IGENDEC BASED SELECTION INDEXES AT THE NORTH AMERICAN LIMOUSIN FOUNDATION AND AMERICAN GELBVIEH ASSOCIATION

Bob Weaber, Ph.D.

Professor and Head,

Eastern Kansas Research and Extension Centers

Kansas State University

LIMOUSIN
NORTH AMERICAN LIMOUSIN FOUNDATION

American Gelbvieh Association

OVERVIEW

- Index Basics
- New Indexes
  - Index development
  - Scenarios and Economic Model Assumptions
  - Gelbvieh Indexes
  - Limousin Index

iGENDEC

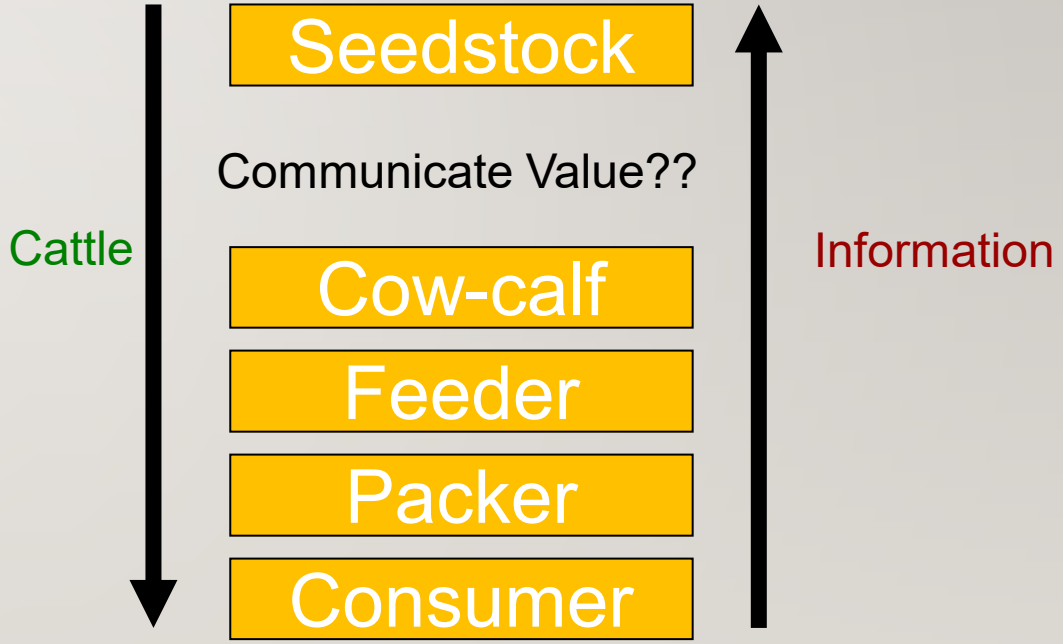
WHY DO WE NEED SELECTION INDEXES?

"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*

WHY IS MULTIPLE TRAIT SELECTION..

- Difficult?
  - Lots of EPDs
  - Some for Economically Relevant Trait (ERT) some for Indicator Traits
  - Relative economic importance of traits given breeding/marketing/endpoint
  - Ability to construct a meaningful profit function
- Important?
  - More than one trait is important for enterprise, operation or industry profitability



