

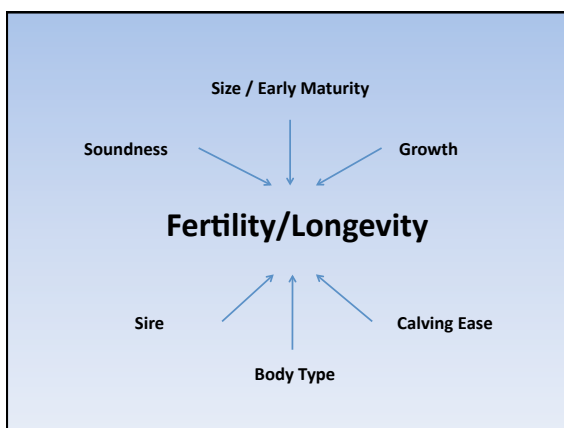
## EFFECT OF HEIFER CALVING DATE ON LONGEVITY AND LIFETIME PRODUCTIVITY

E.M. Mousel, R.A. Cushman, G.A. Perry, and L.K. Kill

Applied Reproductive Strategies in Beef Cattle  
December 3-4 2012, Sioux Falls, SD

### Selection for Fertility

- ✓ Spreading costs of cow maintenance over larger offspring numbers thus remains the single most important strategy for improving biological efficiency of beef production (Notter, 2002).
- ✓ To be sustainable, producers need to manage their herd to reduce the number of cows that are culled at a young age.
- ✓ How quickly does she recover her development cost?



### Selection for Fertility

- ✓ Fertility is a key component of longevity in the cow herd.
- ✓ Low heritabilities of most direct measures of fertility (Cammack et al., 2009).
- ✓ Breeding for fertility may not be achievable at the population level, but selecting high fertility individual heifers may be.
- ✓ Is there a more direct way to select for fertility and thus longevity?

### Objectives

- ✓ Does selecting heifers based on early conception and thus early calving consistently result in:
  - ✓ Increased longevity in the herd?
  - ✓ Increased productivity?
  - ✓ Increased profitability of the herd?

### Methods

- ✓ Two separate populations were evaluated in this study.
- ✓ The first population included data collected from producers involved in South Dakota Integrated Resource Management groups (n=2,195).
- ✓ The second population included heifers and their respective calves over a twenty-one year period of time (1980 to 2000) at the USMARC (n=16,469).

### Methods

- ✓ Heifers were then sorted into 21 day calving groups.
- ✓ Females were removed from the record at any point they preg-checked open.
- ✓ Females that were removed from the herd, yet still recorded as pregnant were censored from the data analysis the year they left the herd.

### Longevity in the Herd

- ✓ Heifers that calved with their first calf during the first 21 d period of the calving season had increased ( $P < 0.01$ ) longevity compared to heifers that calved in the second 21 d period, or later (Figure 1 and 2).
- ✓ Two very different populations.

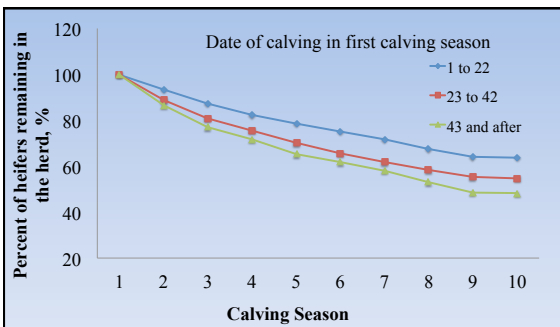


Figure 1. Influence of calving date in first calving season on longevity within the USMARC heifers ( $P < 0.01$ ).

