Economics of Newer Sex-sorted Semen Technologies on Beef Operations

February 6, 2017

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http://amap.missouri.edu
This Work Based On:

Effective use of SexedULTRA™ sex-sorted semen for timed artificial insemination of beef heifers: The 14-d CIDR-PG protocol with split-time AI

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Unique Considerations Relative to Use of Sex-Sorted Semen

- The sex-sorting process and associated technologies continue to improve
  - Decreased cellular damage/stress to sperm cells
  - Increased sperm cell number per dose due to improved efficiency
- However, use of sex-sorted semen still requires careful consideration of timing of insemination relative to ovulation
  - Particularly critical when considering timed AI systems
Advantages of Fixed-Time AI

- Allows for all females to be inseminated at one time on one day rather than over multiple days
- Eliminates the need for estrous detection over multiple days

Disadvantages of Fixed-Time AI

- Potential for sub-optimal female fertility compared to estrous detection
  - Females that have not expressed estrus prior to FTAI achieve lower pregnancy rates (Richardson et al., 2016)
- Potential for sub-optimal sperm fertility based on timing of insemination relative to ovulation
Obstacles to Use of Sex-Sorted Semen in the Beef Industry

- Beef producers increasingly rely on FTAI protocols due to time and labor associated with estrus detection.

- High indirect cost associated with low first service pregnancy rates due to seasonal nature of beef breeding programs.
  - Decreased average calf age and therefore weight at weaning (Dziuk and Bellows, 1983)
  - Decreased lifetime productivity of beef heifers (Lesmeister et al., 1973)
Results: Sex-Sorted Semen in Split-Time AI Beef Cows Following 7-d CO-Synch + CIDR

<table>
<thead>
<tr>
<th>Estrous Status</th>
<th>Fixed-Time AI Conventional</th>
<th>Fixed-Time AI Sex-sorted</th>
<th>Split-Time AI Sex-sorted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estrous</td>
<td>77% a (81/105)</td>
<td>51% b (53/104)</td>
<td>42% b (47/111)</td>
</tr>
<tr>
<td>Non-estrous</td>
<td>37% bc (42/113)</td>
<td>2% d (3/113)</td>
<td>36% bc (40/110)</td>
</tr>
<tr>
<td>Total</td>
<td>56% x (123/218)</td>
<td>26% z (56/217)</td>
<td>39% y (87/221)</td>
</tr>
</tbody>
</table>

Trial Design

- 856 heifers in four locations
- Semen collected from two bulls
  - SexedULTRA 4M™ sex-sorted semen (4 x 10^6 cells per unit)
  - Conventional semen (25 x 10^6 cells per unit)
- Heifers pre-assigned to balanced treatments (bull and semen type) within location based on reproductive tract score and weight at CIDR insertion
- Heifers were treated with the 14-d CIDR-PG protocol with split-time AI performed based on estrous response
## Results by Location

<table>
<thead>
<tr>
<th>Location</th>
<th>Conventional</th>
<th>SexedULTRA 4M™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location 1</td>
<td>62% (37/60)</td>
<td>61% (37/61)</td>
</tr>
<tr>
<td>Location 2</td>
<td>60%a (128/212)</td>
<td>52%b (108/209)</td>
</tr>
<tr>
<td>Location 3</td>
<td>60% (36/60)</td>
<td>58% (33/57)</td>
</tr>
<tr>
<td>Location 4</td>
<td>58%c (56/97)</td>
<td>42%d (40/95)</td>
</tr>
<tr>
<td>Total</td>
<td>60%x (257/429)</td>
<td>52%y (218/422)</td>
</tr>
</tbody>
</table>

\( \text{ab} p = 0.07 \quad \text{cd} p = 0.03 \quad \text{xy} p = 0.02 \)

How To Evaluate The Economic Effects of the Broader Adoption of Sex-sorted Semen?

- Direct cost and benefits to cow-calf producers
  - Cost of FTAI protocol
  - Cost of sexed semen
  - Economic benefit uniform calves, etc.

- Indirect benefits to other cattle market participants
  - More steers – higher slaughter weights
  - Increased feed efficiency through better genetics
  - Increased quality grade through better genetics
  - Other
Assumptions

- Direct costs
  - SexedULTRA - $20 more than conventional semen
  - SexedULTRA – relative to conventional semen 90%
  - Loss of pregnancy 6%
  - Cost of lost calf weight and slower rebreeding in out years - $55
  - Assume 20% of herd adopts SexedULTRA in 5 years
Assumptions (continued)

- Can breed for steers and raise slaughter weights – increase 4.5 pounds
- Increase feed efficiency - 2.5%
- Increase beef quality - 5% increase in prime grade
- These are preliminary assumptions
Fed Steer Price

Dollars per cwt

Baseline Scenario

College of Agriculture, Food and Natural Resources
Fed Steer Price

![Graph showing Fed Steer Price from 2016 to 2026. The graph compares Baseline and Scenario scenarios.](image-url)
Prime Box Beef Price

Dollars per cwt

2016 2018 2020 2022 2024 2026

Baseline Scenario
US Beef Cow Inventory

Dollars per cwt

2016 2018 2020 2022 2024 2026

Baseline
Scenario

College of Agriculture,
Food and Natural Resources