Effect of Winter Supplementation Level on Yearling System Profit Across Economic Scenarios

Kari L. Gillespie
Terry J. Klopfenstein
Jim C. MacDonald
Brandon L. Nuttelman
Cody J. Schneider[1]

Summary

Calves backgrounded in a forage–based, yearling system at a greater ADG maintained a performance advantage through finishing. High-level supplemented cattle gained an additional 0.18 lb daily during finishing and produced an additional 81 lb of saleable live weight compared to cattle backgrounded at a low-supplementation level. Across four economic scenarios with varying corn and distillers prices, high-level supplemented cattle returned $55.54 more than cattle fed a low level of supplementation during the winter backgrounding phase. Corn price would have to exceed $11.70/bu for high supplementation level to no longer be profitable.

Introduction

Wintering programs are typically associated with high feed costs; thus, decades of research have focused on the effects of low nutritional inputs during the winter period as a means to lower costs but then attain increased summer grazing gains (compensatory growth) during a period of higher nutrient intake. However, this philosophy may not have considered the benefits of a high-supplementation level when cattle are retained through finishing, or when ethanol byproducts are available as a supplement.

In the last seven years, corn prices have nearly tripled. Previous economic analyses may no longer be relevant and increasing gain prior to feedlot entry through backgrounding may be of greater value than previously realized. The objective of this study was to compare a high and low winter supplementation level in a forage-based backgrounding system regarding animal performance, and supplementation level profit sensitivity concerning corn price and distillers grains price relationship to corn. The forage-based backgrounding system includes three phases (winter backgrounding, summer grazing, and finishing).

Procedure

Six studies, completed from 1987 through 2013, examined a high (HI) and low (LO) winter supplementation level within a forage-based backgrounding system, subsequent summer grazing performance, followed by feedlot finishing. Four studies utilized steers, and two studies used spayed heifers. Cattle were backgrounded on corn residue to achieve specific levels of gain during the winter, and grazed cool- and warm-season grass through the summer prior to being finished. Within studies, treatment groups had identical implant procedures, summer grazing management, and finishing diets. Performance data were adjusted to an equal fat thickness within study to equitably compare treatments.

Five studies used were outlined in an initial analysis *(2013 Nebraska Beef Cattle Report,* pp. 17-18). A sixth study (*2014 Nebraska Beef Cattle Report* pp. 39-42) was included in the present analysis which used 110 heifer calves (initial BW = 491 lb). Heifers grazed corn residue 149 days and were supplemented with 2 lb (LO) or 5 lb (HI) wet distillers grains with solubles (WDGS) on a DM basis. This added study was similar to study 5 (*2013 Nebraska Beef Cattle Report*, pp. 17-18), but was completed under drought conditions and was included in the analysis to increase statistical power.

Performance values from each of the six studies (Table 1) were adjusted to an equal fat thickness within study and an economic sensitivity analysis was applied to the two backgrounding gain levels using four scenarios. The economics are intended to represent the biology differences between treatments rather than absolute profit or

Table 1. Backgrounding and finishing average performance across six systems studies comparing winter supplement level.

	LO	HI	SEM	*P*-value
Winter backgrounding phase				
Initial BW, lb	500	497	1.2	0.36
ADG, lb	0.57	1.4	0.09	<0.01
Summer grazing phase				
ADG, lb	1.39	1.06	0.07	0.02
Compensation, %	35[1]			
Finishing phase				
DOF	114	110	3.72	0.51
ADG, lb	4.00	4.18	0.04	0.05
Total DMI, lb	3,210	3,168	95.0	0.77
Feed:Gain	6.85	6.80	9.6	0.63
Final BW, lb	1,230	1,311		<0.01

Means with different superscripts differ ($P < 0.05$).
LO = cattle supplemented during the winter phase for a low daily gain.
HI = cattle supplemented during the winter phase for a high daily gain.
[1]Percent compensation, calculated as difference in total lb of summer gain divided by difference in total lb of winter gain.

Table 2. Effect of corn and distillers price on profitability of low or high winter supplementation level.

	LO[1]	HI[2]	SEM	*P*-value[3]
Initial Cost, $/head	873.87	870.96	2.1	0.36
Revenue, $/head	1,545.90	1,646.74	12.10	<0.01
$5.50/bu corn, distillers priced at 85% corn price				
Winter cost, $/head	72.69	114.66	1.18	<0.01
Summer cost, $/head	110.00	110.	0	1.0
Finishing cost, $/head	420.66	414.26	12.49	0.73
Total cost, $/head	1,477.22	1,509.9	11.71	0.11
Profit, $/head	68.68	136.86	9.78	<0.01
$5.50/bu corn, distillers priced at 105% corn price				
Winter cost, $/head	79.26	131.13	2.19	<0.01
Summer cost, $/head	110.00	110.00	0	1.0
Finishing cost, $/head	420.66	414.26	12.49	0.73
Total cost, $/head	1,483.81	1,526.35	11.44	0.05
Profit, $/head	62.11	120.39	9.45	0.01
$7.50/bu corn, distillers priced at 85% corn price				
Winter cost, $/head	88.62	145.88	2.42	<0.01
Summer cost, $/head	123.75	123.75	0	1.0
Finishing cost, $/head	552.42	544.34	16.38	0.74
Total cost, $/head	1,638.67	1,684.92	14.81	0.07
Profit, $/head	-92.76	-38.19	11.55	0.02
$7.50/bu corn, distillers priced at 105% corn price				
Winter cost, $/head	97.61	168.33	2.99	<0.01
Summer cost, $/head	123.75	123.75	0	1.0
Finishing cost, $/head	552.42	544.34	16.38	0.74
Total cost, $/head	1,647.65	1,707.37	14.78	0.04
Profit, $/head	-101.75	-60.63	11.06	0.05

[1]LO = cattle supplemented during the winter phase for a low daily gain
[2]HI = cattle supplemented during the winter phase for a high daily gain
[3]Means with $P < 0.05$ differ.

loss. Economic scenarios included 1) corn priced at $5.50/bu with distillers grains priced at 85% corn price, **$5.50 and 85%**; 2) corn priced at $5.50/bu with distillers grains priced at 105% corn price, **$5.50 and 105%**; 3) corn priced at $7.50/bu with distillers grains priced at 85% corn price, **$7.50 and 85%,** 4) corn priced at $7.50/bu with distillers grains priced at 105% corn price, **$7.50 and 105%** (Table 2).

