFERENCES IN BREEDING OBJECTIVES

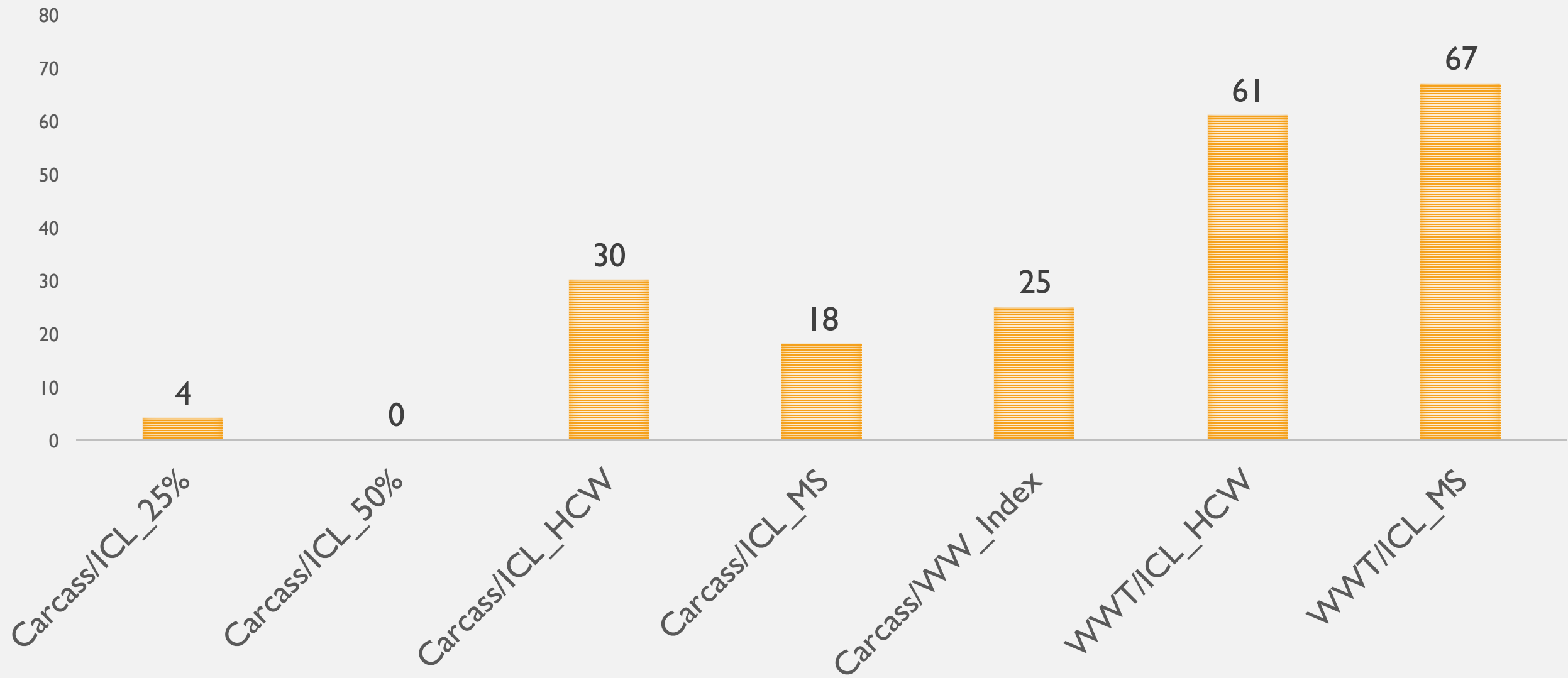


DIFFERENCES IN DECISIONS

- Pearson correlation between the harvest endpoint and weaning endpoint was high ($r=0.86$) when indexes were applied to ~27,000 bulls.
- Why?
 - There are traits in common
 - Prediction error covariance
- Re-ranking still expected
 - Commonality among bulls chosen?
 - Economic value of bulls chosen?