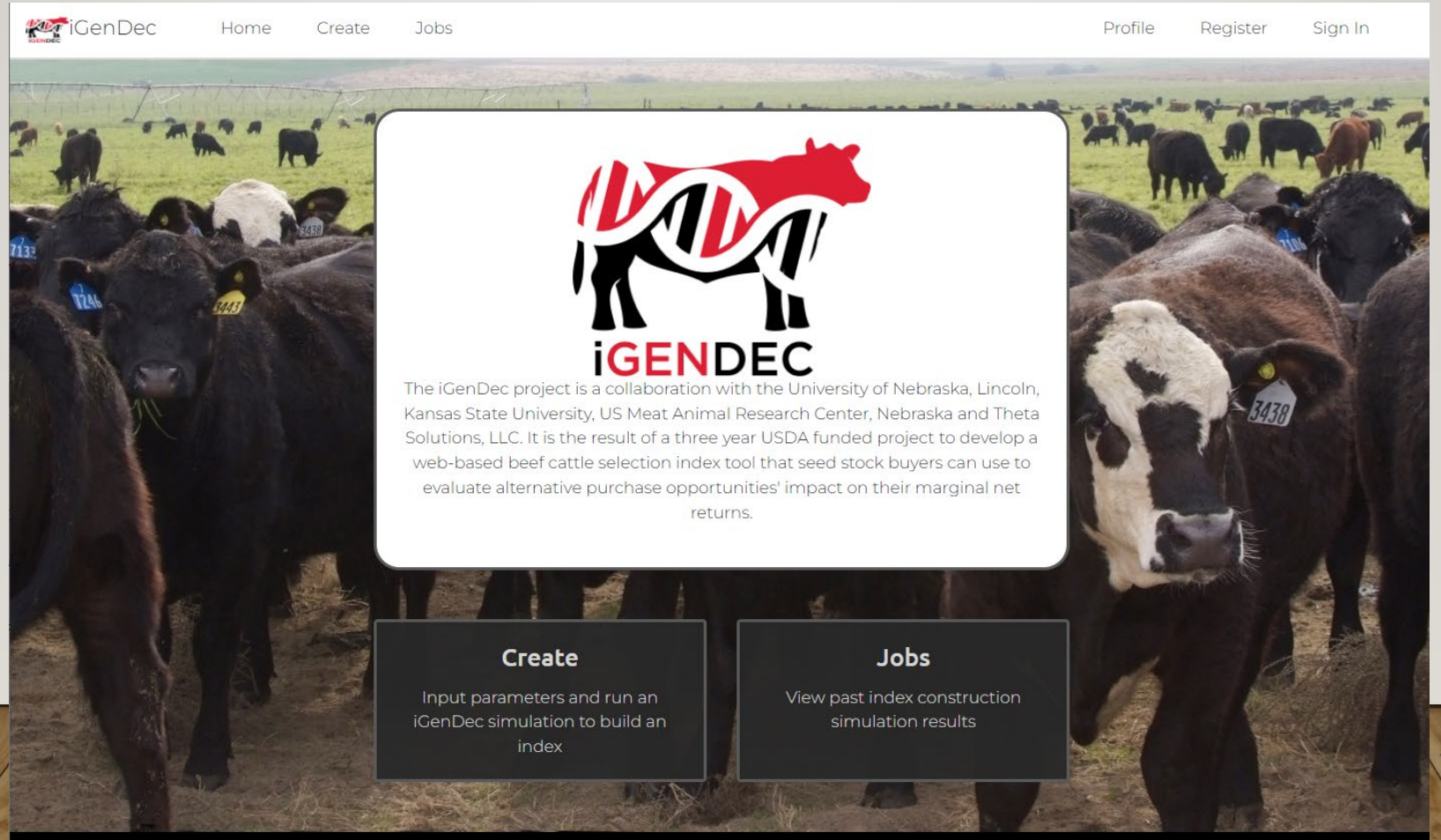
WHAT'S A SELECTION INDEX?

- $FPI - One number to use in selection that summarizes multiple EPD
- Appropriately weights each trait for its influence on profit (Economic Value * EPD)
- Selection on 'aggregate merit' (Hazel, 1943)
- Value of each trait - increase in satisfaction with one unit change in a trait, all others held constant
- Selection index is formal statement of trade-offs among traits used to evaluate selection candidates (MacNeil et al., 1997)

