Bull Performance and contribution to ranch income

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Outline

- Overview of CA commercial ranch project
- Prolificacy of commercial sires
- Feeder calf and retained ownership value of calves
- EPDs, prolificacy and total income
- Effect of calving distribution on income
- Practical implications and take homes
California Commercial Ranch Project

Three ranches:
- Cowley (900 cows)
- Kuck (500 cows)
- Mole-Richardson (700 cows)

Approximately 150 Angus bulls, and 6000 calves on project

Assessment of DNA-enabled approaches for predicting the genetic merit of herd sires on commercial beef ranches

United States Department of Agriculture
National Institute of Food and Agriculture
Average bull age at the beginning of the breeding season, and number of calves produced per bull that sired at least one calf on 3 commercial ranches in Northern California in 2009 and 2010.

<table>
<thead>
<tr>
<th>Ranch</th>
<th>Year</th>
<th>Season</th>
<th># of sires</th>
<th>Mean bull age</th>
<th>Total # of calves</th>
<th>Number of calves per bull</th>
<th>Aver # of calves per bull/season</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2009</td>
<td>Spring</td>
<td>13</td>
<td>2.5 ± 0.6</td>
<td>246</td>
<td>6</td>
<td>18.9 ± 12.5</td>
</tr>
<tr>
<td>A</td>
<td>2009</td>
<td>Fall</td>
<td>19</td>
<td>2.9 ± 0.9</td>
<td>345</td>
<td>1</td>
<td>18.2 ± 13.9</td>
</tr>
<tr>
<td>A</td>
<td>2010</td>
<td>Spring</td>
<td>19</td>
<td>3.4 ± 0.9</td>
<td>366</td>
<td>5</td>
<td>19.3 ± 10.7</td>
</tr>
<tr>
<td>B</td>
<td>2009</td>
<td>Spring</td>
<td>8</td>
<td>3.5 ± 2.7</td>
<td>139</td>
<td>1</td>
<td>17.4 ± 16.6</td>
</tr>
<tr>
<td>B</td>
<td>2009</td>
<td>Fall</td>
<td>9</td>
<td>4.4 ± 2.2</td>
<td>196</td>
<td>10</td>
<td>21.8 ± 11.4</td>
</tr>
<tr>
<td>B</td>
<td>2010</td>
<td>Spring</td>
<td>8</td>
<td>2.9 ± 1.2</td>
<td>129</td>
<td>3</td>
<td>16.1 ± 9.1</td>
</tr>
<tr>
<td>C</td>
<td>2009</td>
<td>Fall</td>
<td>30</td>
<td>3.3 ± 10</td>
<td>639</td>
<td>2</td>
<td>21.3 ± 13.8</td>
</tr>
<tr>
<td>C</td>
<td>2010</td>
<td>Fall</td>
<td>27</td>
<td>3.7 ± 1.3</td>
<td>568</td>
<td>1</td>
<td>21.0 ± 13.1</td>
</tr>
</tbody>
</table>

**MEAN**  

3.3  2628  19 ± 2  

Additionally, 7.3% sires failed completely (i.e. no calves sired) in any given breeding season.
Feeder calf and retained ownership value of calves.

- We compared the projected income that would have been derived per bull from 1) selling calves as feeders (cash load) or 2) using a retained ownership marketing system (going to the grid) was calculated using the production data from the California commercial ranch project (Scott Brown, MO).
- A total of 2,241 calves from 3 commercial northern California cow/calf ranches were evaluated.
- Feeder calf prices were calculated using feedlot in weights and market prices based on a single day (Green City, MO 11/23/10), and may not be representative of general trends.
- Feedlot in weights averaged 706 pounds, and the average feeding period was 152 days. Average carcass traits were: carcass weight: 743 lb; Choice: 84.5%; Prime: 1.3%; YG: 3.2; fat thickness: 0.62 inches; and ribeye area: 12.8 sq. inches.
Figure 4. Total income as feeder calves per sire or total retained ownership varied by sire (Total dollar per sire per calf crop, left axis), and the number of progeny per sire (right axis) and the mean individual feeder value/calf (right axis, $/10)
Scrotal circumference (SC) and cow energy value index ($EN) EPDs were positively correlated to total feeder calf income per sire, total retained ownership value per sire and sire prolificacy.