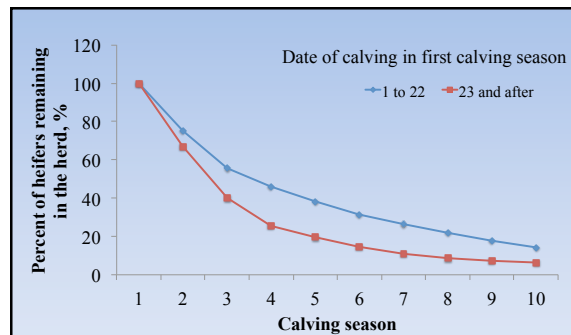


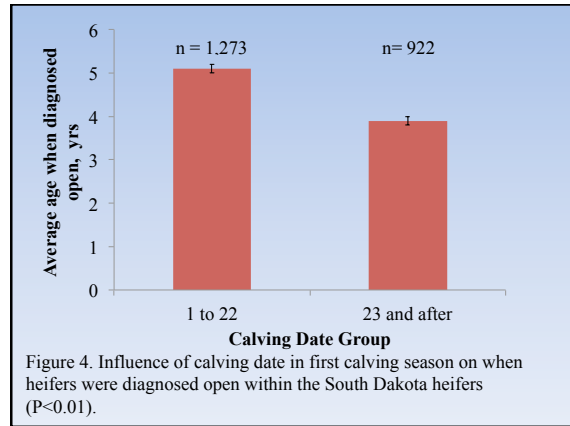
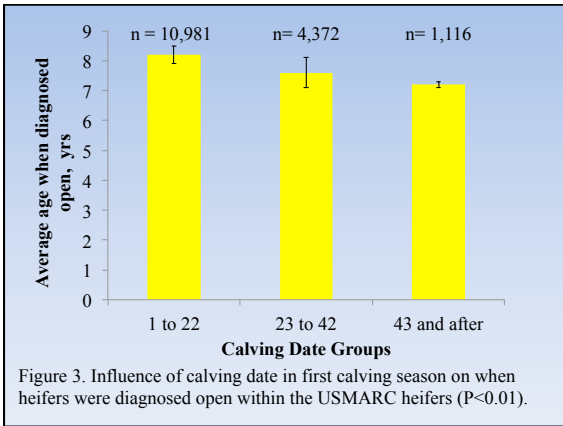
Figure 2. Influence of first calving date in first calving season on longevity within the South Dakota heifers ( $P < 0.01$ ).

### Longevity in the Herd

- ✓ Of the heifers that calved with their first calf in the first 21 d period of the calving season at the USMARC:
  - ✓ 63.7% of them were still in the herd after 10 calving seasons
    - ✓ 54.7% of heifers in 2<sup>nd</sup> 21 d
  - ✓ 14.3% of South Dakota heifers remained after 10 calving seasons
    - ✓ 6.4% of heifers in 2<sup>nd</sup> 21 d
- ✓ Positive relationship between early calving heifers and longevity in the herd.

### Longevity in the Herd

- ✓ Two very different populations:
  - ✓ Climate
  - ✓ Management
  - ✓ Profit taking



### Longevity in the Herd

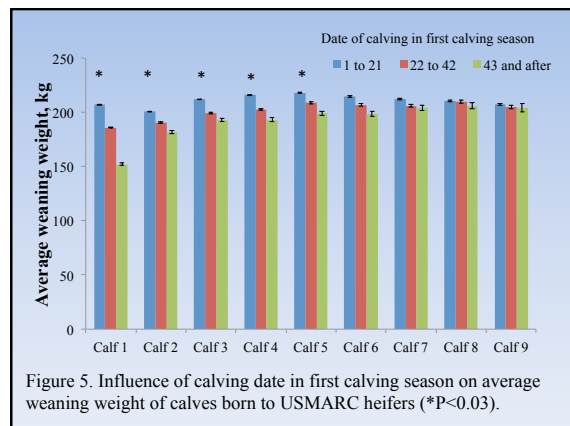
- ✓ USMARC heifers:
  - ✓ 66% calved in 1<sup>st</sup> 21 d
- ✓ South Dakota heifers:
  - ✓ 58% calved in 1<sup>st</sup> 21 d

