Reproductive management strategies for beef cattle in Florida

How many cows do you need to produce 30,000 lb of weaned calves?

- premise: weaning weight = 500lb
- # calves needed = 60

1st Scenario: 60% weaning rate (poor reproduction)

2nd Scenario: 90% weaning rate (excellent reproduction)
How many cows do you need to produce 30,000 lb of weaned calves?

- Premise: weaning weight = 500lb
- # calves needed = 60

1st Scenario: 60% weaning rate: **100 cows needed**
(100 cows x 60% = 60 calves)

2nd Scenario: 90% weaning rate: **67 cows needed**
(67 cows x 90% = 60 calves)

Conclusion: you may have the same total production with less cows that are more efficient reproductively. This means less methane.

How many females in reproduction do you need if you breed vs. don’t breed yearling heifers?

- Premise 1: 100 females in reproduction
- Premise 2: 20% replacement rate
- Premise 3: 80% weaning rate
- Premise 4: 500 lb weaning weight
How many females in reproduction do you need if you breed vs. don’t breed yearling heifers?

- Premise 1: 100 females in reproduction
- Premise 2: 20% replacement rate
- Premise 3: 80% weaning rate
- Premise 4: 500 lb weaning weight

<table>
<thead>
<tr>
<th>Female Category</th>
<th>Breed yearlings</th>
<th>Don’t breed yearlings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature cow</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>2 years-old heifer</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Yearling heifer</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Total females</td>
<td>100</td>
<td>120</td>
</tr>
<tr>
<td>Total breeding females</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Total calf production</td>
<td>40,000 lb</td>
<td>40,000 lb</td>
</tr>
</tbody>
</table>

Conclusion: you may have the same total production with less females if you breed yearlings. This means less methane.

Topics (and take-home message):

1. Reproductive efficiency.
   **Guiding principle**: breeding early in the season is critical to maximize lifetime productivity.

2. Heifer fertility.
   **Guiding principle**: puberty attainment prior to breeding is critical to yearling heifer fertility.

3. Reproductive technologies.
   **Guiding principles**: Use of technology will benefit your cow-calf operation; Apply gradually; Have realistic expectations.
Control of the breeding season

- Timed bull breeding
  - AI + bull
- Timed AI + bull
- TAI + resynch + TAI
- Embryo transfer
- OPU + IVF + Embryo transfer

Increasing technological level

- Breed
  - Year 1
  - Year 2
  - Year 3
  - Year 4

There is a 40-50 days window to get a cow pregnant in a 90-day breeding season, to keep a 12 mo. calving interval.

A multi-year scenario

- Breed
  - Year 1
  - Year 2
  - Year 3
  - Year 4

12 mo. calving interval
A multi-year success scenario: dam and yearling heifer pregnant at the beginning of breeding season year 4

A multi-year challenging scenario: dam and yearling heifer not pregnant at the end of breeding season year 4
Control of the breeding season

Timed bull breeding

- AI + bull
- Timed AI + bull
- TAI + resynch + TAI
- Embryo transfer
- OPU + IVF + Embryo transfer

San Marino Ranch, Okeechobee, FL (2018-2019)
San Marino Ranch, Okeechobee, FL (2018-2019)

- **CIDR® PGF2α**
  - Bulls in (1:10)
  - Synch
  - Bulls out (1:25)

- **Heat:** 88.9% (56/63)
- **Preg at 60 days of BS:** 78.5% (51/65)
- **Preg at 105 days of BS:** 92.3% (60/65)

San Marino Ranch, Okeechobee, FL (2019-2020)

- **Heat:** 88.7% (47/53)
- **Preg at 60 days of BS:** 37.7% (20/53)
- **Cyclicity:** 77.4% (41/53)

Using Timed Natural Breeding to increase early conception in the breeding season

- **Bulls in (1:25)**
- **Bulls out**
Crossbred multiparous cows (n=119 animals; Ona)

Obs: Pregnancy check at 90d was not performed (COVID).

