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# Effects of Production System and Post-weaning Management on Finishing Performance and Carcass Characteristics of Steer and Heifer Calves

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## Summary with Implications

*This study evaluated the effects of cow-calf production system and post-weaning management on finishing performance and carcass characteristics of steer and heifer calves. Calves that were wintered on cornstalks prior to weaning had lighter initial BW compared to calves that were wintered in the dry-lot; however, final BW and carcass weight were similar between treatments. Post-weaning management was either adapting calves to a finishing diet following weaning or feeding a grower diet prior to the finishing phase. When harvested at similar back fat, calves that were fed a grower diet for 76 days prior to the finishing phase had 71 pounds more final BW and 45 lb. greater carcass weight compared to calves that were directly adapted to a finishing diet. Cow-calf production system appears to have minimal impact on feedlot performance due to compensatory gain during the post-weaning phase; however, post-weaning practices can be used to manipulate finishing performance and carcass characteristics.*

## Introduction

When traditional forage resources are limited, alternative production systems may be necessary. Research has demonstrated that a semi-confined cow-calf production system with winter cornstalk grazing can be used as an alternative system to traditional pasture beef production (2018 *Nebraska Beef Cattle Report*, Gardine, Cow-calf production system).

In addition to alternative cow-calf production systems, different post-weaning management strategies may be implemented. Two common post-weaning management strategies are to directly adapt calves to a finishing diet following weaning or place them into a growing program prior to the finishing phase. The type of post-weaning management utilized may have different effects on finishing performance and carcass characteristics. Additionally, interactions may occur between post-weaning management and cow-calf production system. Therefore, the objectives of the current study were to evaluate cow-calf production system and post-weaning management on finishing performance and carcass characteristics of calves produced from a semi-confined cow-calf production system.

## Procedure

Summer-born steer (n = 78) and heifer (n = 60) calves (BW 585 ± 92 lb.) were utilized in a study conducted over two years at the Eastern Nebraska Research and Extension Center (ENREC) feedlot. Calves were sourced from two cowherds maintained at either ENREC or the Panhandle Research and Extension Center (PREC) (2018 *Nebraska Beef Cattle Report*; Gardine, Cow-calf production system). Data reported are from progeny in years 1 and 2 of the referenced study.

Within each location, cowherds were maintained in confinement from approximately April to November during which the calving season occurred. Cow-calf pairs were then subject to one of two winter cow-calf production treatments: dry-lot feeding or corn residue grazing with supplementation. Calves from both cow-calf production systems were weaned in April and received into the ENREC feedlot for post-weaning treatments.

Once received into the feedlot, calves were allocated by previous location and winter cow-calf production treatment, stratified by initial BW, and assigned

**Table 1. Diet composition of growing and finishing diets<sup>1</sup>**

| Growing Diet              |        |        |
|---------------------------|--------|--------|
| Ingredient, %             |        |        |
| Sweet Bran                | 30     |        |
| Wheat Straw               | 31     |        |
| MDGS <sup>2</sup>         | 35     |        |
| Supplement <sup>3,4</sup> | 4      |        |
| Finishing Diet            |        |        |
| Ingredient, %             | Year 1 | Year 2 |
| HMC                       | 50     | 51     |
| Sweet Bran                | 30     | 30     |
| Wheat Straw               | 5      | 5      |
| MDGS <sup>2</sup>         | 10     | 10     |
| Supplement <sup>3,5</sup> | 5      | 4      |

<sup>1</sup>All values presented on a DM basis

<sup>2</sup>Modified distillers grains plus solubles

<sup>3</sup>Supplement includes limestone, trace minerals, and vitamin A,D,E premix

<sup>4</sup>Formulated for 200 mg/animal of Rumensin daily

<sup>5</sup>Formulated for 330 mg/animal of Rumensin and 90 mg/animal of Tylan daily

randomly within strata to one of two post-weaning treatments. The study was completely randomized with a 2 × 2 factorial treatment design. Factors were 1) cow-calf production system and 2) post-weaning management. Cow-calf production treatments included winter dry-lot feeding (DLOT) or corn residue grazing (STALK). Post-weaning management treatments were a finish (FINISH) or grow-finish (GROW) treatment. Calves in the FINISH treatment were adapted to a finishing diet (Table 1) following weaning. In the GROW treatment, calves were fed a grower diet (Table 1) for 76 days before being adapted to the same finishing diet as calves in the FINISH treatment.

