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Comparison of Two Heifer Development Systems on a Commercial Nebraska Ranch

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A system of developing bred heifers on native winter range and supplement resulted in improved body condition, with similar weight change and reproductive performance as a hay-fed control system.

Summary

A trial was conducted at a commercial Nebraska ranch to evaluate the effectiveness of a bred heifer development program that minimized the use of harvested feed. Two management systems were imposed on 505 March-calving bred heifers during the winter before the calving season, one including the use of hay (CON), and one relying solely on winter range and supplementation (TRT). During the winter period, heifers in the TRT system lost less condition and had similar weight gains to CON. Two-year-old pregnancy rates did not differ between systems. A partial budget analysis of the two development programs indicated that the TRT system could decrease costs relative to the CON system.

Introduction

Reported values of the cost of providing winter feed to beef cows vary (*2002 Nebraska Beef Report, pp. 17-19*), though it is clear that these costs are a significant portion of the annual cow cost. Reducing winter feed costs without sacrificing performance would improve ranch profitability. Decreasing dependency on harvested feeds and increasing use of winter grazing with supplementation may lower winter feed costs.

Supplementing to meet the relatively high nutritional requirements of bred heifers presents unique challenges. Pregnant heifers grazing native winter range have been shown to be deficient in metabolizable protein (MP;*2000 Nebraska Beef Report, pp. 7-10*). Heifer supplementation programs must not only meet these MP demands but meet heifers' higher energy requirements as well. Byproducts of the grain milling industry

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are becoming increasingly available to Nebraska producers (*2001 Nebraska Beef Report, pp. 45-47*). Because of the amount and form of protein and energy in dry corn gluten feed (DCGF), it may fit well as a supplement to pregnant heifers grazing native winter range.

The objective of this trial was to design a program for developing bred heifers that would maintain the high levels of production already present in the herd, and do so relying solely on winter range and supplementation, without using harvested feeds.

Procedure

The study was conducted at the Rex Ranch (Abbot Unit) near Ashby, Nebraska. On Sept. 15, 2000, approximately 700 yearling heifers (841 + 3.1 lb) were weighed and assigned a body condition score (BCS; 1 = emaciated, 9 = obese) by two technicians. Heifers that met a minimum weight requirement as determined by the ranch, that were not previously marked for culling, and were determined pregnant by rectal palpation were assigned to one of two pre-calving treatments. Treatments included the ranch's standard heifer management program (CON; n = 249) and an alternative system (TRT; n = 256).

The CON system included access to native range with heifers being rotated to new pastures regularly, and included supplementation of a high undegradable intake protein (UIP) supplement (Table 1), formulated to meet MP requirements (*2000 Nebraska Beef Report,* pp. 7-10). Hay feeding began in December and was gradually increased until calving. Levels of hay fed were at the discretion of the ranch manager, and increased from about 7 to 18 lb per heifer per day. As the amount of hay increased, rotation to ungrazed winter pastures declined until little grazed forage was made available to the CON heifers.

As in the CON system, TRT heifers were given access to native winter range. In contrast to CON, the TRT system was designed under the assumption that heifers would not be limited in the amount of standing forage available to them at any time, and the rotation schedule was maintained throughout the winter. Heifers allocated to the TRT system were fed no hay before calving season began. The TRT supplement (Table 1) was based on dry corn gluten feed (DCGF). Mineral and vitamin premixes were included in the supplement, and sunflower meal and fat were added to improve pellet quality. The supplementation schedule was set up such that predicted forage intake and DCGF supplement delivered approximately the same amount of TDN intake as the hay, control supplement, and grazed forage intake of the CON heifers. Metabolizable protein requirements were met at all times.

The feeding schedule for each treatment was designed to begin October 1, and continue through March 1 (estimated start of calving). The amount of supplement fed was changed at the beginning of the month from October through Jaunary (0.7 to 1.1 and 0.7 to 4.0 lb for CON and TRT), and at two-week intervals during February (1.2 to 1.8 and 5.7 to 7.5 lb for CON and TRT).

These changes were made to account for predicted changes in forage quality and intake, as well as to meet the demands of advancing gesta-

Table 1. Composition of supplements.

	Composition, %DM	
Ingredient	CON	TRT
Dry gluten feed	—	72.00
Feather meal	40.00	—
Sunflower meal	30.00	22.40
Wheat middlings	26.25	—
Molasses	2.50	2.50
Bentonite	—	2.50
Salt	1.00	—
Starch	—	0.25
Fat	—	0.25
Vitamin premix	0.26	0.05
Trace mineral premix	—	0.05

Table 2. Weight, body condition, and reproductive performance of two heifer development systems.

Item	CON	TRT	*P*-value
Initial weight, lb	840.5 + 3.1	842.3 + 3.1	0.67
Final weight, lb	937.9 + 3.7	939.5 + 3.8	0.77
Weight change, lb	99.9 + 2.4	98.3 + 2.5	0.62
Initial BCS[a]	5.2 + .02	5.2 + .02	0.49
Final BCS[a]	5.0 + .02	5.1 + .02	0.02
BCS change[a]	-0.2 + .02	-0.1 + .02	0.01
Pregnancy rate, %[b]	96.4	98.0	0.26

[a]BCS = body condition score; 1 = emaciated, 9 = obese
[b]Percentage pregnant with second calf; *P*-value reflects chi-square analysis

Table 3. Feed and labor costs associated with two heifer development systems.

