Economically Relevant Traits and Selection Indicies

Matt Spangler

University of Nebraska - Lincoln

Follow this and additional works at: http://digitalcommons.unl.edu/rangebeefcowsymp

http://digitalcommons.unl.edu/rangebeefcowsymp/363

This Article is brought to you for free and open access by the Animal Science Department at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Range Beef Cow Symposium by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.
**Economically Relevant Traits and Selection Indicies**

Matt Spangler  
University of Nebraska-Lincoln

*P=G+E  
*Phenotype = Mean + BV + Environment  
*There is more than one trait that impacts the profitability of your herd!

**Fundamentals**

*What are my breeding/marketing goals?*  
*What traits directly impact the profitability of my enterprise?*  
*Are there environmental constraints?*

**How To Begin?**

*Traits that are directly associated with a revenue stream or a cost*  
*Examples*  
*BWT vs CE*  
*REA vs YG*  
*YWT vs CWT*  
*MWT vs DMI*  
*RFI vs FI*

**Economically Relevant Traits**

*Many ERTs are not currently evaluated nor collected routinely in the seedstock sector*  
*However, they drive value downstream*  
*Reproduction phenotypes (longevity)*  
*Disease (puls, treatments, mortality)*  
*“Routine” carcass data*  
*Plant value—primal yield, dark cutters, blood splash, etc.*

**Value Discovery of Added Information**

*Traits that are genetically correlated to an ERT*  
*Why use indicator traits?*  
*Measured earlier in life*  
*Cheaper/easier to measure*  
*Measured on both sexes*  
*Coheritability > heritability of ERT*

**Indicator Traits**

2015 Range Beef Cow Symposium, Loveland, Colo.
Breed table factor \((A_i)\) to add to the EPD for bull of breed \(i\):

\[ M = \text{USMARC}(i)/b + [\text{EPD}(i)_{YY} - \text{EPD}(\text{Angus})_{YY}] \]

\( \text{USMARC}(i) \) is solution for effects of sire breed \(i\) from analysis of USMARC data.

\( \text{EPD}(i)_{YY} \) is the average within-breed 2012 EPD for breed \(i\) for animals born in the base year YY (which is two years before the update).

\( \text{EPD}(i)_{\text{USMARC}} \) is the weighted average of 2012 EPD of bulls of breed \(i\) having descendants with records at USMARC.

\( b \) is the pooled coefficient of regression of progeny performance at USMARC on EPD sire.

\( i \) denotes sire breed.

Adapted from Kuehn et al., 2015.

**Table 1: Adjustment Factors to Add to EPD of Eighteen Different Breeds to Estimate Angus Breed EPD**

<table>
<thead>
<tr>
<th>Breed</th>
<th>Color</th>
<th>Weight</th>
<th>Proportion</th>
<th>ME</th>
<th>Sex Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angus</td>
<td>0.6</td>
<td>0.0</td>
<td>0.8</td>
<td>1</td>
<td>0.83</td>
</tr>
<tr>
<td>Hereford</td>
<td>0.8</td>
<td>0.2</td>
<td>0.6</td>
<td>1</td>
<td>0.60</td>
</tr>
<tr>
<td>Red Angus</td>
<td>0.4</td>
<td>0.2</td>
<td>0.6</td>
<td>1</td>
<td>0.63</td>
</tr>
<tr>
<td>Brahman</td>
<td>0.1</td>
<td>0.9</td>
<td>0.8</td>
<td>1</td>
<td>0.83</td>
</tr>
<tr>
<td>South Devon</td>
<td>0.6</td>
<td>0.4</td>
<td>0.8</td>
<td>1</td>
<td>0.80</td>
</tr>
<tr>
<td>Shorthorn</td>
<td>0.7</td>
<td>0.3</td>
<td>0.8</td>
<td>1</td>
<td>0.89</td>
</tr>
<tr>
<td>Holstein</td>
<td>0.9</td>
<td>0.1</td>
<td>0.8</td>
<td>1</td>
<td>0.81</td>
</tr>
<tr>
<td>Santa Gertrudes</td>
<td>0.6</td>
<td>0.4</td>
<td>0.8</td>
<td>1</td>
<td>0.80</td>
</tr>
<tr>
<td>Simmental</td>
<td>0.0</td>
<td>1.0</td>
<td>0.6</td>
<td>1</td>
<td>0.83</td>
</tr>
</tbody>
</table>

**Problem...**

Scaling of threshold traits

* Correctly accommodating the differences in models used by various beef breed associations
* For CE All breeds use a multi-trait model fitting BWT but some use a linear-linear and some use a threshold-linear
* Some breeds combine categories
* Mean incidence of difficulty (e.g. 50%, 80%, etc.)