### Longevity in the Herd

- ✓ Average longevity for USMARC heifers:
  - ✓ 1<sup>st</sup> 21-days = 8.2 ± 0.3 years
  - ✓ 2<sup>nd</sup> 21-days = 7.6 ± 0.5 years
  - ✓ 3<sup>rd</sup> 21 days = 7.2 ± 0.1 years
- ✓ Average longevity for South Dakota heifers:
  - ✓ 1<sup>st</sup> 21-days = 5.1 ± 0.1 years
  - ✓ 2<sup>nd</sup> 21-days = 3.9 ± 0.1 years

### Longevity in the Herd

- ✓ Longevity of USMARC heifers:
  - ✓ Calved in first 21 d vs. second 21 d was 7% greater
- ✓ Longevity of South Dakota heifers:
  - ✓ Calved in first 21 d vs. second 21 d was 24% greater
- ✓ Variation within herds



### Productivity

- ✓ Calving period influenced total weight weaned and mean weaning weight per calf ( $P < 0.01$ ).
- ✓ Heifers that calved during the 1<sup>st</sup> period:
  - ✓ 4.5% higher total weight weaned (4,169 lb. vs. 3,979 lb.)
  - ✓ 4.5% higher mean weaning weight per calf (463 lb. vs. 442 lb.)
- ✓ Calving period of USMARC heifers:
  - ✓ Influenced weaning weight of the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> calf
  - ✓ Did not influence weaning weight of the 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, or 9<sup>th</sup> calf

### Productivity

- ✓ Shorter postpartum intervals of early calving females play a major role in calf weaning weight.
- ✓ Influence of a fixed weaning date in managed systems
- ✓ Females that have longer reproductive lives wean more calves and thus have the potential for a higher lifetime weaning weight average.

### Profitability of SD Herds

- ✓ Mean return per female:
  - ✓ 1<sup>st</sup> 21 d period \$1,055.69
- ✓ Mean return per female:
  - ✓ 2<sup>nd</sup> 21 d period and after \$705.45
- ✓ Mean return per female:
  - ✓ Whole herd \$908.19
- ✓ Heifers that calve in the 1<sup>st</sup> 21 d represent as much as 75% of future income

### What Does This Mean?

- ✓ Identifying the heifers that calve early in the calving season may be the simplest method to improve longevity and profitability.
- ✓ Tendency of cow-calf operators is to select the oldest and largest heifers as a proxy for fertility.
- ✓ The oldest, heaviest heifers do not always cycle the earliest; suggesting a tremendous amount of genetic variation, environmental effects, or both.

### What Does This Mean?

- ✓ Can we select for fertility?
- ✓ Heritability of fertility is fairly low, thus it is likely that very little improvements in fertility in a population would be made simply by selecting for those heifers that calved early in their first season (Lesmeister et al. 1973).
- ✓ The relatively low heritability of reproduction traits has made selection through the use of genetic technology relatively slow.

### What Does This Mean?

- ✓ Physiological indicators used as an indicator of fertility in cattle:
  - ✓ Antral follicle count (Cushman et al. 2009)
  - ✓ Interval to commencement of luteal activity postpartum (Royal et al. 2002)
  - ✓ Interval from calving to postpartum ovulation (Darwash et al. 1997)
- ✓ Selection indices for fertility based on these criteria (and others) have been developed in dairy industry (Miglior et al. 2005). Similar indices have been suggested for fertility in beef females (VanRaden 2005).

### What Does This Mean?

- ✓ The use of genetic markers for fertility are the most likely to generate any real advancements in selection tools.
- ✓ Will we be able to identify genetic markers for fertility?
- ✓ Heifer's age at first calving may be the best phenotypic indicator of fertility and likely is a promising population to use for finding genetic markers for fertility.

### Conclusions

- ✓ Heifers that calved early in the calving season with their first calf had increased longevity and productivity compared to heifers that calved later in the calving season.
- ✓ The relative impact may be more pronounced in some herds than others.
- ✓ Selecting heifers that calve early in their first calving season may be the best indicator of fertility, predictor of longevity in the herd, and profitability to the business.

### Conclusions

- ✓ Identifying the heifers that calve early in the calving season may be the simplest method to improve longevity and profitability in beef herds.
  - ✓ Mass selection
  - ✓ Short breeding seasons
  - ✓ Sell late calvers

Thank You!