“The two most important days in your life are the day you are born and the day you find out why.”

Mark Twain
How is the country changing – Urban vs Rural??

2018 - World Urban Population 55%

2050 Projected 68%

Source: UN Dept. Economic and Social Affairs
Top Dairy Producer in the state of Oklahoma


USDA-NASS, November 2014
“The trigger year for the most profitable cows is approximately five years before the cattle cycle price break...the next cycle is projected to peak around 2026.”

Harlan Hughes

“Buying your next 100 cows” Beef Magazine June 2019
“Buy the cows to start calving in 2022. These animals would be born in 2020, bred in 2021, and have their first calves in 2022.”

Harlan Hughes

Increase Market Value
- Increased market price
- Quality / niche bonus

“Buying your next 100 cows”

Beef Magazine June 2019
Sustainable - Non Ag Revenue

Increase Production
“Production Medicine”  
- Managing Cost

- Pelvic Measurement
  - CED & BW EPD’s
    - Pelvic Measurement
    - Reproductive Tract Score
    - Estrous Synchronization
    - Artificial insemination

Need Industry tools
Do Not incentivize poor animal husbandry

Better Skill Sets

Sustainable
Great cows are like great treasures… They are WHERE YOU FIND THEM & hard to come by
Great Beef Female

- **Cost**
  - Optimize
    - Labor
    - Successful outcomes
  - Breed Early
  - Thrive
    - Calve unassisted
    - Stay in herd
    - Sell a calf that stays healthy
# Efficiency through Genetics - Selection Pressure

## Table 1. Reproductive tract scoring method

<table>
<thead>
<tr>
<th>Reproductive Tract Score</th>
<th>Uterine Horns</th>
<th>Ovaries</th>
<th>Ovarian structures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Length (mm)</td>
<td>Height (mm)</td>
</tr>
<tr>
<td>1</td>
<td>Immature, &lt; 20 mm diameter, no tone</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>20-25 mm diameter, no tone</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>20-25 mm diameter, slight tone</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>30 mm diameter, good tone</td>
<td>30</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>&gt; 30 mm diameter</td>
<td>&gt;32</td>
<td>20</td>
</tr>
</tbody>
</table>
“Great cows are like great treasures… They are WHERE YOU FIND THEM & hard to come by”

How do we go about finding those great females ???

<table>
<thead>
<tr>
<th>Reproductive Tract Score (RTS)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of heifers</td>
<td>163</td>
<td>893</td>
<td>8,422</td>
<td>10,092</td>
<td>9,773</td>
</tr>
<tr>
<td>Number pregnant</td>
<td>9</td>
<td>255</td>
<td>4,091</td>
<td>5,138</td>
<td>5,088</td>
</tr>
<tr>
<td>FTAI pregnancy rate (%)</td>
<td>6%</td>
<td>29%</td>
<td>48%</td>
<td>51%</td>
<td>52%</td>
</tr>
</tbody>
</table>

*Pregnancy rates resulting from fixed-time AI based on RTS. These data include pregnancy rates for 29,343 heifers that were inseminated beginning during the fall of 2010 through fall of 2016.*
Effect of reproductive tract scoring on reproductive efficiency in beef heifers bred by TAI and NS versus only NS Gutierrez K, et al. Theriogenology 81, 2014 p. 918-924

<table>
<thead>
<tr>
<th>Reproductive tract score</th>
<th>Al and natural service group</th>
<th>Natural service only group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Al-PR (%)</td>
</tr>
<tr>
<td>1 and 2</td>
<td>108</td>
<td>40.7(^a)</td>
</tr>
<tr>
<td>3</td>
<td>596</td>
<td>48.3(^a)</td>
</tr>
<tr>
<td>4</td>
<td>736</td>
<td>57.6(^b)</td>
</tr>
<tr>
<td>5</td>
<td>1220</td>
<td>64.6(^c)</td>
</tr>
</tbody>
</table>

AI and natural service group, bull-to-cow ratio is 1:40 to 1:50. Natural service only group, bull-to-cow ratio is 1:20 to 1:25. *85-day breeding season [29].

