BEEF CATTLE RESEARCH UPDATE

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Utilization of Fixed-time Artificial Insemination to Reduce Breeding Season Length: Case Study

A 2007-08 USDA survey of U.S. beef cow operations (2,872 cow/calf operations from 24 states) found that only 7.6% of these operations utilize artificial insemination (AI) as a reproductive management tool.[1] Two of the primary reasons that these operations did not use AI were "labor/time" concerns and "too difficult/complicated" to implement estrous synchronization protocols (37.7 and 16% of operations, respectively). However, during the past decade, fixed-time AI (TAI) protocols have been developed that eliminate detecting estrus and yield satisfactory pregnancy rates. A recent University of Florida case study evaluated the long-term production and economic impact of implementing estrous synchronization (ES) and TAI protocols over an eight year period at the North Florida Research and Education in Marianna, FL.[2]

This case study was conducted during the spring 2008 to spring 2013 breeding seasons in a cow/calf operation consisting of 300 cows. Prior to 2008, the herd was exposed to a 120 day breeding season by natural service. In 2008, and every subsequent breeding season to 2013, all females were exposed to TAI using ES protocols (either 5 day or 7 day CO-Synch + CIDR protocol) with the goal of reducing the breeding season to 70 days. To achieve this goal, these researchers decided that all females in the operation would be exposed to the following criteria: 1) replacement heifers must become pregnant during the first 25 days of the breeding season; 2) every cow will be exposed to ES and TAI; 3) each cow must produce a live calf every year and calve without assistance or they will be culled; 4) every cow must provide the resources for the genetic potential of the calves and each calf it produces must be genetically capable of performing; 5) no supplemental feeding was offered to cows that failed to maintain body condition; and 6) any cow with an undesirable temperament or disposition was culled.

In the 2008 and 2009 breeding seasons, the cows were inseminated in three TAI groups, subsequently reduced to two TAI groups in the 2010 and 2011 breeding seasons, and eventually to a single TAI group in the 2012 and 2013 breeding seasons. Following the initial TAI for each group, the cows were detected for estrus and artificially inseminated after an observed estrus until day 23 after TAI. On day 23 after TAI, bulls were introduced and cows were naturally mated for the remainder of the breeding season.

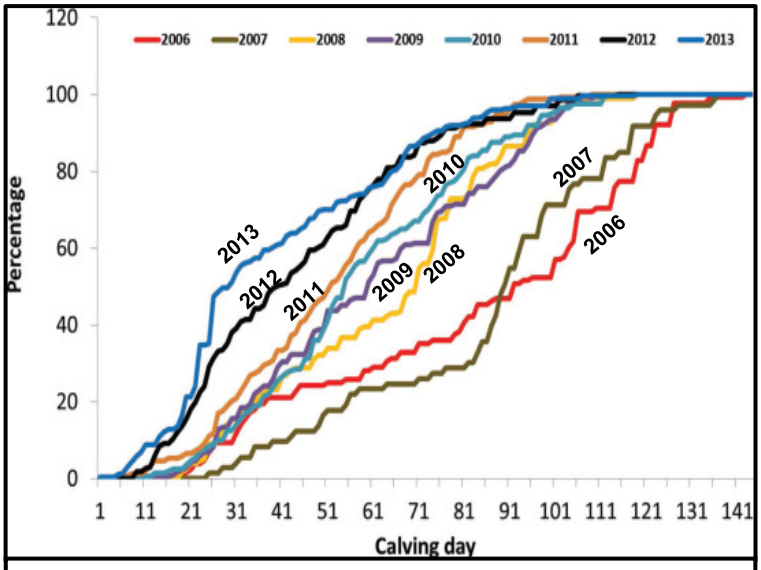

Figure 1. Cumulative calving percentage by year for 2 years (2006 and 2007) before introducing fixed-time AI, reducing the breeding season, and selecting heifers that become pregnant early in the breeding season for 5 years (2008 to 2013). Adapted from Mercadante et al., 2015.

These researchers noted that as a result of incorporating ES, TAI and other reproductive management practices, that the initial 120 day breeding season was reduced to 70 days. In addition, almost all cows calved prior to initiation of the subsequent breeding season and were exposed to a single TAI on the first day of

the breeding season. The effect of utilizing ES and TAI on calving distribution are illustrated in Figure 1. This figure shows that in 2006 and 2007, before initiation of the TAI program, it took 90 days for 50% of the calves to be born, whereas, in 2013 it took less than 30 days for 50% of the calves to be born.

Data in Table 1 shows the breeding season characteristics and changes in calf value that occurred by incorporating an ES TAI program into the operation. These data show that the mean calving date from the first calf born during each calving season was reduced from approximately 80 days for the 2006 and 2007 breeding seasons to approximately 39 days for the 2012 and 2013 breeding seasons. The overall pregnancy rates (including AI and natural service) increased from 81% and 86% in the 2006 and 2007 breeding seasons, respectively, to 92% and 93% in 2012 and 2013, respectively. Assuming an average daily gain (ADG) of 2.0 lb/day and a fixed calf value of $2.00/lb across years, the mean value per calf increased by $86.8 per calf resulting from the 2008 breeding season to $168.8 per calf resulting from the 2013 season. As a result of the more compact breeding season, total calf value (in current dollars) for the 300 head operation increased $47,100 from the 2006 and 2007 breeding seasons to the 2013 breeding season.

Table 1. Breeding season characteristics and change in calf value by incorporating an estrous synchronization and fixed-time artificial insemination program into a beef cattle operation

Item	2006	2007	2008	2009	2010	2011	2012	2013
Breeding season length, days	120	120	110	88	80	75	70	72
Difference from 2006-2007, days	0	0	21.7	24.7	27.2	33.7	41.4	42.2
Mean calving day[1]	79.2	80.9	59.2	56.2	53.7	47.2	39.5	38.7
Overall pregnancy rate, %	81	86	84	86	82	94	92	93
Per calf increase in value, $[2]	0	0	86.80	98.80	108.80	134.80	165.60	168.80
Per herd increase in value, x $1000[3]	0	0	21.9	25.5	26.8	38.1	45.8	47.1

[1]Mean calving day from initiation of calving season.
[2]Increase in calf value based on increased weaning weight assuming an ADG of 2 lb/day and a fixed calf value of $2.00/lb.
[3]Increase in calf value based on 300-head cow herd assuming the pregnancy rate within each year.
Adapted from Mercadante et al., 2015.

These researchers concluded that “exposing beef females to estrous synchronization and fixed-time artificial insemination, and reducing the breeding season length during a period of 6 years altered calving distribution, increased breeding season pregnancy rates, and increased calf value”.

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[1] USDA-APHIS. 2009. Pages 18-21 in Beef 2007-08, Part II: Reference of Beef Cow-calf Management Practices in the United States, 2007–08. USDA–APHIS–VS–CEAH, Fort Collins, CO. Available: https://www.aphis.usda.gov/animal_health/nahms/beefcowcalf/downloads/beef0708/Beef0708_dr_PartII.pdf.

[2] Mercadante, V. R. G., F. M. Ciriaco, D. D. Henry, P. L. P. Fontes, N. Oosthuizen, N. DiLorenzo, and G. C. Lamb. 2015. Utilization of fixed-time artificial insemination (TAI) to reduce breeding season length and its effects on subsequent calf value: A case study. Florida Beef Research Report: 29-33.