Performance and Economics of Supplementing Yearlings on Smooth Bromegrass Pastures

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Summary

Ten years of performance data from 2005–2014 were summarized to evaluate the effects of distillers grains plus solubles supplementation or fertilization of smooth bromegrass on performance and economic profitability of yearling steers with corn priced at either $3,4, or 5/bu and DGS priced at either 95, 105, or 115% the price of corn. Steers supplemented with distillers grains on non-fertilized smooth bromegrass had greater ADG (2.37 lb/d) compared with unsupplemented steers (1.69 lb/d). Unsupplemented steers grazing fertilized and non-fertilized pasture had similar gains; however, steers grazing fertilized pasture were more profitable due to savings in land rent. Supplemented steers were more profitable than unsupplemented steers until distillers grains reached 105% the price of $5/bu corn.

Introduction

Supplementing steers grazing smooth bromegrass pastures with distillers grains plus solubles (DGS) increases ADG compared to unsupplemented cattle. Adding nitrogen fertilizer (in the form of urea) to smooth bromegrass pastures increases forage production, but does not impact forage quality, demonstrated by similar ADG of cattle (*2011 Nebraska Beef Report*, pp. 24–25). Profitability of these treatments is greatly impacted by input costs such as land rent, fertilizer price, and DGS cost (*2013 Nebraska Beef Report*, pp. 33–35). Additionally, summer grazing management strategies can affect profitability of steers if they are retained through the finishing period.

The objective of this study was to summarize 10 years of cattle performance data and evaluate the effects of DGS supplementation or nitrogen fertilization on cattle backgrounding and finishing economics.

Procedure

Performance

Four hundred and fifty yearling steers (708 lb, SD = 46) were utilized in a randomized complete block design on smooth bromegrass pastures over the course of 10 years. Each year, 45 steer calves were assigned to 1 of 3 treatments with 3 replications per treatment. Treatments consisted of bromegrass pastures fertilized with 80 lb N/acre (FERT), unfertilized pastures stocked with cattle that received DGS at 0.6% of BW (SUPP), and unfertilized pastures stocked with cattle that received no supplement (CON). The FERT and SUPP pastures were stocked at 4 AUM/acre while the CON pastures were stocked at 2.8 AUM/acre or 69% of the other 2 treatments. Five tester animals were maintained on each pasture for performance measurements; extra calves were added or removed to maintain constant grazing pressure across all treatments. Treatment pastures were divided into 6 equal paddocks and rotationally grazed for an average of 152 days per year from April to September. The grazing period was divided into 5 cycles with cycles 1 and 5 lasting 24 days and cycles 2, 3, and 4 lasting 36 days. In order to update supplement amount, BW was measured at the end of each cycle and shrunk 4% to account for gut fill. Beginning and ending BW measurements were collected on 3 consecutive days and averaged following 5 days of being limit fed a diet of 50% roughage and 50% byproduct to equalize gut fill. From 2005–2009 cattle received no implant and from 2010–2014 cattle were implanted with Revalor-G (40 mg trenbalone acetate, 8 mg estradiol).

Economics

Total costs for each system included initial animal cost, yardage, pasture rent, fertilizer, health and processing, death loss, interest, and supplement cost (Table 1).

Table 1. Economic analysis input costs

Initial Steer Cost	$210.00/cwt		
Final Grazing Value	$180.64/cwt, 963 lb; $10/cwt slide		
Final Live Value[a]	$3/bu, $145.94/cwt; $4/bu, $151.84/cwt; $5/bu, $157.74/cwt		
Grazing Yardage	[b]CON & FERT, $0.10/hd/day; SUPP, $0.20/hd/day		
Feedlot Yardage	$0.45/hd/day		
Health and processing	Grazing, $8.40/animal; Finishing, $8.40/animal		
Death loss	Grazing, 0.50%; Finishing, 0.25%		
Fertilizer	$430/ton urea plus $4/acre application fee		
Land cash rent	$31/AUM		
DGS, relative to corn price	95%	105%	115%
$3/bu corn, $124.53/ton DM	$118.30/ton DM	$130.76/ton DM	$143.21/ton DM
$4/bu corn, $166.05/ton DM	$157.75/ton DM	$174.35/ton DM	$190.96/ton DM
$5/bu corn, $207.56/ton DM	$197.18/ton DM	$217.94/ton DM	$238.69/ton DM

[a]Nine economic scenarios were compared with corn priced at $3, 4, and 5/bu and DGS priced at 95, 105, and 115% the price of corn.
[b]Treatments consisted of nonfertilized paddocks (CON), paddocks fertilized with 80 lb N/acre (FERT), and nonfertilized paddocks grazed by steers supplemented with DGS at 0.6% of BW daily.