$$I = a_1 EPD_1 + a_2 EPD_2 + \cdots + a_n EPD_n$$

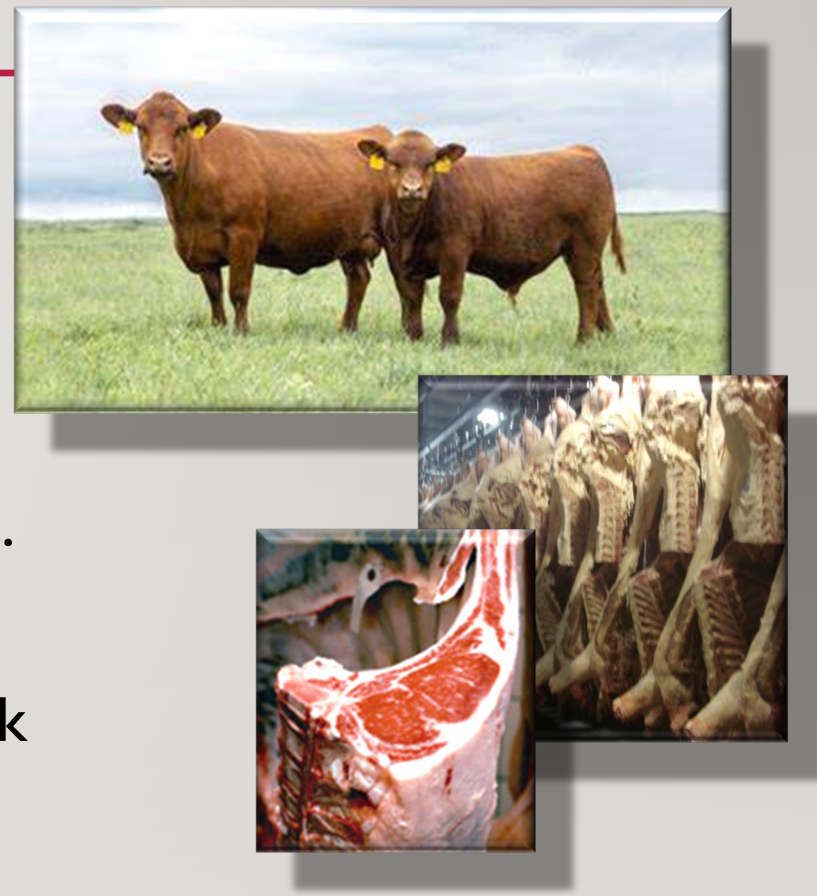
IGENDEC – A BIOECONOMIC SIMULATION TOOL TO DEVELOP CUSTOMIZED SELECTION INDEXES

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



AMERICAN GELBVIEH INDEX UPDATE

- Scenario:
  - Gelbvieh/Balancer bulls
  - Mated to Angus based cows (2 – 10 years old)
- Designed to aid **commercial cattlemen** in making the most efficient, economic based selection decision.
- The new indexes are NOT a desired gains index or ones designed for Gelbvieh breeders use in seedstock selection (although they are not un-useful for that!)



IGENDEC PARAMETERIZATION FOR GELBVIEH INDEX MODELS

- Pricing data 7/2015 – 6/2025
  - mid-year fiscal split so update isn't Jan 1 in front of bull sale season.
  - Publicly accessible sources (USDA)
- Cattle Performance
  - US-MARC Expected Sire Breed Mean Performance (Table 2, AB-EPD Report)
  - K-State Focus on Feedlots Monthly Averages (10-year average)

COW, BACKGROUNDING AND FEEDLOT COST

Item	Units	Value	Source
Annual Per Cow Cost	$/cow	602.53	USDA ERS 10-year average cash costs 2015-2024
Background Cost	$/mo/hd	48.00	UNL Report 2 lb/hd/d ADG
Background Period	Days	120	
Days on Feed (feedlot)	Days	177	KSU Focus on Feedlot Data 7/2015-6/2025
Feedlot Feed Cost	$/lb DM	0.1354	Computed from Focus on Feedlot corrected for yardage
ADG	lb/d	3.55	KSU Focus on Feedlot Data 7/2015-6/2025
FCR	lb feed/lb gain	6.21	KSU Focus on Feedlot Data 7/2015-6/2025
DMIp	lb intake/day	22.05	Computed from Focus on Feedlot
CoG	$/cwt gain	95.09	KSU Focus on Feedlot Data 7/2015-6/2025
FE	gain:feed	0.1610	Computed

ANIMAL PHENOTYPIC GROWTH AND CARCASS PARAMETERS

Parameter	Units	Value
Hot Carcass Weight	lb	894
Ribeye Area	square inches	14.26
12^{th} Rib Fat Thickness	inches	0.53
Marbling Score	Marb (SM00=5.00)	5.33
Birth Weight	lb	81.91
Weaning Weight	lb	576
Yearling Weight	lb	838

FEEDER CATTLE PRICES

		2014-2024		*2015-2025*		*Change*	
Wt Class	**Units**	**Steers**	**Heifers**	**Steers**	**Heifers**	**Steers**	**Heifers**
300-400	$/cwt	$ 238.88	$ 202.69	$ 248.02	$ 209.87	$ 9.15	$ 7.18
400-500	$/cwt	$ 216.46	$ 187.98	$ 223.57	$ 193.16	$ 7.11	$ 5.18
500-600	$/cwt	$ 198.43	$ 174.96	$ 204.43	$ 179.61	$ 6.00	$ 4.65
600-700	$/cwt	$ 181.75	$ 165.26	$ 187.29	$ 169.90	$ 5.53	$ 4.64
700-800	$/cwt	$ 170.72	$ 156.76	$ 175.89	$ 161.25	$ 5.17	$ 4.48
800-900	$/cwt	$ 162.67	$ 148.69	$ 167.57	$ 153.09	$ 4.90	$ 4.40
900-1000	$/cwt	$ 154.44	$ 141.35	$ 158.98	$ 145.08	$ 4.55	$ 3.74

10 year rolling average Oklahoma City

USDA AVERAGE WEEKLY WEIGHTED 5 AREA DRESSED BEEF PRICES JULY 2013-JUNE 2023

Class	Weight	$/cwt
Steers	<600 lb.	$200.44
Steers	>600 lb.	$220.44
Heifers	<600 lb.	$200.47
Heifers	>600 lb.	$220.47

FED CATTLE CARCASS PRICING GRID

	Yield Grade				
Quality Grade	1	2	3	4	5
Prime	$ 29.21	$ 26.98	$ 24.48	$ 15.40	$ 8.92
Program	$ 10.16	$ 7.92	$ 5.42	$ (3.66)	$ (10.13)
Choice	$ 4.74	$ 2.51	$ -	$ (9.07)	$ (15.55)
Select	$ (14.45)	$ (16.68)	$ (19.19)	$ (28.26)	$ (34.74)
Standard	$ (36.06)	$ (38.29)	$ (40.80)	$ (49.87)	$ (56.35)

USDA Cattle Contract Library Average Pricing Grid (1/1/2023 – 4/28/2025)

IGENDEC OUTPUT - RELATIVE EMPHASIS

- Describes the percentage of variation the respective selection criteria trait (EPD) explains in the variation of the index.
  - For those that are statistically inclined… think partial R^2
- Relative importance of each trait in the index
- Assist in identification of the 'big drivers' in the index
- The relative emphasis values are **NOT** the weights applied to the EPDs.

