Economically Relevant Traits for Commercial Cow-Calf Production: Weight & Carcass

K-STATE Research and Extension

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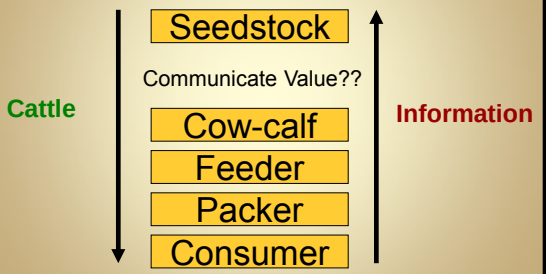
Overview

- The Role of the Breeding Objective
- Economically Relevant Traits for Commercial Cow-Calf Production: Growth and Carcass
- Simple Selection for Practical Results
- What are selection indexes? Why do we need them…
  - Defined
  - The Breeding Objective
  - Traits vs. Characteristics
  - Relative Economic Values

Beef Business!



Do You Have a Breeding Objective??

Our objective is to breed cattle that breed as yearlings, calve unassisted and rear a good calf for sale at weaning every year. We aim to breed functional cattle that flesh easily and can forage on the hills over winter but must have the temperament and soundness to be farmed intensively during calving and the breeding season.

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Missing: *How do they replace females in herd?*

The Role of Economically Relevant Traits

- A trait that has a direct cost or return associated with it is an Economically Relevant Trait (ERT).
- Traits that are correlated to ERTs are indicator traits.
- Example: Is Birth Weight or Calving Ease the ERT? Why??
- Weaning Weight or Yearling Weight?

Proposed ERT and Their Indicators

ERT EPD	INDICATORS
• Sale Wt. Weaning Direct Weaning Maternal (MILK) 600 d. Direct Carcass Weight Direct Salvage Cow Weight	• 205 d Weight • 365 d Weight • Carcass Weight • Birth Weight • Fat Thickness • Cull Cow Weight
• Probability of Calving Ease	• CE Score, BW, Gest. Length
• Cow Maintenance Feed Requirement	• Mature Cow Wt., BCS, Milk, Gut Wt.
• Days to Target Finish (Fat Th., Weight, Marbling Sc)	• BF and Age at Sl., Wt and Age at Sl., Grade and Age at Sl.

Adapted from Golden et al. 2000

Simple Trait Selection

- Sell calves at **weaning** and …
  - purchase crossbred replacement heifers
    - think 'Terminal Sire', moderate calving ease, high growth
  - raise your own replacements
    - think 'Balance', calving ease, easy fleshing, moderate milk and moderate growth

AVOID CARCASS TRAIT LOSERS!!

Simple Trait Selection

- Retain ownership and sell calves **in the beef** and …
  - purchase crossbred replacement heifers
    - think 'Terminal Sire', high growth (carcass wt), balance of quality and yield traits
  - raise your own replacements
    - think 'Balance', calving ease, easy fleshing, moderate milk and moderate growth, balance of quality and yield.

MANAGE MARKET RISK WITH BALANCED CARCASS TRAITS !!

Genetic Correlations

- BW – Mature Wt. 0.61
- WW – Mature Wt. 0.65
- YW – Mature Wt. 0.65
- Feed Intake – Mature Wt. 0.75

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

Relative Economic Weights for Integrated Beef Firm

Reproduction:Growth:End Product

2:1:1

(Melton, 1995)

Tools for Multiple Trait Selection

- Independent Culling Levels
  - Too cumbersome
  - Inefficient in generating response to selection
  - Economics sketchy—'seat of pants' approach
- Selection Indexes
  - Objective
  - Easy to use and interpret ($)
  - Economically driven
    - REVs from bio-economic simulation
  - Links ERTs and Indicator Traits
  - Customizable (Site/user specific)

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

What Is a Selection Index?