Interest was calculated using a rate of 6% and applied to half of the initial animal cost and all of the other costs. Grazing yardage was included at $0.10/hd/day for the CON and FERT treatments to account for fence maintenance, checking on animals, and watering. Yardage was increased to $0.20/hd/day for the SUPP treatment to account for extra labor incurred due to daily supplementation. Pasture rent was charged at a rate of $31/AUM (*2014 Nebraska Farm Real Estate Report*, Department of Agricultural Economics, University of Nebraska–Lincoln). As stocking rate varied between treatments, cost of land rent also changed. For CON cattle land rent was $168.48 for the grazing period while for FERT and SUPP cattle land rent was $112.48. Urea cost $430/ton and an application fee of $4/acre was included. For the summer grazing period an $8.40/animal health and processing fee and a 0.5% death loss were charged. Initial calf price was based on a Nebraska 3 year average.

Nine economic scenarios were compared. Corn was priced at $3, 4, or 5/bu with DGS priced at 95, 105, or 115% the price of corn. When corn was $3/bu, DGS prices were $118.30, 130.76, and 143.21/ton DM, respectively for 95, 105, and 115% the price of corn. At $4/bu the DGS prices increased to $157.75, 174.35, and 190.96/ton DM and $197.18, 217.94, and 238.69/ton DM with $5/bu corn.

The effects of summer grazing system on profitability of steers through the finishing period were also evaluated. Total costs for the entire system through finishing included costs incurred during the summer grazing period, plus feedlot yardage ($0.45/hd/d), health and processing ($8.40/animal), death loss (0.25%), interest on yardage and feed, and feed cost. Feed cost during the finishing period was calculated using the same price scenarios as during the grazing season with the finishing diet consisting of 70% corn and 30% DGS. Finishing performance was based on previous research in which supplemented or unsupplemented steers grazing pastures during the summer were followed through the finishing phase(*2012 Nebraska Beef Report*, pg. 112–114). The CON and FERT steers required 126 days on feed compared to 102 days for SUPP steers due to SUPP steers weighing approximately 100 lbs more at the end of the grazing season. To

Table 2. Performance of yearling steers grazing smooth bromegrass pastures

	Treatments[a]			SEM	*P*-Value
	CON	FERT	SUPP		
Initial BW, lb	709	708	706	15.2	0.47
Ending BW, lb	963[c]	963[c]	1063[b]	15.1	< 0.01
ADG, lb/d	1.68[c]	1.70[c]	2.37[b]	0.09	< 0.01

[a]Treatments consisted of nonfertilized paddocks (CON), paddocks fertilized with 80 lb N/acre (FERT), and nonfertilized paddocks grazed by steers supplemented with DGS at 0.6% of BW daily.
[b,c]From the *P*-values, means with differing superscripts are different ($P < 0.05$).

Table 3. Profitability of yearling steers under differing summer management strategies with different corn and DGS prices