**Examples**

- **Calf survival**
- **Male fertility**
- **Disease susceptibility**
- **Calving ease direct**
- **Growth rate**
- **Feed efficiency**
- **Carcass quality/composition**

**Terminal Sires—Traits of Importance**

- **Female fertility**
- **Maternal calving ease**
- **Maintenance requirements**
- **Longevity**
- **Maternal weaning weight (Milk)**
- **Disease susceptibility**
- **Adaptation**
- **Temperament**

**Maternal Traits of Importance**
*Tandem Selection
*Independent Culling Levels
*Selection Indices

**Methods of Multiple Trait Selection**

**Economic Index**

* [Dam Weight*Lean Value of Dam + No. Progeny*Progeny Weight*Lean Value of Progeny] - [Dam Feed*Value of Feed for Dam + No. Progeny*Progeny Feed*Value of Feed for Progeny].

*By simply increasing number of progeny per dam through either selection, heterosis from crossing, or better management, we will increase efficiency of production.*

**Improving Efficiency**

**Terminal or Maternal?**

**Terminal**
- SB, SF, SG (Angus)
- TI (Simmental)
- CHB$ (Hereford)
- MTI (Limousin)
- EPI and FPI (Gelbvieh)
- Charolais
- GridMaster (Red Angus)

**Maternal**
- $W, $EN (Angus)
- API (Simmental)
- BMIS, BII$, CEZ$ (Hereford)
- HerdBuilder (Red Angus)
- $Cow (Gelbvieh)

**Simulation Framework**

*Stochastic Model
*Allows for random variation in multiple traits
*Variation based on fluctuation in historical data
*Simulated base herd
*Multiple iterations

b = $P 'Gv
Economic values from simulation

**INDEPENDENT CULLING LEVELS**

CED = 2.1  WW = 43  MM = 18  SC = 0.9  IMF = 0.04

<table>
<thead>
<tr>
<th></th>
<th>CED</th>
<th>WW</th>
<th>MM</th>
<th>SC</th>
<th>IMF</th>
<th>SBMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.5</td>
<td>55</td>
<td>20</td>
<td>1.0</td>
<td>0.10</td>
<td>20.16</td>
</tr>
<tr>
<td>2</td>
<td>5.0</td>
<td>50</td>
<td>25</td>
<td>1.2</td>
<td>-0.10</td>
<td>19.55</td>
</tr>
<tr>
<td>3</td>
<td>4.0</td>
<td>45</td>
<td>20</td>
<td>1.0</td>
<td>0.25</td>
<td>20.35</td>
</tr>
<tr>
<td>4</td>
<td>1.6</td>
<td>62</td>
<td>19</td>
<td>1.0</td>
<td>0.20</td>
<td>21.64</td>
</tr>
</tbody>
</table>

Moser, 2005
*Profitability per exposure
*HerdBuilder
*Bull A 134
*Bull B 110

*30 cows/yr. over 4 yrs. = 120 exposures
*120 exposures X (134-110) =
*$2,880 profit difference
*If you follow the assumptions of the index!

*Improvement in current indices can be made by increasing the number of ERT that have EPD
*Input traits
*Fertility

*Enterprise level profitability should move closer to industry level profitability
*Example: What is the direct economic benefit for a producer to improve tenderness?

*Establish production goals
*Use economic indices that fit your desired breeding objectives
*Do not make sire selection more cumbersome than it needs to be

*Know your costs
*Select on PROFIT not just revenue

*Multiple trait selection is critical and could become more cumbersome
*Economic indexes help alleviate this
*Use index values that meet your breeding objective

*http://beef.unl.edu
*www.beefefficiency.org
*www.nbcec.org
*www.eBEEF.org

*Helpful Resources