

The Heifer Bull Project: Assessing Calving Ease and Exploring Finishing Options

Greg Mantz, CGREC Animal Scientist
Dwight Schmidt, CGREC Manager of Ag Operations
Rodney Schmidt, Research Technician

Project Overview

Using sires of lower birth weight potential, sometimes known as “heifer bulls”, on virgin heifers can benefit commercial cattle producers by increasing live calving percentage from first-calf heifers and decreasing labor costs. However, the offspring of these sires, which tend to have lighter mature weights, may be at a disadvantage in management systems in which the calves are placed on a high-energy finishing ration within 90 days of weaning. This in turn can decrease calf value. This project seeks to assess the calving ease of sires with different birth weight potentials when used on virgin heifers and look at stocker-finishing strategies that are best fitted to managing the resulting calves. Some of these strategies may allow producers more flexibility in managing their range resources by utilizing the flush of cool-season grasses that occurs in the spring. Others may open niche marketing opportunities.

Birth Weight, Calving Ease and Weaning Weights

One-hundred-nine yearling virgin heifers were weighed and frame scored in May 2008. To maintain treatment uniformity, eleven very small and very large heifers were removed from the main experiment and placed into a demonstration project where they were mated to Galloway sires. The remaining 98 heifers were stratified by frame score and weight within frame score then randomly mated to sires of two birth weight potentials: “moderate” (Black Angus sires with birth weight expected progeny difference [EPD] ranging from -3.5 to +0.8 lbs.) and “very low” (Lowline sires).

Pre-calving heifer weights were obtained February 18, 2009. Calves were born from March through May of 2009 and birth weights were collected within 24 hours of birth. Calving difficulty (CD) was scored from 1 to 5 with a CD score of 1 being an unassisted birth, 2 a hand pull, 3 a mechanically assisted pull, 4 a Caesarean section, and 5 an abnormal presentation. Heifer and calf weights were recorded on May 27 when the pairs were vaccinated and the bull calves castrated before being sent to pasture. Calves and heifers were weighed again October 8 at weaning.

There was a significant sire birth weight potential by calf sex interaction for birth weight and calving difficulty (Table 1). There was no significant difference in birth weight or calving difficulty for heifer calves sired by the moderate and very low birth weight potential sires. However, bull calves sired by moderate birth weight potential sires were significantly heavier at birth with higher calving difficulty scores than bull calves sired by very low birth weight potential sires.

There was a strong sire birth weight potential effect for actual weaning weight with the calves from the moderate birth weight potential sires weaning heavier than calves from very low birth weight potential sires (Table 1). However calf sex did not affect actual weaning weights nor was there a sire birth weight potential by calf sex interaction. For projected 205-day weaning weights sire birth weight potential and calf sex were both significant factors owing to the fact that the average age at weaning was 174 days for the steer calves from moderate birth weight potential sires versus 184-185 days for the other



Low birth weight potential sire (red), very low birth weight potential sire (middle) and moderate birth weight potential sire (right).

groups of calves. One interesting side note is that the heifers nursing calves sired by very low birth weight potential sires lost significantly less weight ($P = 0.03$) than heifers nursing calves sired by moderate birth weight potential sires (Table 1). However there was not a significant effect of calf sex or a significant calf sex by sire birth weight potential interaction for weight loss by the dam.

Table 1. Birth weights, calving difficulty scores, weaning weights, and dam weight loss pre-calving to weaning by sire birth weight potential and calf sex for calves born to first-calf heifers at CGREC in 2009.					
Sire Birth Weight Potential and Calf Sex	Birth Weight (lbs.)	Calving Difficulty (Scale 1 to 5)	Weaning Weight		Dam Weight Loss Pre-calving to Weaning (lbs.)
			Actual (lbs.)	Projected 205 Day (lbs.)	
Moderate					
Bull-steer	88	1.7	482	551	97
Heifer	73	1.0	477	521	92
Very Low					
Bull-steer	74	1.1	444	485	69
Heifer	72	1.0	413	452	52
Least Significant Difference ($P < 0.05$)	6	0.3	28	24	31

Stocker-Finishing Research

Recap of 2008 Forage Finishing Pilot Study. In 2008 a pilot forage finishing study was conducted at CGREC using steers and spayed heifers from the 2007 calf crop sired by very low birth weight potential sires. Some of the animals received a low-starch protein supplement while on pasture. Pasture supplementation did not affect daily gains or marbling scores. The daily gains of the steers were not significantly higher than those of the spayed heifers. However, the spayed heifers had significantly higher marbling scores, which translate into higher USDA quality grades. The research also showed that when finished at 18-24 months of age, steers from very low birth weight potential sires had an average carcass weight of 593 lbs., exceeding the 550 lb. minimum carcass weight requirement of the large beef packing plants, but the carcasses of the spayed heifers from these sires fell short at an average carcass weight of 463 lbs.