Within columns, means without a common superscript differed (P < 0.05).

Within rows, means without a common superscript differed (P < 0.05).

Abbreviations: AI, artificial insemination; Al-PR, artificial insemination pregnancy rate; BS-PR, breeding season pregnancy rate.
Estrous synch. protocol
固定时间受精（FTAI）

• reduce the amount of animal handling
  o sorting estrual heifers at the time of insemination
  o Estrus detection and insemination at 12 hours does not accomplish minimal handling

“Establishment of Pregnancy in Beef Cattle: Application of Basic Principles” - Applied Reproductive Strategies in Beef Cattle, 2015,
Mike Smith
<table>
<thead>
<tr>
<th>Protocol</th>
<th>Non-cycling (2&amp;3)</th>
<th>Cycling (4&amp;5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-day CO-Synch + CIDR</td>
<td>166/438</td>
<td>369/861</td>
</tr>
<tr>
<td>MGA-PG</td>
<td>81/230</td>
<td>265/564</td>
</tr>
<tr>
<td>14-day CIDR-PG</td>
<td>4,027/8,647</td>
<td>9,588/18,434</td>
</tr>
</tbody>
</table>

Note: Does not include RTS 1 - Prepubertal Heifers

Percentages within rows with different superscripts differ (P < 0.01).

Percentages within columns with different superscripts differ (P < 0.01).
## 2020 Heifer Development Season

<table>
<thead>
<tr>
<th>Description</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Females P.M. &amp; RTS</td>
<td>456</td>
<td></td>
</tr>
<tr>
<td>Number Heifers culled for RTS #1 or Small Pelvis</td>
<td>85</td>
<td>18.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.I. Preg. Rate:</td>
<td></td>
<td></td>
</tr>
<tr>
<td># Al Preg</td>
<td>214</td>
<td></td>
</tr>
<tr>
<td># A.I.</td>
<td>371</td>
<td>58%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeding Season Preg Rate:</td>
<td></td>
<td></td>
</tr>
<tr>
<td># preg</td>
<td>309</td>
<td></td>
</tr>
<tr>
<td># Exposed</td>
<td>371</td>
<td>83%</td>
</tr>
</tbody>
</table>

NAHMS Open Rate = 17%
• Heifers that returned to estrus after being bred to a fertile bull differed (p<.05)

  o first heat (E1-43%) and third heat (E3-22%)
  o i.e. twice as many first heats returned to estrus

(Byerley et al., 1987, J. Anim. Sci. 65:645-650)

Other tools - Synchronized bull breeding

• Pubertal heifers remains critical for efficiency
Effect of RTS used with Fixed Timed A.I. (FTAI) and P₄-based ovulation synchronization

- 4041 Angus cross beef heifers
  - Age: 14.8 + 0.6 months
  - 7 locations
  - RTS @ 4 wks prebreeding
  - 2008-2010 breeding seasons
  - Feed to NRC requirements

Controlling Labor cost through use of FTAI
- Least number of times handled
- Efficient labor when handling
Effect of RTS used with Fixed Timed A.I. (FTAI) and P₄-based ovulation synchronization

- 4041 Angus cross beef heifers
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  - 7 locations
  - 4 wks prebreeding
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- 2,660 hd. = Al-NS
  - CIDR & FTAI followed by natural service B/H ratio 1:40
  - Total breeding season 85-day
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- 1,381 hd. = NSO
  - Exposed to bulls only for total 85 days
  - B/H ratio 1:20
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- U.S. Preg ck. at 70 days post A.I. and again 2mo post end of breeding season
- BSE, Trich, etc. and BCS of heifers standard across both groups
  - No difference among bulls - CR across all groups P>0.1
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Heifers in the Al-NS group, pregnant at least 25 days earlier than NSO group
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Heifers in the Al-NS group, pregnant at least 25 days earlier than NSO group
Increased Revenue by increasing age & weight
Does 25 Days Make a Difference?