IGENDEC OUTPUT - MARGINAL ECONOMIC WEIGHTS

- Change in Net Revenue from a 1 (one) unit increase in selection criteria trait (EPD) all others held constant
- Accounts for differences in:
  - Heritability of trait
  - Genetic variation of trait
  - Genetic correlations between traits
  - Economic contribution to profit
  - Captures efficiencies (Input:Output) relationships

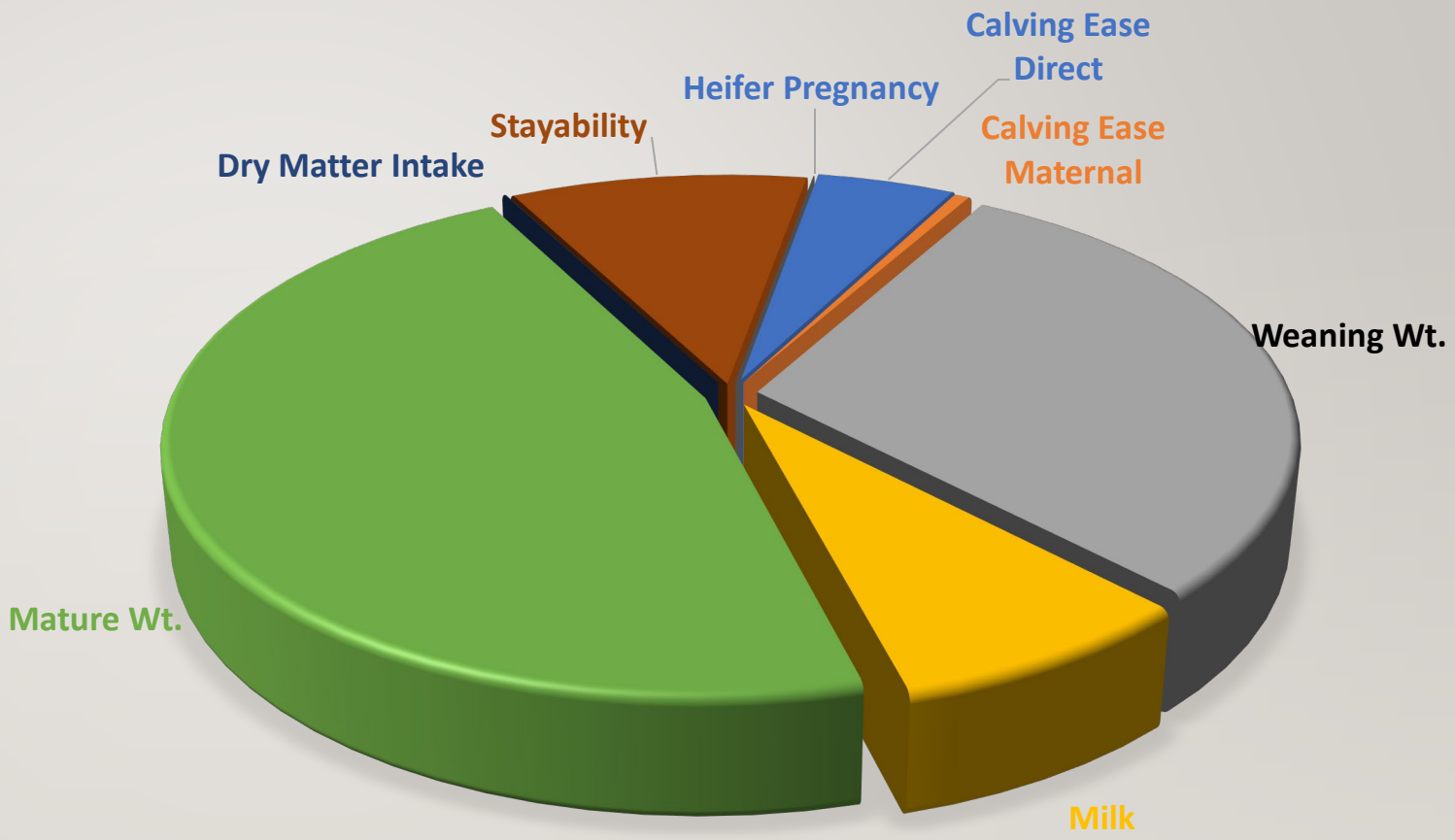
Profit = Revenue – Costs

Revenue – easy to measure
Costs – hard to measure

MATERNAL PROFIT INDEX - W/ UPDATED PRICING - ANGUS COW BASE

Trait	Component	Marginal Economic Value
WW	Direct	1.178
WW	Maternal	0.369
FI	Direct	-0.009
MW	Direct	-0.35
STAY	Direct	1.272
HP	Direct	0.012
CE	Direct	2.584
CE	Maternal	0.434