- Selection on 'aggregate merit' (Hazel, 1943)
- List of traits that influence "satisfaction"
- Relative Economic Value (REV) of each trait
  - Increase in satisfaction with one unit change in a trait, all others held constant
- List of characteristics to be measured on animal
- Relationships between characteristics (phenotypes) and traits (genotypes)

$$H_i = a_1 BV_{i1} + a_2 BV_{i2} + \cdots + a_n BV_{in}$$

Connecting the Selection Index and the Breeding Objective

Traits in Selection Index	Characteristics In Breeding Objective
• CE EPD	• Calf Survival
• WW EPD	• Weaning weight
• YW EPD	• Male/female Fertility
• Milk EPD	• Longevity
• Heifer Pregnancy EPD	• Milk production
• Stayability EPD	• Feed efficiency

Genetic Correlations of EPD Traits

	STAY	BWT	CE(d)	CE(m)	WW(d)	WW(m)	YW	YG	MRB
STAY	1.00	-0.10	0.20	0.40	0.00	-0.10	0.00	-0.10	-0.20
BWT		1.00	-0.41	0.14	0.50	-0.15	0.47	-0.05	0.00
CE(d)			1.00	0.35	-0.15	-0.15	-0.10	-0.05	0.05
CE(m)				1.00	0.25	-0.05	0.30	-0.05	-0.05
WW(d)					1.00	-0.32	0.89	-0.20	-0.15
WW(m)						1.00	-0.21	0.00	0.10
YW							1.00	-0.25	-0.20
YG								1.00	0.20
MRB									1.00

(W. R. Shafer, Am. Simmental Assn., Bozeman, MT, personal communication)

Genetic Correlations of Traits in Selection Criteria & Breeding Objective

	MWT	MLK	FERT	SURV	WWd	ADG	FI	DP	YG	MRB
STAY	-0.25	-0.10	1.00	0.50	0.00	0.00	0.00	0.00	-0.10	-0.20
BWT	0.61	-0.15	-0.10	-0.50	0.49	0.32	0.65	-0.15	-0.05	0.00
CE(d)	-0.20	-0.15	0.20	0.75	-0.15	-0.20	-0.10	0.00	-0.05	0.05
CE(m)	0.20	-0.05	0.40	0.65	0.25	0.20	0.10	0.00	-0.05	-0.05
WW(d)	0.65	-0.32	0.00	0.00	1.00	0.51	0.67	0.22	-0.20	-0.15
WW(m)	-0.10	1.00	-0.10	0.00	-0.30	-0.02	0.10	0.00	0.00	0.10
YW	0.65	-0.21	0.00	0.00	0.90	0.84	0.78	0.18	-0.25	-0.20
YG	-0.25	0.00	-0.15	0.00	-0.20	-0.10	-0.25	0.10	1.00	0.20
MRB	-0.25	0.10	-0.20	0.00	-0.15	0.10	0.10	0.16	0.20	1.00

(W. R. Shafer, Am. Simmental Assn., Bozeman, MT, personal communication)

Angus Selection Indexes

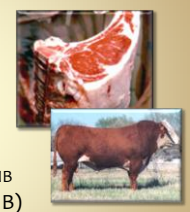
- $W = Weaning Value ($ per head)
  - BW, WW, Milk, Mature Wt.
- $F = Feedlot Value ($ per head)
  - WW, YW and correlations
- $ QG = Quality Grade ($ per head)
- $ YG = Yield Grade ($ per head)
- $G = Grid Value ($ per head)
  - Grade and yield components
- $B = Beef Value ($ per head)
  - $F and $G adjusted for weight and costs
- $EN = Cow Energy (savings/cow/year)
  - Milk and Mature Wt.:maint. energy req.


Simmental Selection Indexes

- All Purpose Index (API)
  - Sell progeny on Value Based Grid
  - Retain heifers
  - Carcass Merit
  - Maternal Traits
  - Stayability, Heifer Pregnancy
- Terminal Sire Index (TSI)
  - Sell all progeny on Value Based Grid
  - Growth and carcass trait focus

Hereford Selection Indexes

- Baldie Maternal Index (BMI)
  - Hereford x Angus Cows
  - Replacement females and
- Calving Ease Index (CEZ)
  - Hereford bulls for use on heifers; calves sold through CHB
- Brahman Influence Index (BMI)
  - Tiger stripe cows; calves sold through CHB
- Certified Hereford Beef Index (CHB)
  - Value Based Marketing of Calves through CHB
  - Terminal sire; carcass trait emphasis



And More Indexes

- Charolais
  - Terminal Sire Index
    - Customizable Index System
- Gelbvieh
  - Carcass Value
  - Feedlot Merit
  - Both Terminal Focused

Using Selection Indexes

- Use your marketing endpoint to guide you to 'right' index
- Apply independent culling levels to EPDs you know limit production in your environment (CED, MILK)
- Limit use of other EPDs in selection criteria (decreases selection pressure)
- Use $Index to guide you to the bull with the most optimal combination of traits
- Use $Index just like other EPDs

Thank You!

Questions?

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