At initial processing in year 1, calves in both treatments received Bovi-Shield Gold 5° (Zoetis) and StandGuard° (Elanco), and were implanted with Revalor XS° (steers, Merck Animal Health) or Revalor-IH° (heifers, Merck Animal Health). Heifers were re-implanted with Revalor 200° (Merck Animal Health) approximately 100 days prior to harvest date. Calves in the FINISH

treatment began the finishing phase April 21 and were harvested Nov. 4 (196 days on feed). A grower diet was fed to calves in the GROW treatment for 79 days (April 21 to July 8). GROW calves were then adapted to the common finishing diet (Table 1) and harvested on Jan 6 (260 days on feed).

In year 2, calves in both treatments received Titanium 5\* (Elanco), StandGuard\* (Elanco), and were implanted with Component TEIS\* (steers, Elanco) or Component TEIH\* (heifers, Elanco) at initial processing. All calves were re-implanted with component T200 approximately 100 days before harvest. Calves in the FINISH treatment entered the finishing phase April 27 and were harvested Nov 3 (190 days on feed). GROW calves were fed the grower diet for 73 days (April 27 to July 8) before adaptation to the common finishing diet. GROW calves were then harvested Dec 28 (245 days on feed).

Optaflexx was included in the common finishing diet for the last 28 days on feed (300 mg/head daily). Weights were collected over two consecutive days at trial initiation. Prior to collecting weights, calves were limit-fed a minimum of five days to minimize gastrointestinal weight variation. For calves in the GROW treatment, ending BW for the growing phase was used as initial BW for the finishing phase. In year 1, a 4% shrink was applied to calves in the GROW treatment upon completion of the growing phase due to calves not being limit-fed prior to collecting weights. In year 2, GROW calves were limit-fed between phases prior to collecting weights. On the day of harvest, hot carcass weight (HCW) and liver abscess scores were collected. Following a 48-hour chill, 12<sup>th</sup> rib fat, marbling score, and LM area were recorded. Final BW, ADG, and F:G were calculated on a carcass-adjusted basis using a common dressing percentage of 63%. Yield grade was calculated using the following equation:  $2.5 + (2.5 \times 12^{\text{th}} \text{ rib fat, in}) - (0.32 \times \text{LM area, in}^2) + (0.2 \times 2.5 [\text{KPH, \%}]) + (0.0038 \times \text{HCW, lb})$ .

Data were analyzed using the mixed procedure of SAS (SAS Institute, Inc., Cary, N.C.) as a completely randomized design. Experimental unit was pen with cow-calf production system, post-weaning management, and the cow-calf  $\times$  post-weaning interaction as fixed effects. Location and year were included as random effects. Because

**Table 2. Effects of cow-calf production system on finishing performance and carcass characteristics**

|                                     | DLOT <sup>1</sup> | STALK <sup>2</sup> | SEM  | P-value |
|-------------------------------------|-------------------|--------------------|------|---------|
| Calves, n                           | 66                | 72                 |      |         |
| Feedlot performance                 |                   |                    |      |         |
| Initial BW, lb                      | 613               | 556                | 21   | 0.02    |
| Final BW <sup>3</sup> , lb          | 1344              | 1328               | 42   | 0.39    |
| DMI                                 | 20.6              | 21.2               | 1.0  | 0.18    |
| ADG <sup>3</sup> , lb               | 3.34              | 3.53               | 0.06 | 0.07    |
| F:G <sup>3,4</sup>                  | 6.16              | 6.01               | -    | 0.27    |
| Carcass Characteristics             |                   |                    |      |         |
| HCW, lb                             | 847               | 837                | 27   | 0.39    |
| LM area, in <sup>2</sup>            | 13.3              | 13.7               | 0.3  | 0.06    |
| 12 <sup>th</sup> rib fat, in        | 0.59              | 0.56               | 0.05 | 0.30    |
| Marbling <sup>5</sup>               | 445               | 454                | 9.2  | 0.50    |
| Calculated Yield Grade <sup>6</sup> | 3.5               | 3.2                | 0.2  | 0.11    |

<sup>1</sup> DLOT = winter dry-lot feeding

<sup>2</sup> STALK = winter corn residue grazing

<sup>3</sup> Calculated on a carcass-adjusted basis using a common dressing % (63%)

<sup>4</sup> Analyzed as G:F, reported as F:G

<sup>5</sup> Marbling score: 400 = Small, 500 = Modest, etc.

<sup>6</sup> Calculation:  $2.5 + (2.5 \times 12^{\text{th}} \text{ rib fat, in}) - (0.32 \times \text{LM area, in}^2) + (0.2 \times 2.5 [\text{KPH, \%}]) + (0.0038 \times \text{HCW, lb})$

proportion of steers and heifers varied within pen, steer proportion was included as a covariate for all variables.