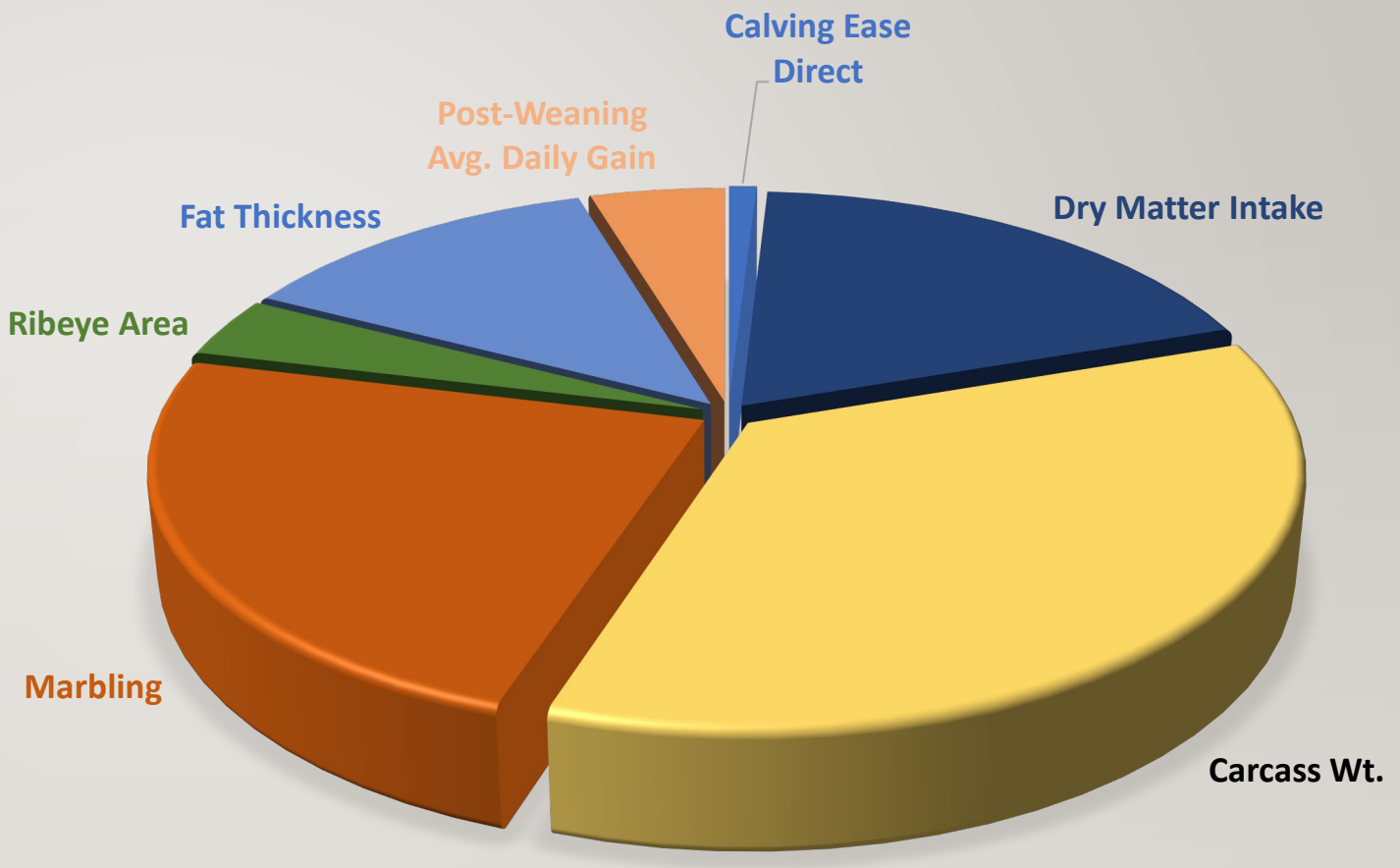
FIGURE 1. AGA MATERNAL PROFIT INDEX SELECTION CRITERIA RELATIVE EMPHASIS



FEEDER PROFIT INDEX - W/ UPDATED PRICING AND PERFORMANCE DATA

Trait	Component	Marginal Economic Value
HCW	Direct	1.724
REA	Direct	16.506
FAT	Direct	-154.072
MS	Direct	78.696
WW	Direct	-0.343
YW	Direct	-0.062
FI	Direct	-21.572
CE	Direct	1.23
ADG	DIrect	0.281