	CON		TRT	
Item	$/animal	% total	$/animal	% total
Feed costs				
Supplement[a]	13.58	21.4	23.49	46.0
Grazing[b]	17.64	27.7	24.30	47.8
Hay[c]	24.78	39.0	0.00	0.0
Labor costs				
Supplement[d]	0.76	1.2	3.22	6.3
Hay[d]	6.84	10.8	0.00	0.0
Total	63.59	100.0	51.02	100.0

[a]Includes delivered price to the ranch
[b]Standing winter forage valued at $6/AUM
[c]Hay valued at $0.025 per lb DM, or $55 per ton as-fed
[d]Includes ranch values of costs associated with feed delivery

tion. The actual dates supplementation and hay feeding began were at the discretion of the ranch manager, and were dependent upon weather, forage availability, etc. The first hay was fed to the CON group in late November. Supplementation for both groups began Oct. 20.

To help alleviate differences in gut fill that may have resulted from the treatments, groups were commingled March 1, 2001 and fed a common diet. On March 2, heifers were weighed and BCS were determined independently by two evaluators. Winter weight and BCS change were calculated. Heifers were managed as a single group during the calving period and summer grazing season.

To examine carryover effects of the pre-calving treatments, heifers were weighed, assigned BCS, and rectally palpated to determine pregnancy on Oct. 22, 2001. Weight and BCS change, and reproductive performance were calculated.

A partial budget analysis was used to compare the costs associated with implementing the two systems. Costs of the supplements were obtained through personal communication and amounts fed from ranch records. Intake predictions were used to calculate grazing costs, with a value of $6 per AUM used for standing winter range. This value is 25% the recommended value of $24 per growing season AUM in the Sandhills. The amount of hay fed was obtained from ranch records, and valued at $0.025 per pound DM, or about $55 per ton as-fed.

Results

Initial body weight was 841 lb, final weight was 939 lb, and neither differed ($P > 0.67$) between systems (Table 2). Control and TRT heifers gained 100 and 98 lb, respectively ($P = 0.62$) over the course of the trial. Gestational weight gain (fetus, fluids, uterus and placenta) can be approximated by multiplying calf birth weight by 1.7. Average calf birth weight from heifers used in this study was 81.4 lb. Using the 1.7 estimate, gestational weight gain would be 138 lb, suggesting that the heifers actually lost body weight from September to March.

Body condition at the beginning of the trial was 5.2 (Table 2), and was similar ($P = 0.49$) between systems. Final BCS of CON heifers was 5.0, which was lower ($P = 0.02$) than TRT heifers (5.1). Previous research has demonstrated the importance of pre-calving energy reserves to subsequent reproduction. Although the TRT heifers lost less ($P = 0.01$) condition than CON, it is difficult to say whether 0.1 BCS units is of biological significance. Two-year-old pregnancy rates were 96.4 and 98.0% for CON and TRT, respectively ($P = 0.26$). These values are high, particularly for second-parity cows. Because reproductive rates had been high previously (*2000 Nebraska Beef Report, pp. 7-10*), it was not an objective to increase the percentage of pregnant two-year-olds, only to maintain productivity at a lower cost.

A partial budget analysis of cost differences of the two treatments showed that implementing the TRT system would reduce costs by $12.58 per heifer (Table 3). The unit cost of the TRT supplement was lower than the CON supplement, but higher levels of feeding led to higher supplement costs for TRT heifers. A higher grazing cost was charged to the TRT system, which relied more heavily on grazed forage. However, the cost of the hay fed to CON heifers was nearly $25 per animal. This caused feed costs in the CON system to be $8.21 more per heifer. Due to the high levels of supplement fed, there was a greater cost associated with feeding the TRT supplement, particularly in February when two trips per day were necessary to deliver the needed level of supplement. In spite of this, the cost of feeding hay ($6.84/heifer) lead to higher total labor costs for the CON system, and this cost comprised the balance of the $12.58 difference. Hay comprised the largest single cost of the CON system, at about 39% of the total cost (Table 3). Labor costs totaled nearly 12% of the total cost for CON heifers. Supplement and grazing costs were nearly equal for TRT heifers, with labor costs representing around 6% of the total (Table 3).

Accurate values for a winter AUM are difficult to establish, particularly when pastures may have been grazed multiple times, both during the summer and winter as was the case in this study. Because the TRT system relies more heavily on grazed forage, changes in this value have a larger impact on the cost associated with the TRT system. However, using our partial budget, the value would have to reach $17.25 per AUM (or about 72% of summer AUM) before the systems would be equal in cost. Because hay and supplement represent the largest feed costs for CON and TRT, respectively, changes in the values of those feedstuffs could alter the outcome of the comparison. However, fluctuating the prices within likely ranges may change the magnitude of the difference, but would not change the ranking. The value of hay would have to decline to $28 per ton as-fed before costs become equal. Likewise, the cost of the TRT supplement would have to increase to nearly the same value of the CON supplement (an increase of more than 50%) before costs equalized.

In conclusion, it is possible to design a bred heifer development program that relies exclusively on grazed winter forage and supplementation. Heifers in the TRT system lost less condition and did not differ in weight change relative to CON heifers. Pregnancy rates were quite high for 2-year old cows, and no difference was observed between the two systems. Additionally, costs associated with implementing the TRT system were slightly less than the cost of the CON program.

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