## Results

There were no cow-calf production by post-weaning management interactions observed for any feedlot performance or carcass characteristic variables ( $P \geq 0.32$ ); therefore, main effects are presented.

### Cow-calf Production System

The effects of cow-calf production system on finishing performance and carcass characteristics are presented in Table 2. The initial finishing BW was greater for calves wintered in the dry-lot compared to calves wintered on cornstalks ( $P = 0.02$ ). There was a tendency for ADG to be greater for STALK calves compared to DLOT cattle ( $P = 0.07$ ). A tendency was also observed for STALK calves to have greater LM area compared to DLOT calves ( $P = 0.06$ ). No significant treatment differences were observed for any other variables ( $P \geq 0.11$ ).

Calves that were wintered on cornstalks had lighter initial BW entering the finishing phase than calves that had been wintered in the dry-lot. However, there were no effects of the cow-calf production system on final

BW or carcass weight, suggesting STALK calves experienced compensatory gain.

### Post-weaning management

Effects of post-weaning management on feedlot performance and carcass characteristics are presented in Table 3. A tendency was observed for FINISH calves to consume more feed daily ( $P = 0.06$ ) compared to GROW calves; however, GROW calves were on feed for 60 more days. Calves in the FINISH treatment also had greater ADG ( $P < 0.01$ ) and improved feed efficiency ( $P < 0.01$ ). When evaluating growing and finishing performance independently, GROW calves had daily gains of 2.76 and 3.29 during the growing and finishing phase, respectively. Although overall ADG was less, GROW calves still finished with 71 lb. greater final BW ( $P < 0.01$ ).

Twelfth rib fat thickness, calculated yield grade, and LM area did not differ between treatments ( $P \geq 0.36$ ). Calves fed the grower diet prior to the finishing phase had 45 lb. more carcass weight ( $P < 0.01$ ) and greater marbling ( $P = 0.01$ ) compared to calves in the FINISH treatment.

Calves that were adapted to the finishing diet following weaning were finished in fewer days, but had lighter final BW and carcass weight. Feeding a grower diet for

Table 3. Effects of post-weaning management on finishing performance and carcass characteristics

|                                     | FINISH | GROW <sup>1</sup> | SEM  | P-value |
|-------------------------------------|--------|-------------------|------|---------|
| Calves, n                           | 69     | 69                |      |         |
| DOF                                 | 193    | 253               |      |         |
| Feedlot performance                 |        |                   |      |         |
| Initial BW, lb                      | 583    | 586               | 21   | 0.87    |
| Final BW <sup>2</sup> , lb          | 1301   | 1372              | 42   | <0.01   |
| DMI                                 | 21.3   | 20.5              | 1.05 | 0.06    |
| ADG <sup>2</sup> , lb               | 3.72   | 3.15              | 0.06 | <0.01   |
| F:G <sup>2,3</sup>                  | 5.73   | 6.48              | -    | <0.01   |
| Carcass Characteristics             |        |                   |      |         |
| HCW, lb                             | 819    | 864               | 27   | <0.01   |
| LM area, in <sup>2</sup>            | 13.4   | 13.6              | 0.24 | 0.46    |
| 12 <sup>th</sup> rib fat, in        | 0.57   | 0.57              | 0.05 | 0.98    |
| Marbling <sup>4</sup>               | 428    | 470               | 8.6  | 0.01    |
| Calculated Yield Grade <sup>5</sup> | 3.3    | 3.4               | 0.2  | 0.36    |

<sup>1</sup>Growing and finishing phase performance combined  
<sup>2</sup>Calculated on a carcass-adjusted basis using a common dressing % (63%)  
<sup>3</sup>Analyzed as G:F, reported as F:G  
<sup>4</sup>Marbling score: 400 = Small, 500 = Modest, etc.  
<sup>5</sup> Calculation: 2.5 + (2.5 x 12<sup>th</sup> rib fat, in) – (0.32 x LM area, in<sup>2</sup>) + (0.2 x 2.5 [KPH, %]) + (0.0038 x HCW, lb)

76 days prior to the finishing phase allowed additional time for skeletal growth as evidenced by the 71 lb. increase in final BW and 45 lb. greater carcass weight when cattle were harvested at similar back fat.

Conclusion

There does not appear to be a cow-calf production system by post-weaning management interaction on finishing performance or carcass characteristics. Because calves are able to compensate gain during the feedlot phase, cow-calf production system appears to have minimal impact on finishing performance. However, post-

weaning practices have greater influence for variables affecting a producer’s profitability. These data suggest that a growing period prior to the finishing phase allows for skeletal growth, which then corresponds to greater final BW and carcass weight.

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