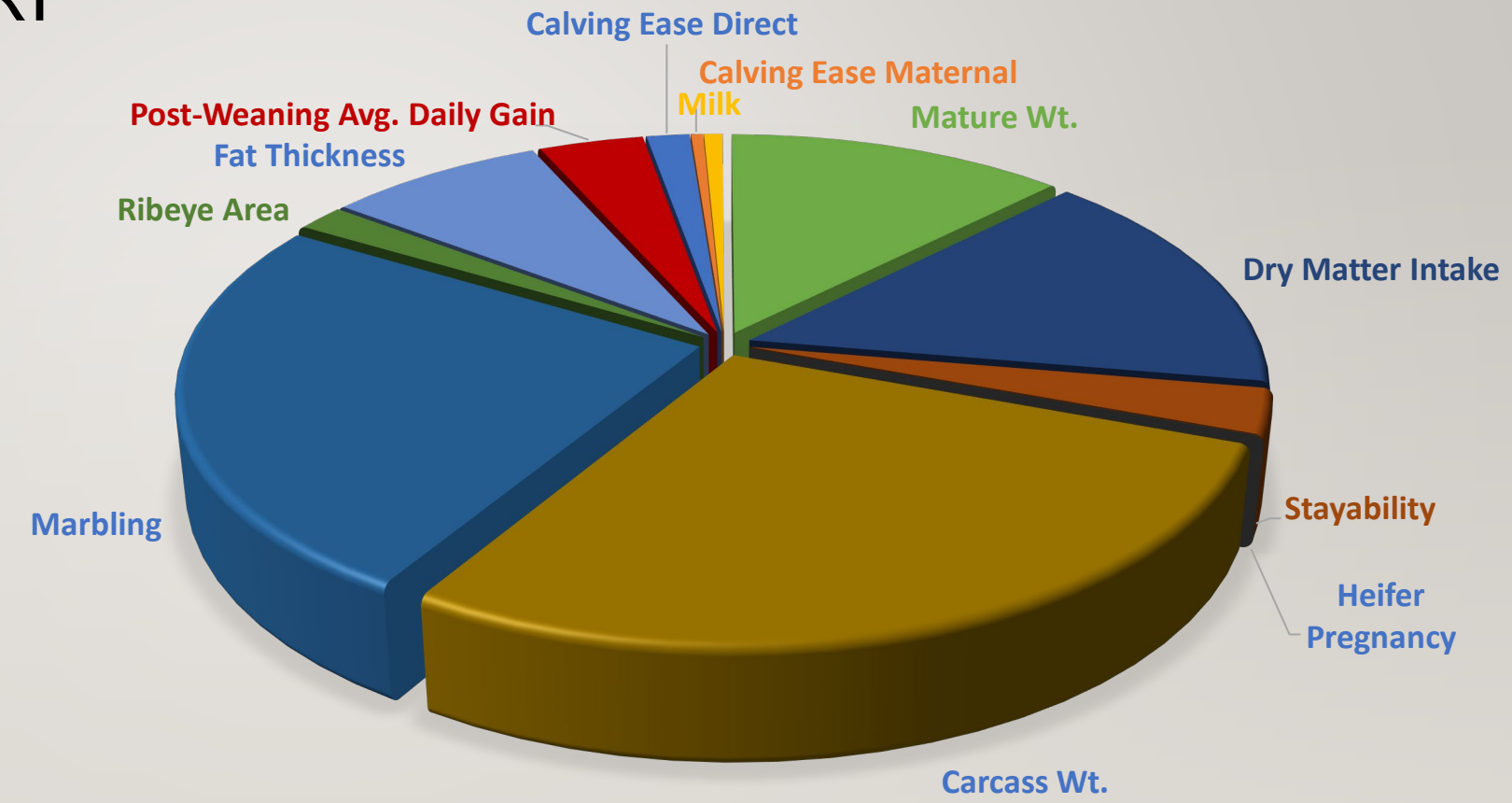
FIGURE 2. AGA FEEDER PROFIT INDEX SELECTION CRITERIA RELATIVE EMPHASIS



TOTAL PROFIT INDEX - W/ UPDATED PRICING FROM CONTRACT LIBRARY - ANGUS COW BASE

Trait	Component	Marginal Economic Value
HCW	Direct	2.144
REA	Direct	11.443
FAT	Direct	-152.979
MS	Direct	147.295
WW	Direct	-0.427
WW	Maternal	-0.118
YW	Direct	-0.075
FI	Direct	-26.736
MW	Direct	-0.35
STAY	Direct	1.341
HP	Direct	-0.37
CE	Direct	3.13
CE	Maternal	1.385
ADG	*Direct*	*0.352*