Scenario		Treatments[a]			SEM	*P*-Value
		CON	FERT	SUPP		
$3/bu corn, DGS at 95%	Revenue[b]	$1736.96[e]	$1736.96[e]	$1811.03[d]	11.72	< 0.01
	Profit[b]	$0.00[f]	$15.67[e]	$70.99[d]	26.02	< 0.01
	Breakeven[c]	$180.37	$178.74	$163.69		
$3/bu corn, DGS at 105%	Revenue	$1736.96[e]	$1736.96[e]	$1811.03[d]	11.72	< 0.01
	Profit	$0.00[f]	$15.67[e]	$65.67[d]	26.02	< 0.01
	Breakeven	$180.37	$178.74	$164.19		
$3/bu corn, DGS at 115%	Revenue	$1736.96[e]	$1736.96[e]	$1811.03[d]	11.72	< 0.01
	Profit	$0.00[f]	$15.67[e]	$60.35[d]	26.02	< 0.01
	Breakeven	$180.37	$178.74	$164.69		
$4/bu corn, DGS at 95%	Revenue	$1736.96[e]	$1736.96[e]	$1811.03[d]	11.72	< 0.01
	Profit	$0.00[f]	$15.67[e]	$54.14[d]	26.02	< 0.01
	Breakeven	$180.37	$178.74	$165.28		
$4/bu corn, DGS at 105%	Revenue	$1736.96[e]	$1736.96[e]	$1811.03[d]	11.72	< 0.01
	Profit	$0.00[f]	$15.67[e]	$47.05[d]	26.02	< 0.01
	Breakeven	$180.37	$178.74	$165.94		
$4/bu corn, DGS at 115%	Revenue	$1736.96[e]	$1736.96[e]	$1811.03[d]	11.72	< 0.01
	Profit	$0.00[f]	$15.67[e]	$39.96[d]	26.02	< 0.01
	Breakeven	$180.37	$178.74	$166.61		
$5/bu corn, DGS at 95%	Revenue	$1736.96[e]	$1736.96[e]	$1811.03[d]	11.72	< 0.01
	Profit	$0.00[f]	$15.67[e]	$37.30[d]	26.02	< 0.01
	Breakeven	$180.37	$178.74	$166.86		
$5/bu corn, DGS at 105%	Revenue	$1736.96[e]	$1736.96[e]	$1811.03[d]	11.72	< 0.01
	Profit	$0.00[e]	$15.67[d]	$28.43[d]	26.02	< 0.01
	Breakeven	$180.37	$178.74	$167.70		
$5/bu corn, DGS at 115%	Revenue	$1736.96[e]	$1736.96[e]	$1811.03[d]	11.72	< 0.01
	Profit	$0.00[e]	$15.67[d]	$19.57[d]	26.02	< 0.01
	Breakeven	$180.37	$178.74	$168.53		

[a]Treatments consisted of nonfertilized paddocks (CON), paddocks fertilized with 80 lb N/acre (FERT), and nonfertilized paddocks grazed by steers supplemented with DGS at 0.6% of BW daily.
[b]$/animal
[c]$/cwt, ending wt
[d,e,f]From the *P*-values, means within a row with differing superscripts are different ($P < 0.05$).

control for changes in cattle prices among years, price received for steers coming off grass and at the end of the finishing period were calculated so that CON cattle broke even when DGS was priced at 95% of the bushel price of corn. Therefore, grazing season profitability remained the same for the CON cattle as corn and DGS prices increased. However, system profitability decreased due to the increase in total costs as the price of DGS and corn in the finishing diet increased. To account for the greater weight of SUPP steers at the conclusion of the grazing period compared to CON and FERT steers, a price slide of $10/cwt was used. Cost of gain over the grazing season and finishing period was calculated by dividing the total costs incurred, excluding initial steer price, by total weight gained during either the grazing season or finishing period. Breakeven prices were calculated by dividing total costs by BW at the end of the grazing period or shrunk final BW. Profitability was then calculated as live animal revenue minus total costs.

Results

Performance

Steers on CON and FERT treatments gained similarly throughout the grazing season (1.68 and 1.70 lb/day, respectively; $P = 0.67$); however, fertilized pastures had greater gain per acre. Steers supplemented with DGS at 0.6% of BW had increased ADG (2.37 lb/day) compared to CON and FERT steers ($P < 0.01$; Table 2). This increase in ADG of SUPP steers throughout the grazing season led to greater ending BW compared to nonsupplemented steers (1063 vs. 963 lb, respectively). Additionally, SUPP steers had increased production per unit of land over FERT steers. While SUPP and FERT steers were stocked at the same rate, the increase in ADG of SUPP steers led to 371 lb gain/acre over the 152 d grazing season compared to 289 lb gain/acre for FERT steers over the same time period.

Economics

Over the grazing season, FERT and SUPP steers were more profitable than CON steers ($P < 0.01$; Table 3). With CON steers generating a net return of $0, FERT steers generated a net return of

Table 4. Effect of summer management strategy on retained ownership profitability of yearling steers through the finishing period