Initial feeder calf cost was assumed to be $174.95/cwt. For $5.50/bu corn scenario, stalk grazing cost was $0.31/day per head, summer grazing cost was $0.80/day per head, and feedlot diet cost was $0.115/lb of diet DM. At $7.50/bu corn scenario, stalk grazing cost was $0.35/day per head, summer grazing cost was $0.90/day per head, and feedlot diet cost was $0.156/lb of diet DM. Stalk grazing costs included supplement delivery cost regardless of level of supplement as calves need to be checked and supplemented anyway. Supplement cost varied with amount. Feedlot yardage was $0.45 daily per head. Sale price was $125.53/cwt on a liveweight basis.

Across scenarios, modified distillers grains (MDGS) was the winter supplement fed at 2.0 lb/head (DM) daily for the low supplementation level and 5.0 lb/head (DM) daily for the high supplementation level. Distillers supplement was charged at $0.097, $0.12, $0.132, and $0.164/lb DM for $5.50 and 85%, $5.50 and 105%, $7.50 and 85%, and $7.50 and 105% scenarios, respectively.

Given profitability results, corn price/bu was adjusted to determine the point at which HI and LO had equal profit. All economic assumptions were held constant for each scenario, with only corn price and MDGS price varied.

Data were analyzed using the GLIMMIX Procedure of SAS (SAS Institute, Inc., Cary, N.C.). Performance data and profitability comparisons were analyzed as a complete block design with treatment within study the experimental unit. Winter supplementation level was a fixed effect, and study a random effect.

Results

Calves supplemented at HI level gained 1.41 lb/day, compared to 0.57 lb/day for cattle at the LO level ($P < 0.01$) during winter backgrounding. Cattle supplemented at the LO winter level gained 0.33 lb/day ($P = 0.02$) more during the summer phase, (1.39 lb/day for LO compared to 1.06 lb/day for HI), which is a classic compensatory gain response. Numerically LO cattle required an additional 4 DOF (Table 1). Total DMI and feed efficiency were similar. Gain during finishing was greater ($P = 0.05$) by 0.18 lb/day for HI cattle. This greater ADG coupled with the maintained weight advantage from the winter phase, resulted in 81 lb greater final weight ($P < 0.01$) for HI at 1,311 lb, compared to 1,230 lb for LO.

Revenue was $100.84 greater ($P = 0.05$) for HI than LO (Table 2). Total costs between HI and LO tended ($P = 0.07$) to be greater when distillers grains were priced at 85% corn price, and were greater ($P < 0.05$) for HI than LO when distillers grains were priced at 105% corn price (Table 2), regardless of corn price. Profit was consistently greater for HI than LO ($P < 0.05$), with a $54.83 advantage for HI across the four scenarios (Table 2).

Profit advantage for HI compared to LO was greater at $5.50/bu corn compared to $7.50/bu corn, and greater when distillers grains were priced at 85% corn price compared to 105% corn price (Table 2). At $5.50/bu corn, profit advantage for HI was $68.18 and $58.28, when distillers grains were priced at 85% and 105%

(Continued on next page)

corn price, respectively. However, at $7.50/bu corn, profit advantage for HI was $54.47 and $41.12, when distillers grains were priced at 85% and 105%, respectively.

At both the low corn price ($5.50/bu) and the low distillers price (85% corn price), there was a greater profit response with high winter supplementation level than was observed with the high corn price and high distillers price. Because revenue was constant among studies, the greater winter cost due to supplement price is responsible for the various responses in profit difference across studies.

Given these results, corn price/bu was adjusted to determine the point where HI and LO had equal profit within each of the scenarios. That breakpoint was $14.50, $11.70, $14.65, and $11.90/bu, at $5.50 and 85%, $5.50 and 105%, $7.50 and 85%, and $7.50 and 105%, respectively (Table 3). As distillers grains price increases, the point at which HI supplementation no longer has a profit advantage decreases. If corn price would attain these breakpoint levels, assumptions in this analysis may no longer be true. However, corn price/bu would have to dramatically increase before increased winter gains from supplementation level would no longer be profitable.

Table 3. Economic sensitivity of corn price and distillers price relative to corn on profit/head advantage for High compared to Low winter supplemented cattle[1].

	Distillers grains price relative to corn	
Corn price/bu	85%	105%
$5.50	$68.18	$58.28
$7.50	$54.57	$41.12

[1]Profit/head difference = Profit advantage of supplementing at a high winter level over low winter level.

Profitability increased by $55.54 when supplementing 5 lb/head daily of MDGS compared to 2 lb/head. Regardless of corn price or distillers grains price, HI was more profitable than LO. When economic assumptions were held constant, corn price/bu would have to exceed at least $11.70/bu for HI supplementation to no longer have a profit advantage compared to LO.

[1]Kari Gillespie, graduate student; Terry Klopfenstein, professor; James MacDonald, associate professor; Brandon Nuttelman and Cody Schneider, research technicians; University of Nebraska–Lincoln Department of Animal Science, Lincoln, Neb.