FIGURE 3. AGA TOTAL PROFIT INDEX SELECTION CRITERIA RELATIVE EMPHASIS



CORRELATIONS AMONG INDEXES – ACTIVE SIRES

	MPI	*FPI*	*TPI*
MPI	1.00		
FPI	0.25	1.00	
TPI	0.43	0.90	1.00

	MPI	FPI	TPI	FPI_exist	$Cow	EPI	API	TI
epd_ce	**0.51**	**0.01**	**0.29**	0.12	0.21	-0.13	0.43	0.06
epd_bw	-0.21	0.13	-0.17	-0.01	-0.16	0.22	-0.40	0.01
epd_ww	**0.34**	0.42	**0.15**	0.63	0.07	0.45	0.08	0.55
epd_pwg	0.24	0.51	0.33	0.65	0.00	0.55	0.21	0.53
epd_yw	0.31	0.50	0.25	0.68	0.04	0.54	0.15	0.58
epd_cem	**0.43**	0.03	**0.27**	0.16	0.23	-0.07	0.41	0.11
epd_milk	**0.25**	0.10	**0.10**	0.18	0.18	0.05	0.21	0.22
epd_mww	0.41	0.38	0.19	0.58	0.16	0.36	0.20	0.54
epd_stay	**0.38**	-0.06	**0.08**	0.08	0.96	-0.07	0.45	0.05
epd_doc	0.13	0.10	0.07	0.14	0.06	0.07	0.09	0.14
epd_cw	0.18	**0.78**	0.52	0.48	-0.08	0.42	0.09	0.43
epd_ms	0.16	**0.63**	0.78	0.73	0.08	0.15	0.70	0.58
epd_rea	0.09	**0.26**	0.01	0.05	0.16	0.09	-0.21	0.00
epd_bf	0.15	**0.19**	0.36	0.32	-0.04	0.17	0.45	0.35
epd_yg	0.09	0.26	0.41	0.34	-0.16	0.21	0.41	0.37
epd_dmi	**0.26**	**0.33**	**0.15**	0.56	0.05	0.39	0.14	0.46
dollar_gain	0.16	0.46	0.45	0.36	-0.04	0.39	0.26	0.31
mwt_epd	**-0.31**	0.18	**-0.11**	0.32	0.15	0.27	0.04	0.23
cer_yearly	-0.28	0.20	-0.10	0.33	0.16	0.28	0.05	0.25
hp_epd	**0.24**	0.20	**0.15**	0.33	0.51	0.08	0.26	0.25
pg30_epd	0.18	0.15	0.19	0.17	0.42	0.00	0.19	0.07

NORTH AMERICAN LIMOUSIN FOUNDATION INDEX DEVELOPMENT

NALF INDEX UPDATE

- Scenario:
  - Limousin/Lim-Flex bulls
  - Mated to Angus based cows (2 – 10 years old)
- Designed to aid **commercial cattlemen** in making the most efficient, economic based selection decision.
- The new indexes are NOT a desired gains index or ones designed for Limousin breeders use in seedstock selection (although they are not un-useful for that!)

ANIMAL PHENOTYPIC GROWTH AND CARCASS PARAMETERS

Parameter	Units	Value
Hot Carcass Weight	lb	902
Ribeye Area	square inches	14.53
12th Rib Fat Thickness	inches	0.53
Marbling Score	Marb (SM00=5.00)	5.29
Birth Weight	lb	80.81
Weaning Weight	lb	525
Yearling Weight	lb	845