6 cwt Steer
Cost for Artificial Insemination

<table>
<thead>
<tr>
<th>AI Costs/head</th>
<th>Dose #</th>
<th>Labor 50 cows/heifers</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>Hours</td>
<td>Rate</td>
</tr>
<tr>
<td>Semen</td>
<td>$ 22.50</td>
<td>$ 22.50</td>
<td>Corral</td>
<td>1.5</td>
</tr>
<tr>
<td>CIDR</td>
<td>$ 13.75</td>
<td>$ 13.75</td>
<td>Insert CIDR</td>
<td>0.5</td>
</tr>
<tr>
<td>Lutalyse</td>
<td>$ 3.80</td>
<td>$ 3.80</td>
<td>Corral</td>
<td>1.5</td>
</tr>
<tr>
<td>GNRH</td>
<td>$ 2.48</td>
<td>$ 4.96</td>
<td>Pull CIDR</td>
<td>0.3</td>
</tr>
<tr>
<td>Estrus Alerts</td>
<td>$ 1.62</td>
<td>$ 1.62</td>
<td>Corral</td>
<td>1.5</td>
</tr>
<tr>
<td>Artificial Insemination</td>
<td>$ 16.45</td>
<td>$ 16.45</td>
<td>Assist Breed Day</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>$ 58.12</td>
<td>$ 4.96</td>
<td>Total</td>
<td>$ 149.40</td>
</tr>
</tbody>
</table>

Total Meds. $63.08
Total Labor
Per Hd. $2.99

$ 66.07 per hd.
## Cost of Natural Service Sires

<table>
<thead>
<tr>
<th>Breed</th>
<th>3 Year Average Sales</th>
<th>Multi-year - Multi-breed - Mean Sire Purchase Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$3,989</td>
<td>$3,800</td>
</tr>
<tr>
<td>B</td>
<td>$4,265</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>$3,263</td>
<td></td>
</tr>
</tbody>
</table>

Average age at cull: 6 years

Prorated Price Bull / Year: $650

Average 15% loss due to lame, fertility, penis/sheath: $765

Average Carrying cost / Year: $755

Total Annual Average Bull cost: $1,520

Average Cows Serviced per Year: 25

Average cost per cow at 100% preg rate: $76
Figure 1. Analysis of the influence of calving period on herd survival from (A) U.S. Meat Animal Research Center (USMARC) and (B) South Dakota Integrated Resource Management groups. (A) Results from Angus and Angus crossbred heifers \((n = 16,549)\) from USMARC. More heifers from the first calving period remained in the herd at 5 yr of age than from the later calving periods \((P < 0.01)\); (B) Commercial beef heifers \((n = 2,195)\) on producer operations that were retained by producers as replacement heifers. Heifers that calved during the first 21-d period with their first calf remained in the herd longer than heifers that calved later \((P < 0.01)\).


Sustainable • Great Cows!

Cushman - reported increases in calf weaning weights for cows calving in the first 21 days compared to their contemporaries **through first 6 calves.**
25 days - Literature

Real World Application

Drought/Fire Recovery herd - ½ owned and managed, ½ leased and managed

Same Heifers - same feed costs - same breeding cost
- $156.41 Sept. 2019 WW livestock
- $?/?/head Advantage

<table>
<thead>
<tr>
<th>Age of last calf @ weaning</th>
<th>171</th>
<th>Age of last calf @ weaning</th>
<th>182</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Weight of steers</td>
<td>660</td>
<td>Avg. Weight of steers</td>
<td>567</td>
</tr>
<tr>
<td>Avg. weight of heifers</td>
<td>608</td>
<td>Avg. weight of heifers</td>
<td>546</td>
</tr>
</tbody>
</table>

93 lb. difference in average w. wt. steers = $10,881

62 lb. difference in average w. wt. heifers = $2,604
(Heifers kept as replacements removed from revenue)