Integrated Systems Single Timed-AI Heifer Development

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Research Brief:

Reproduction is the most profitable single management tool for the beef cattle enterprise. Heifers that become pregnant at the first service and calve early within the first 21 days of the calving season produce more pounds of beef compared to their later calving counterparts and have a greater probability of becoming pregnant early in subsequent breeding seasons (Burris and Priode, 1958). Moreover, heifers that calve early with their first calf have greater herd longevity and lifetime productivity compared to those that calve in the second 21 days or later (Cushman et al., 2013). In addition to the importance of pregnancy and early calving, accessing elite sires artificially ensures that replacement heifers have above average production opportunity due to genomic enhanced genetic potential.

Integrated crop-livestock beef cattle systems research at the NDSU-Dickinson Research Extension Center (DREC), has shown that regardless of steer frame score extended grazing of perennial and annual forages and delayed feedlot entry supported comparable meat quality and was consistently more profitable than feedlot control steers (Senturklu et al., 2018; 2019). This previous yearling steer grazing performance would be nutritionally supportive and is an ideal management system for replacement heifer development.

First service TAI using a 14-day Controlled Internal Drug Release® (CIDR-PGF2α-GnRH) program results in consistent pregnancy rates of 50-60% (Perry et al., 2012, 2015). A principal result from the use of progesterone delivered from a CIDR is to manipulate follicular waves by preventing the negative effect of premature $PGF_{2\alpha}$ release from the uterus on corpus luteum survival (Patterson et al., 2019). For virgin heifers, a 14-d CIDR followed by $PGF_{2\alpha}$ 16 d after CIDR removal and GnRH at the time of insemination 66 hr.±2hr after $PGF_{2\alpha}$ has been a cost-effective timed artificial insemination (TAI) program. Moreover, using a single-TAI procedure produces heifers that are timed to calve early and the cost for keeping easy-calving heifer bulls year-around is eliminated.

The first objective for this long-term research and extension project is to evaluate reproductive performance comparing a traditional TAI program in which cleanup bulls are used after a single-TAI breeding and non-pregnant heifers are sold as feeder cattle after an 85-day pregnancy exam to a single-TAI program *without* cleanup bulls. Since cleanup bulls are not used, all non-pregnant heifers graze annual forages grown in multi-crop rotation and feedlot entry is delayed until fall and early-winter grazing has been completed. The finished heifers are marketed “in the meat” on a carcass grid basis.

The second project objective is to determine the economic value and efficiency of bred heifers and sale of open heifers compared to the combined values of bred heifers and non-pregnant finished heifer carcass value.

The third objective is to train students in estrous synchronization management techniques and cattle artificial insemination, and the third objective is to conduct a beef cattle producer heifer development survey comparing heifers developed in drylot compared to a pasture system.

Preliminary Results:

This is a long-term four-year research project. The first-year results presented here are preliminary and will change as subsequent year data is added.

The project is designed to compare control heifers reared in drylot (DLOT) and fed hay and supplement to heifers managed grazing either native range (NR) or a combination of native range and annual forages (winter wheat, field pea-barley, corn, cover crop) grown in a diverse cropping system (ANN), which are bred using a common single Timed-AI protocol (14d CIDR-PG-GnRH) and all non-pregnant heifers are finished for grid marketing. As such, following synchronization cleanup bulls are placed with the DLOT control heifers; however, there are no cleanup bulls placed with the grazing treatments.

Heifers in the study grazed native range and annual forages for a period of 121 days and during the period total gain per heifer was 33.7, 119.5, and 126.5 kg ($P = 0.001$), and synchronized timed-AI pregnancy rates were 59.4, 43.8, and 62.5% ($P = 0.27$) respectively, for the DLOT, ANN and NR treatments. Total pregnancy rate of 90.6% in the drylot control group was significantly greater than the ANN forage group (43.8%), and the NR total pregnancy rate of 62.5% ($P = 0.002$) did not differ from either the DLOT or ANN treatment groups.

Grazing heifer feedlot performance for the ANN forage and NR had numerical differences; however, there was no measurable difference for starting weight (452 vs 456 kg, $P = 0.29$), ending weight (610.0 vs 600.0 kg, $P = 0.74$), feedlot finishing gain (157 vs 164 kg, $P = 0.69$), ADG (1.42 vs 1.48 kg, $P = 0.70$), daily DM feed intake (15.0 vs 14.7 kg, $P = 0.73$), G:F ratio expressed as the amount of gain per unit of feed consumed (0.04298 vs 0.04554 kg, $P = 0.42$), daily feed cost ($4.38 vs $4.30, $P = .73$), feed cost/kg gain ($3.11 vs $2.95, $P = 0.51$), and feed and yardage cost/kg gain ($3.42 vs $3.24, $P = 0.55$).

Non-pregnant grazing heifers from the ANN and NR treatments were harvested at the Cargill Meat Solutions federally inspected packing plant located in Ft. Morgan, Colorado. Similar to the feedlot heifer growth performance and efficiency data, grazing heifer carcass measurements did not differ between treatments for, HCW (369 vs 365 kg, $P = 0.83$), dressing pct (60.7 vs 61.0, $P = 0.69$), marbling score (524 vs 531, $P = 0.78$), and percent Choice/Prime (100% vs 100%).

The gross pregnant heifer and gross carcass return for DLOT, ANN and NR were $1,325, $1,702, and $1,601, respectively. These data indicate that grazing systems combining bred heifer value and grid-based carcass value are competitive.

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