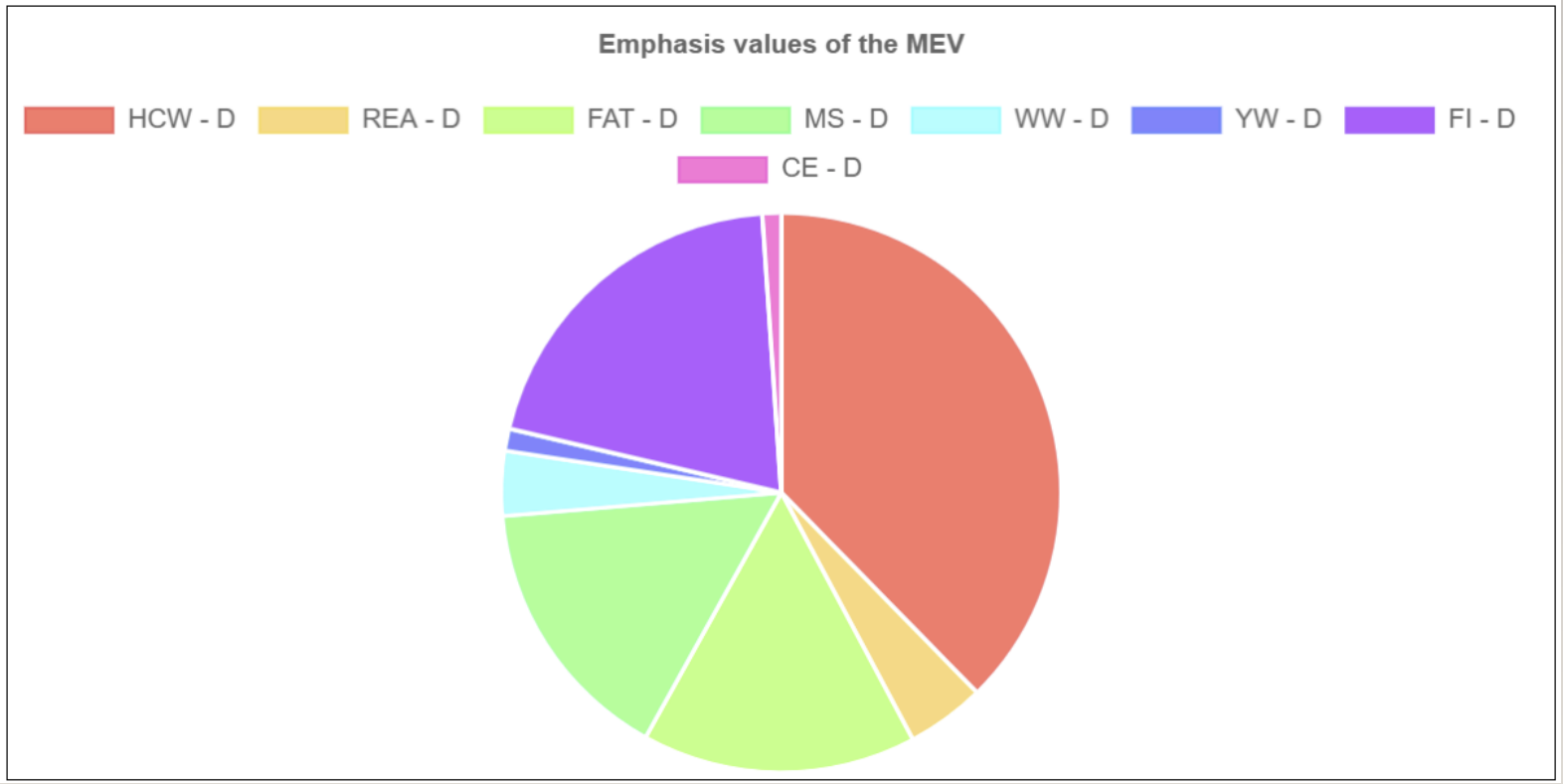
FED CATTLE CARCASS PRICING GRID

7/2015-6/2025	Yield Grade				
Quality Grade	1	2	3	4	5
Prime	$ 21.44	$ 18.72	$ 16.32	$ 6.68	$ 2.29
Program	$ 9.65	$ 6.93	$ 4.53	$ (5.11)	$ (9.50)
Choice	$ 5.12	$ 2.40	$ -	$ (9.64)	$ (14.03)
Select	$ (9.90)	$ (12.62)	$ (15.02)	$ (24.66)	$ (29.05)
Standard	$ (23.84)	$ (26.56)	$ (28.96)	$ (38.60)	$ (42.99)

USDA 5-Area Premium/Discount Schedule Grid 7/2015 – 6/2025)

$TPI – TERMINAL PROFIT INDEX

Trait	Component	Marginal Economic Value
HCW	Direct	1.807
REA	Direct	18.496
FAT	Direct	-189.165
MS	Direct	57.709
WW	Direct	-0.345
YW	Direct	-0.062
FI	Direct	-22.168
CE	Direct	1.337
ADG		*0.283*



CORRELATIONS

	$MPI	$TPI	$API
$MPI	1.00		
$TPI	**0.47**	1.00	
$API	**0.53**	**0.82**	1.00

	$MPI	$TPI	$API
$MPI	1.00		
$TPI	0.47	1.00	
$API	0.53	0.82	1.00
IGS_TI	0.77	0.57	0.65
IGS_API	0.71	0.45	0.78
epd_ce	0.51	0.08	0.44
epd_bw	-0.29	0.07	-0.30
epd_ww	0.68	0.45	0.20
epd_yw	0.67	0.50	0.28
epd_milk	0.10	0.09	0.06
epd_mww	0.57	0.40	0.18
epd_cem	0.48	0.16	0.45
epd_stay	0.41	0.17	0.32
epd_doc	0.37	0.14	0.21
epd_yg	0.36	0.18	0.43
epd_cw	0.52	0.82	0.58
epd_rea	-0.08	0.21	-0.15
epd_ms	0.33	0.41	0.69
epd_bf	0.37	0.15	0.41
epd_dmi	0.62	0.36	0.30
$GAIN	0.07	0.30	0.22
mwt_epd	0.58	0.39	0.15
cer_yearly	0.55	0.39	0.14

LIMOUSIN
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Traits in Index

THANK YOU!

QUESTIONS?