2008-2009 Integrated Stocker-Finishing Study. Following weaning in October 2008 the steers calves born to first-calf heifers sired by moderate and very low birth weight potential sires were backgrounded in a common pen on a ration of 30% chopped hay and 70% corn silage (as-fed basis). In May of 2009 yearling frame scores were obtained on the steers. The steers were then classified into two frame sizes: "medium" (frame scores 4, 5 and 6) and "small" (frame scores 2 and 3). The majority of the medium frame steers were sired by moderate birth weight potential sires and the majority small frame steers were sired by very low birth weight potential sires. Two steers sired by very low birth weight potential sires had yearling frames scores of less than 1.5 and were excluded from the 2009 stocker-finishing study. The medium frame steers gained 1.5 lbs. per head daily during the 218-day backgrounding phase and the small frame steers gained 1.2 lbs. per head daily. Using a \$43 per ton value for the hay and a \$35 per ton value for the corn silage, the feed cost was 51 cents per pound of gain during the backgrounding phase. Because the animals were fed in a common pen the backgrounding costs cannot be broken down by frame size.

On May 14, 2009 the steers were sent to six pastures. Three pastures received a self-fed supplement in which salt was used to limit intake and three pastures received only salt and mineral. Each pasture contained both medium and small frame steers. On June 30 the steers were weighed and half of the medium frame steers and half of the small frame steers in each pasture were removed and placed on a high-concentrate feedlot finishing ration. The remaining steers were left in the pastures to be forage finished. None of the steers in either the forage finishing or feedlot finishing studies received hormone implants. During the early grazing season the medium frame steers gained 2.2 lbs. per day and the small frame steers gained 1.7 lbs. per day. The difference was not considered to be statistically significant ($P = 0.17$). Pasture supplementation did not affect early season gains.

Forage Finishing. The steers left on pasture to be forage-finished were weighed at the end of the grazing season on October 12 and were scanned by ultrasound for back fat and marbling on November 5. The targeted intake of the self-fed

supplement in the three supplemented pastures was 4 lbs. per head daily of an oat-sunflower screening supplement from turnout to August 20 and 8 lbs. per head daily of an oat-sunflower screening-sunflower meal supplement from August 20 onward. However, actual intake averaged 2.8 lbs. per head daily prior to August 20 and 16.4 lbs. per head daily after August 20. For the grazing season as a whole, the average daily gains were higher ($P = 0.04$) for the medium frame than the small frame steers at 1.9 and 1.6 lbs. respectively, but supplementation did not significantly affect daily gains.

Looking at the June 30 through October 12 time period, steer frame size and supplementation both significantly affected daily gains, but there was no frame size by supplementation interaction meaning that the two frame sizes of steers benefitted equally from supplementation. Averaged across supplementation treatments the medium frame steers gained 1.9 lbs. per day and the small frame steers gained 1.5 lbs. per day. Likewise, averaged across steer frame sizes, the supplemented steers gained 1.9 lbs. per day and the non-supplemented steers gained 1.5 lbs. per day. Owing to the trouble regulating supplement intake during the last portion of the grazing season, the cost per pound of added gain from feeding supplement amounted to \$1.42 which is not economical under today's market conditions.

Neither supplementation nor steer frame size affected ultrasound intramuscular fat (IMF) values which is a measure of marbling. Overall IMF averaged 3.7%, which translates into an average quality grade of high select. Of the 22 steers in the forage finishing study eight came off pasture grading low choice, four grading high select, five grading low select and four grading standard based on ultrasound IMF. The eight choice steers were slaughtered on December 1 and December 15. The remaining steers will be finished on a high quality hay ration augmented by an oat-sunflower screening-sunflower meal supplement until they reach the first of three slaughter end points: 4.0% IMF, 0.5 inches of back fat, or 25 months of age.

Feedlot Finishing. The steers removed from the pasture for feedlot finishing on June 30 were divided into two pens of medium frame steers and two pens of small frame steers. Pens rather than individual steers were considered the units of replication for this study. The steers had free access to an alfalfa – Kentucky bluegrass hay (12% crude protein). They also had free access to a mixture of coarsely ground corn and a commercial intake limiter. The commercial intake limiter also supplied salt, vitamins, minerals, urea, monensin, and tylosin. On a dry matter basis the medium frame steers selected a diet that was 80% concentrate and 20% hay whereas the small frame steers selected a diet that was 76% concentrate and 24% hay. The difference was not statistically significant ($P = 0.51$).