Effect of Select Synch + CIDR followed by bull breeding on reproductive performance of crossbred multiparous cows (1 bull : 25 cows)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No CIDR (n=59)</td>
</tr>
<tr>
<td>Cyclic at beginning of BS, %</td>
<td>40.7</td>
</tr>
<tr>
<td>Estrus in 7d of BS, %</td>
<td>39.0</td>
</tr>
<tr>
<td>Pregnancy at 45d of BS, %</td>
<td>28.8</td>
</tr>
<tr>
<td>Presence of CL at 45d of BS, %</td>
<td>90.5</td>
</tr>
<tr>
<td>Pregnancy at the end of BS, %</td>
<td>91.5</td>
</tr>
</tbody>
</table>

How about MGA?

Case study 1 (WCC; Brangus heifers, n=195)
Case study 1 (WCC; Brangus heifers, n=195)

Effect of administration of prostaglandin analogue (Estrumate) 19 d after the end of a treatment with MGA for 14d on reproductive performance of yearling Brangus heifers serviced by bull.

<table>
<thead>
<tr>
<th>Variables</th>
<th>NoPGF (n= 97)</th>
<th>PGF (n= 98)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnancy at first 10 d of BS, %</td>
<td>38.1</td>
<td>33.7</td>
</tr>
<tr>
<td>Pregnancy at first 60 d of BS, %</td>
<td>75.30%</td>
<td>69.40%</td>
</tr>
<tr>
<td>Cyclicity at 90 d of BS, % (open heifer)</td>
<td>56.5</td>
<td>66.7</td>
</tr>
</tbody>
</table>

Case study 2 (Longino Ranch & Perry Cattle Co., Brangus heifers, n=135)

Table 1. Effect of administration of CIDR insertion on the protocol MGA-PG

<table>
<thead>
<tr>
<th>Variables</th>
<th>Non-CIDR</th>
<th>CIDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnancy to AI &amp; TAI, %</td>
<td>(24/47)</td>
<td>(23/50)</td>
</tr>
<tr>
<td></td>
<td>51.1</td>
<td>46</td>
</tr>
<tr>
<td>Pregnancy to Bull, %</td>
<td>(6/21)</td>
<td>(19/17)</td>
</tr>
<tr>
<td></td>
<td>28.6</td>
<td>47.1</td>
</tr>
<tr>
<td>Final Pregnancy</td>
<td>(92/168)</td>
<td>(69/87)</td>
</tr>
</tbody>
</table>

Case study 2 (Longino Ranch & Perry Cattle Co., Brangus heifers, n=135)

Effect of estradiol on estrus detection in Brangus heifers.
Control of the breeding season

- Timed bull breeding
  - AI + bull
  - Timed AI + bull
  - TAI + resynch + TAI
  - Embryo transfer
  - OPU + IVF + Embryo transfer

Protocol used at UF Gainesville Beef Units

Select Synch + CIDR® & TAI

- Heat detection and AI day 7 or 10 and TAI if non-responder 72-94 hr after PG with GoMRI at TAI

Pregnancy rates of UF-multibreed herd during breeding season 2020

- Yearling (n=101)
- Primiparous (n=70)
- Secundiparous (n=115)
- Multiparous (n=176)
Protocol used at UF NFREC Beef Unit

GnRH  PGF2 α + Estrotec BE (AM) TAI + GnRH

D0  D7  D9  D10  D16

Heat detection (AM)
AI (PM)

Bulls in  Bulls out

Preg-Check  Preg-Check

≈D30  ≈D90  ≈D120

Preg-Check

Protocol used at UF NFREC Beef Unit

Dr. Angela Gonella

Fig 4. Pregnancy rates NFREC herd during breeding season 2020

Pregnancy rates of UF-NFREC herd during breeding season 2020

Pregnancy rates of UF-Brahman herd during breeding season 2020

Pregnancy rates per AI, %

Yearling (n= 130)  Primiparous (n= 66)  Secundiparous (n= 11)  Multiparous (n= 62)
How well do cows that calved early in the calving season, do in the subsequent breeding season?

Data set: Multibreed herd 2020

How well does a heifer that was bred as a yearling do as a first calf-heifer in terms of pregnancy?
How well does a heifer that was bred as a yearling do as a first calf-heifer in terms of pregnancy?

- Data set: Multibreed herd 2019/2020

How much better do calves born early in the calving season do (weaning weight and fertility as heifer)?