Generally at least 5% of the total variation (as measured by $R^2$) in each trait was explained by SC EPD. Cow Energy Value Index ($EN) EPD also tended to be positively related to those traits but typically explained only about 3% of the variation.

Four EPDs were linearly related to percent grading Choice plus or better: $G$, MARB, $QG$, and $B$.
Effect of calving distribution

- Calving distribution was categorized into 4 periods based on day of calving: 1) days 1-21; 2) days 22-42; 3) days 43-64; 4) days past 64 with the first calf born in a calf crop being day 1.

- If the genetic potential of sires differs by day of calving, then the impact of days of calving will be confounded by sire effects.

- DNA paternity testing has the added advantage in that it allows sire effects to be teased apart from day of calving effects in multisire herds.
Figure 7. Conceptions per week were greater (P<.02) during each week of the breeding season for the first 10 weeks of the breeding seasons for the two most prolific bulls (from each calf crop) compared to the two least prolific bulls.
Table 2. Calving distribution categorized as 21-d periods impact on feeder calf and retained ownership value. Periods were evaluated without removing sire effects (left), and with sire effects removed (right).

<table>
<thead>
<tr>
<th>TRAIT</th>
<th>Calving Period</th>
<th>Without Sire Effects Removed</th>
<th>With Sire Effects Removed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Mean</td>
<td></td>
</tr>
<tr>
<td>Feeder calf value, $/hd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>878.93</td>
<td>877.60</td>
<td>a</td>
</tr>
<tr>
<td>2</td>
<td>870.91</td>
<td>865.25</td>
<td>b</td>
</tr>
<tr>
<td>3</td>
<td>850.06</td>
<td>846.60</td>
<td>c</td>
</tr>
<tr>
<td>4</td>
<td>829.22</td>
<td>821.60</td>
<td>d</td>
</tr>
<tr>
<td>Calf age into feedlot, d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>353.6</td>
<td>356.6</td>
<td>a</td>
</tr>
<tr>
<td>2</td>
<td>336.8</td>
<td>340.0</td>
<td>b</td>
</tr>
<tr>
<td>3</td>
<td>316.5</td>
<td>319.9</td>
<td>c</td>
</tr>
<tr>
<td>4</td>
<td>280.3</td>
<td>283.4</td>
<td>d</td>
</tr>
<tr>
<td>Carcass grid value, $/hd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1244.89</td>
<td>1250.39</td>
<td>a</td>
</tr>
<tr>
<td>2</td>
<td>1244.62</td>
<td>1247.52</td>
<td>a</td>
</tr>
<tr>
<td>3</td>
<td>1213.31</td>
<td>1219.61</td>
<td>b</td>
</tr>
<tr>
<td>4</td>
<td>1200.06</td>
<td>1200.34</td>
<td>b</td>
</tr>
<tr>
<td>Retained value, $/hd (Carcass grid value minus feed cost)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>859.00</td>
<td>852.80</td>
<td>a</td>
</tr>
<tr>
<td>2</td>
<td>855.59</td>
<td>846.72</td>
<td>a</td>
</tr>
<tr>
<td>3</td>
<td>826.98</td>
<td>822.30</td>
<td>b</td>
</tr>
<tr>
<td>4</td>
<td>806.91</td>
<td>796.21</td>
<td>c</td>
</tr>
</tbody>
</table>
Summary and practical implications

- The number of calves born per sire per calf crop varied from 0 to 54.
- The number of progeny per sire explained most (98.4%) of the variation in the sires’ total income, whereas the individual calf value explained only another 0.88% of the variation. **This clearly supports the old adage that any calf is better than no calf.**
- Scrotal circumference (SC) and cow energy value ($EN) EPDs were positively correlated with herd sire prolificacy (number of calves), and both total feeder calf and retained ownership value per sire.
- Four EPDs were linearly related to percent grading Choice plus or prime: $G$, MARB, $QG$, and $B$
- Calves from the first 21d of the calving season returned about 40% of ranch income, and those from the first 42d of the accounted for 72%
- These data suggest inclusion of SC EPDs might be useful as selection criteria in commercial herd sire selection, & emphasize the importance of management approaches to increase the proportion of calves born in the first 21 or at most 42 days of the calving season.
Costs of natural service sire averaged $92 per live calf born

- Costs for natural service breeding continue to rise. The major factors involved are original purchase price, annual costs of feeding and maintaining bulls, often high injury and death rates, along with potential facility repairs associated with bulls.