Steers were scanned with ultrasound for IMF (marbling) and back fat on August 28, September 28 and November 5. Steers were harvested when they reached the first of two end points, either 4.00% IMF (corresponding with a USDA low choice quality grade) or 0.5 inches of back fat. Three steers were harvested on September 17,

seven were harvested October 27 and the final eight steers were harvested on December 1. The carcasses from all steers graded USDA choice. Table 2 shows the live weight gains, average days on feed, and feed to gain ratio while Table 3 shows the carcass data.

Table 2. Beginning and ending live weights, average days on feed, average daily gain, and pounds of feed required per pound of gain, for medium and small frame steers in the 2009 CGREC feedlot finishing study.

Frame	Average Weight		Average Days on Feed (days)	Average Daily Gain (lbs.)	Feed to Gain	
	Beginning (lbs.)	Ending (lbs.)			As Fed	Dry Matter
					(lbs. feed / lbs. gain)	
Medium	927	1354	123	3.4	9.7	8.6
Small	735	1127	131	3.0	9.6	8.4
P-Value*	0.04	0.14	0.66	0.27	0.95	0.94

*P-values measure the probability of falsely assuming two averages are truly different when they are not. The smaller the P-Value the more certain we are that the two averages are truly different. In this case the 0.04 P-value for beginning weights says that there is a 96% chance that the observed difference reflects real differences between small and medium frame steers and only a 4% chance that difference was due to random variation coupled with inadequate sample size. On the other hand, the 0.95 P-Value for as fed feed to gain says there is a 95% chance that the observed difference in as fed feed to gain between small and medium frame steers was merely due to random variation.

Table 3. Carcass weight, dressing percent, marbling number, yield grade, and percentage of carcasses grading USDA choice, for medium and small frame steers in the 2009 CGREC feedlot finishing study.

Frame	Carcass wt. (lbs.)	Dressing (%)	Marbling (Number)	Yield Grade	% USDA Choice
Medium	821	60.66	490	2.8	100
Small	684	60.71	507	2.6	100
P-value*	0.14	0.24	0.19	0.4	NA

*See footnote for Table 2.

There was no difference in the feed to gain ratio for small and medium frame steers. This concurs with research done elsewhere in the 1950s that found no difference in feed efficiency between different frame sizes of steers when all frame sizes of steers were fed to the same carcass fatness. With corn valued at \$3.20/bushel, hay valued at \$43/ton and the commercial intake limiter at valued 31 cents/lb. the feed cost of gain was 70 cents per pound of gain with one-third of the feed costs consisting of the expense of the commercial intake limiter.

All carcasses exceeded the 550 lb. minimum carcass weight needed to avoid discounts for light carcasses. Previous work at Kansas State University's Hays Research Center by the late John Brethour showed that delaying finishing cattle can increase marbling scores without increasing back fat. The fact that we achieved 100% USDA choice carcasses with no yield grade 4 carcasses supports Brethour's findings. A concern with lengthening the growing period and finishing cattle at older ages is that the larger steers will finish at weights that are too heavy. Currently, some packers begin discounting heavy carcasses at 950 lbs. while others begin discounting at 1050 lbs. Only one carcass exceeded 950 lbs. and none exceeded 1000 lbs. Thus, it appears that in a program of backgrounding and half-season grazing followed by feedlot finishing, steers with frame scores of up to 6 can produce acceptable carcass weights—at least when hormone implants are not used.

Summary and Future Direction

The findings thus far show that using very low birth weight potential sires on virgin heifers decreases birth weights and calving difficulty and may also result in heifers losing less weight during lactation. But there is a trade off in that the weaning weights are lower for calves of very low birth weight potential sires compared to calves of moderate birth weight potential sires. When feedlot finished after a backgrounding and half-season grazing program, the vast majority of steer calves sired by very low birth weight potential sires will gain as efficiently as larger steers and produce carcasses that fit the mainstream marketing channels. However, light weight carcasses may still be a problem with finishing heifer calves out of very low birth weight potential sires. Thus, future research will focus on feedlot finishing steers for the mainstream market and grass finishing spayed heifers for niche markets. Also, starting with the 2010 calf crop, a sire group of intermediate birth weight potential is included in the study. The intermediate group is termed the "low" birth weight potential group and consists of Red Angus sires with birth weight EPDs of between -8.1 and -6.1 lbs. which translate into -5.3 lbs. to -3.3 lbs. on the Black Angus birth weight EPD scale.

Acknowledgements

The authors would like to thank Neil Effertz for the donation of Lowline semen, Sara Bowman and the American Galloway Breeders Association for the donation of Galloway semen and Bieber Red Angus Ranch for the donation of Red Angus semen. They would also like to thank Billy Kienzle, Rick Bohn, Dakotah Dockter, Jenna Gross and Mike Hoffer for their help with data collection.