<table>
<thead>
<tr>
<th>Calving month</th>
<th>Age (d)</th>
<th>Weight (lb)</th>
<th>Reproductive performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>PAI</td>
</tr>
<tr>
<td>Nov-Dec</td>
<td>411.9 ± 14.0</td>
<td>762.0 ± 69.5</td>
<td>40.1</td>
</tr>
<tr>
<td></td>
<td>(59/147)</td>
<td>(118/147)</td>
<td></td>
</tr>
<tr>
<td>Jan-Feb</td>
<td>366.7 ± 15.6</td>
<td>680.7 ± 81.4</td>
<td>40.0</td>
</tr>
<tr>
<td></td>
<td>(20/50)</td>
<td>(38/50)</td>
<td></td>
</tr>
</tbody>
</table>
Control of the breeding season

- Timed bull breeding
  - AI + bull
  - Timed AI + bull
  - TAI + resynch + TAI
- Embryo transfer
- OPU + IVF + Embryo transfer

Increasing technological level

What is the moment of estrus after CIDR removal? Is split timed-AI viable?

- 2019
  - %
- 2020
  - %

Control of the breeding season

- Timed bull breeding
  - AI + bull
  - Timed AI + bull
  - TAI + resynch + TAI
- Embryo transfer
- OPU + IVF + Embryo transfer
A case study: Super-early resynchronization program in Brahman cows (n= 27)

- GnrH
- PGF
- Estrroct
- Doppler
- CIDR
- AI
- TAI
- D10
- D10
- D30
- D54

False negative: 0.1%
A case study: Super-early resynchronization program in Brahman cows (n=27)

Conclusion: 63% of cows were pregnant in first 24 days of the breeding season.
Control of the breeding season

- Timed bull breeding
  - AI + bull
- Timed AI + bull
- TAI + resynch + TAI
- Embryo transfer
- OPU + IVF + Embryo transfer

Increasing technological level
Pre-breeding heifer evaluation: Reproductive Tract Scores (RTS)

Table 1: Uterine and ovarian measurements and descriptions for reproductive tract scores:

<table>
<thead>
<tr>
<th>RTS Classification</th>
<th>Uterine horn (mm)</th>
<th>Ovarian length (mm)</th>
<th>Ovarian height (mm)</th>
<th>Ovarian weight (g)</th>
<th>Ovarian structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepubertal</td>
<td>&lt;30</td>
<td>15</td>
<td>10</td>
<td>6</td>
<td>No palpable</td>
</tr>
<tr>
<td>Pubertal</td>
<td>20-25</td>
<td>15</td>
<td>10</td>
<td>6</td>
<td>8 mm follicles</td>
</tr>
<tr>
<td>Prepubertal</td>
<td>20-25 mm, slight</td>
<td>22</td>
<td>15</td>
<td>10</td>
<td>8 mm follicles</td>
</tr>
<tr>
<td>Pubertal</td>
<td>30 mm, good tone</td>
<td>30</td>
<td>15</td>
<td>12</td>
<td>Ovarian follicles</td>
</tr>
</tbody>
</table>

Relationship between RTS and body weight prior to the beginning of the breeding season for heifers that attained or did not attain puberty just prior to AI.
Relationship between RTS and body weight prior to the beginning of the breeding season for heifers that attained or did not attain puberty just prior to AI.

![Relationship between RTS and body weight](image)

- RTS(D-3(RTS < 4))
- RTS(D-3(RTS4-5))

Table 1. Effect of a 15H-OTR induction treatment on estrus response and pregnancy of heifers that became or did not become pregnant to AI.

<table>
<thead>
<tr>
<th>Variable</th>
<th>PRE</th>
<th>CIDR</th>
<th>CIDR</th>
<th>Status</th>
<th>Status</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estrus by TAL. % (n/n)</td>
<td>42.3 (45/108)</td>
<td>41.8 (49/125)</td>
<td>77.2 (52/67)</td>
<td>66.3 (22/34)</td>
<td>&lt;0.001</td>
<td>0.54</td>
</tr>
<tr>
<td>R/Al. % (n/n)</td>
<td>29.4 (50/155)</td>
<td>30.5 (11/25)</td>
<td>56.8 (17/30)</td>
<td>42.4 (28/104)</td>
<td>&lt;0.001</td>
<td>0.43</td>
</tr>
</tbody>
</table>

Relationship between RTS and body weight prior to the beginning of the breeding season for heifers that became or did not become pregnant to AI.