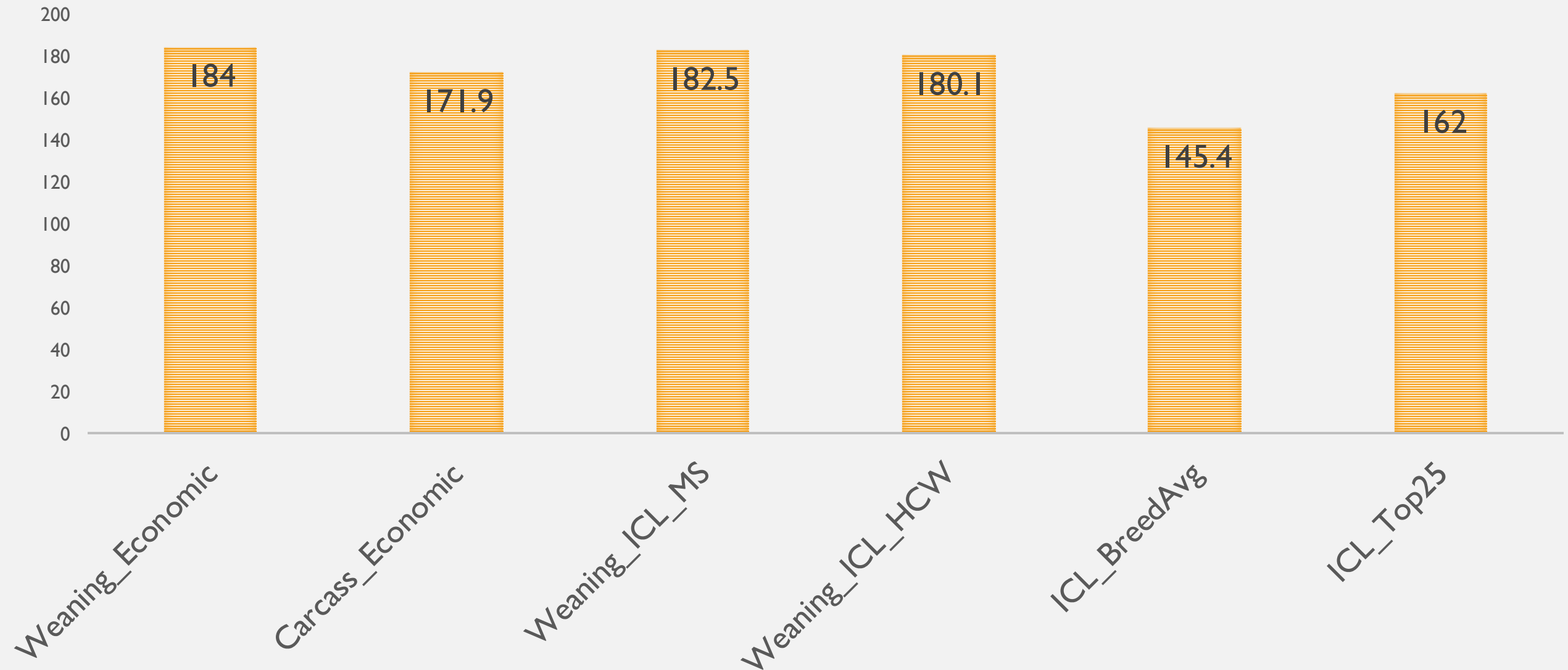
SELECTION CANDIDATES IN COMMON AMONG SCENARIOS

COMMON BULLS



MEAN WEANING INDEX VALUE OF SELECTED BULLS

MEAN INDEX VALUE



REASONABLE OPTIONS

- Genetic evaluations provide indexes that match common breeding objectives
- Use harvest endpoint index if value difference as shown here can be captured by “premiums” for calves
- If using a weaning endpoint index
 - Consider ICL for post-weaning traits to mitigate market risk (capture genetic trend)
 - If post-weaning premium is known this could be formally built into indexes

CONCLUDING THOUGHTS

- My point is not to dissuade anyone from using indexes
 - Clearly only using ICL is sub-optimal
- If you sell at weaning a carcass index points you in the right direction but is sub-optimal
- Defining a breeding objective and actually knowing profit remain critical to inform selection decisions
- The scenarios herein were not exhaustive
 - But should serve as enough for conversation

THANK YOU

- Darrh Bullock
- Hunter Valasek
- Bruce Golden
- Scott Newman