- A range of potential cost per calf can be estimated for either a 10 or 20% bull death loss rate, purchase price ranging from $3,000 to $6,000 and annual feed and maintenance costs of $500 to $900 per bull gives a range of $48-$136/calf born. E.g. An average bull costing $4,500 with annual costs of $700 and 15% death loss siring 20 calves per year results in a cost per live calf born of $92.

Results of spring calving timed single insemination and natural service on predominantly black cows.

Table 2. Results of spring calving timed single insemination and natural service on predominantly black cows.  

<table>
<thead>
<tr>
<th></th>
<th>No. of calves</th>
<th>Age at wean</th>
<th>Actual wean wt</th>
<th>Adj. 205d wt</th>
<th>WDA</th>
<th>Value at $1.25</th>
<th>Breeding cost/calf</th>
<th>Income – Breed $</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI Polled Hereford sired calves</td>
<td>26</td>
<td>189</td>
<td>556</td>
<td>606</td>
<td>2.95</td>
<td>$695</td>
<td>97</td>
<td>$598</td>
</tr>
<tr>
<td>Angus sired calves</td>
<td>135</td>
<td>179</td>
<td>496</td>
<td>576</td>
<td>2.78</td>
<td>$620</td>
<td>79</td>
<td>$541</td>
</tr>
<tr>
<td>Advantage for AI</td>
<td>10</td>
<td>60</td>
<td>30</td>
<td>0.17</td>
<td></td>
<td>$75</td>
<td>-18</td>
<td>$57</td>
</tr>
<tr>
<td>P value</td>
<td>0.001</td>
<td>&lt;.001</td>
<td>0.009</td>
<td>0.003</td>
<td></td>
<td>&lt;.001</td>
<td>&lt;.0001</td>
<td></td>
</tr>
</tbody>
</table>
1957 vs. 2001 chickens

1957

2001

43  57  71  85 d.
Annual Production Derived from 1 Pedigree Broiler Female

3 years

Great Grand Parents

23.4 Females

Grand Parents

725 Females

Parents

24,809 Females

Broilers

3,064,000 Broilers

Image kindly provided by Dr. Rachel Hawkin, Cobb-Vantress

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Animal Genomics and Biotechnology Education
Breeding Objective

“A breeding objective need not be economic. For example, in many companion animal species it is tempting to believe that the breeding objective must be the maintenance of a ridiculous appearance and congenital abnormalities!”

(John Gibson, UNE)
Historically not all beef cattle breeding objectives have been economic.

Photo taken in 1949 at Red Bluff Bull Sale, CA. Kindly provided by Cathy Maas from Crowe Hereford Ranch, Millville, CA.


1986. "Coblepond New Yorker" weighed 2529 lbs and measured 65 inches tall at 35 mos. (Frame 10) when he was Denver Champion.

1988 Grand Champion Bull, National Polled Hereford Show (frame 10).

Images from Harlan Ritchie’s historical review of type
https://www.msu.edu/~ritchieh/historical/cattletype.html
We can make genetic changes in our cattle (and our dogs) - the question is are we making profitable change?

Killed same day at IBP in Iowa:
The small female weighed 835 lbs and was extremely fat. The large male weighed 1900 lbs and was very lean.

Images from Harlan Ritchie’s historical review of type https://www.msu.edu/~ritchieh/historical/cattletype.html
Genetic composition of the herd: 87% of genetic composition of calf crop is determined by the sires used over the last 3 generations.

- Maternal great-grand sires (12.5%)
- Maternal grand sires (25%)
- Sires (50%)


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Time line for beef breeding

Bull purchase/selection

Progeny born

Progeny slaughtered

Female progeny used for breeding


Image adapted from “More Beef from Breeding” Workshop (2007). Meat and Livestock (MLA), Australia

Van Eenennaam MO 2/12/2013
Happy California Cow
Questions?

Happy California Bulls

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