![Relationship between RTS and body weight](image)

- Open
- Pregnant
Relationship between RTS measured prior to the beginning of breeding season (D -23) and reproductive performance of heifers.

<table>
<thead>
<tr>
<th>RTS1-2 (n= 147)</th>
<th>RTS3-5 (n= 429)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnancy rates, %</td>
<td></td>
</tr>
<tr>
<td>27.2</td>
<td>76.7</td>
</tr>
<tr>
<td>44.9</td>
<td>86.7</td>
</tr>
</tbody>
</table>

The “Who’s My Heifer?” Program: Optimizing Replacement Beef Heifer Development in Florida (stay tuned…)

Proponents:
- Mario Binelli, PhD (Animal Sciences, IFAS, UF – Program Leader)
- Angela M. Gonella Diaza, DVM, PhD (NFREC, IFAS, UF)
- João H. Jabur Bittar, DVM, PhD (Large Animal Clinical Sciences, CVM, UF)
- Filipe Moriel, PhD (RCREC, IFAS, UF)
- Livestock Agents (IFAS, UF)

Objective:
- Establish a statewide system to generate, analyze and report information on the reproductive potential and performance of replacement beef heifers.

Activities in a nutshell (reproduction):
- Pre-breeding season evaluation of reproductive potential (RTS) and breeding season evaluation of performance (preg check).
The Specific Objective of this proposal was to discover non-genomic molecular markers (from blood samples) that will be used to predict early puberty in Brahman heifers.

Fig. 1 - Schematic overview of the experiment. Seventy-four Brahman heifers were blood-sampled monthly from weaning to the one month before the beginning of the breeding season (DD) and submitted to an estrous synchronization protocol and artificial insemination. After a subsequent classification between Pubertal and Pre-pubertal heifers, samples collected at D-1 (10-13 months of age) and D-3 (8-11 months of age) were retrospectively submitted to metabolomics analyses to identify molecular markers of early puberty attainment.
Conclusions:

1. Reproductive and nutritional management of heifers and cows should aim to maximize pregnancies early in the breeding season.

2. Exposure to a synchronization protocol followed by natural breeding or AI increases pregnancies early in the breeding season.

3. Pre-breeding season evaluation by RTS provides a decision tool for heifer reproductive management.

4. Puberty can be induced by exposure to progesterone (or MGA).
Brangus heifers (n= 142 animals; WCC)

Obs: Pregnancy check at 120d was not performed (COVID).

Effect of Select Synch + CIDR followed by bull breeding on reproductive performance of yearling, Brangus heifers (1 bull : 20 heifers)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control (n=71)</th>
<th>CIDR (n=71)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclicity at beginning of BS, %</td>
<td>38.0</td>
<td>42.3</td>
</tr>
<tr>
<td>Pregnancy at first 10 d of BS, %</td>
<td>15.5</td>
<td>22.5</td>
</tr>
<tr>
<td>Cyclicity at 30 d of BS, %</td>
<td>51.7</td>
<td>50.9</td>
</tr>
<tr>
<td>Pregnancy at 60 d of BS, %</td>
<td>60.30</td>
<td>63.40</td>
</tr>
<tr>
<td>Cyclicity at 90 d of BS, %</td>
<td>51.90</td>
<td>69.20</td>
</tr>
</tbody>
</table>

Brangus heifers (n= 142 animals; WCC)

Effect of Select Synch + CIDR followed by bull breeding on reproductive performance of yearling, Brangus heifers classified according to the RTS on the beginning of breeding season (BS)

<table>
<thead>
<tr>
<th>RTS1-3</th>
<th>RTS5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight at the beginning of BS (Lb)</td>
<td>758.5</td>
</tr>
<tr>
<td>Pregnancy at 10 d of BS, %</td>
<td>2.3</td>
</tr>
<tr>
<td>Cyclicity at 30 d of BS, %</td>
<td>35.7</td>
</tr>
<tr>
<td>Pregnancy at 60 d of BS, %</td>
<td>43.9</td>
</tr>
<tr>
<td>Cyclicity at 90 d of BS, %</td>
<td>50</td>
</tr>
<tr>
<td>Weight at 90 d of BS (Lb)</td>
<td>781.9</td>
</tr>
</tbody>
</table>