Scenario		Treatments[a]			SEM	*P*-Value
		CON	FERT	SUPP		
$3/bu corn, DGS at 95%	Revenue[b]	$2054.66	$2055.81	$2054.99	21.11	> 0.99
	Profit[b]	$0.00[e]	$16.79[e]	$56.11[d]	23.78	< 0.01
	Breakeven[c]	$145.93	$144.82	$141.97		
$3/bu corn, DGS at 105%	Revenue	$2054.66	$2055.81	$2054.99	21.11	> 0.99
	Profit	$(7.61)[e]	$9.20[e]	$44.65[d]	23.78	< 0.01
	Breakeven	$146.47	$145.36	$142.78		
$3/bu corn, DGS at 115%	Revenue	$2054.66	$2055.81	$2054.99	21.11	> 0.99
	Profit	$(15.20)[e]	$1.61[e]	$33.19[d]	23.78	< 0.01
	Breakeven	$147.01	$145.89	$143.59		
$4/bu corn, DGS at 95%	Revenue	$2137.73	$2138.92	$2138.07	21.11	> 0.99
	Profit	$0.00[e]	$16.86[e]	$55.12[d]	23.78	< 0.01
	Breakeven	$151.83	$150.71	$147.94		
$4/bu corn, DGS at 105%	Revenue	$2137.73	$2138.92	$2138.07	21.11	> 0.99
	Profit	$(10.12)[e]	$6.74[e]	$39.84[d]	23.78	< 0.01
	Breakeven	$152.55	$151.43	$149.02		
$4/bu corn, DGS at 115%	Revenue	$2137.73	$2138.92	$2138.07	21.11	> 0.99
	Profit	$(20.23)[e]	$(3.38)[e]	$24.56[d]	23.78	< 0.01
	Breakeven	$153.26	$152.15	$150.11		
$5/bu corn, DGS at 95%	Revenue	$2220.79	$2222.04	$2221.15	21.11	> 0.99
	Profit	$0.00[e]	$16.93[e]	$54.13[d]	23.78	< 0.01
	Breakeven	$157.73	$156.61	$153.91		
$5/bu corn, DGS at 105%	Revenue	$2220.79	$2222.04	$2221.15	21.11	> 0.99
	Profit	$(12.63)[e]	$4.29[e]	$35.03[d]	23.78	< 0.01
	Breakeven	$158.62	$157.51	$155.26		
$5/bu corn, DGS at 115%	Revenue	$2220.79	$2222.04	$2221.15	21.11	> 0.99
	Profit	$(25.27)[e]	$(8.36)[e]	$15.93[d]	23.78	< 0.01
	Breakeven	$159.52	$158.41	$156.62		

[a]Treatments consisted of nonfertilized paddocks (CON), paddocks fertilized with 80 lb N/acre (FERT), and nonfertilized paddocks grazed by steers supplemented with DGS at 0.6% of BW daily.
[b]$/animal
[c]$/cwt, final wt shrunk 4%
[d,e]From the *P*-values, means within a row with differing superscripts are different ($P < 0.05$).

$15.67 indicating that fertilizer costs are offset by the decrease in land rent due to increased stocking rate. As price of corn increased from $3 to $5/bu, profit of SUPP steers relative to CON steers decreased; however, even at the highest price of corn and DGS relative to corn, SUPP steers still had a $19.57 profit potential compared to CON steers. At the lowest price of DGS in this evaluation, SUPP steers had a net return of $70.99 compared to CON steers. Across all DGS prices at $3 and $4/bu corn, SUPP steers had greater profitability than FERT steers ($P < 0.01$). When corn price increased to $5/bu and DGS were priced at 105 or 115% the price of corn, SUPP steers were no longer more profitable than FERT steers with net returns of $28.43 and $19.57, respectively, compared to the $15.67 net return of FERT steers ($P > 0.07$).

Overall, for every $1/bu increase in corn price, SUPP steer profit decreased by $18.62. Within each corn price, for every 10% increase in DGS relative to corn, profit of SUPP steers decreased by $5.32, $7.09, and $8.87 per animal for $3, $4, and $5/bu corn, respectively.

When comparing the effects of summer management strategy on profitability of steers through the finishing period, CON and FERT steers were not significantly different ($P \geq 0.10$; Table 4), though FERT steers had numerically higher returns. Across all price scenarios SUPP steers were more profitable than unsupplemented steers through the finishing period ($P \leq 0.03$). Similar to the grazing season, as corn and DGS prices increased, profit of SUPP steers relative to unsupplemented steers decreased. The decrease in profit of SUPP steers relative to CON steers from the lowest corn and DGS price to the highest price was $14.88/hd. For the finishing period, as corn increased $1/bu there was a $2.30 decrease in profit of SUPP steers over CON steers and a $4.81 decrease overall. Within each corn price, for every 10% increase in DGS relative to corn, profit of SUPP steers decreased by $11.46, $15.28, and $19.10 per animal for $3, $4, and $5/bu corn, respectively.

When corn was priced at either $3 or 4/bu, it was more profitable to sell SUPP steers at the end of the grazing season rather than retaining ownership through the finishing phase. However, as corn price increased to $5/bu it became more profitable to retain ownership of SUPP steers through the finishing period. This is greatly impacted by cattle prices and price slides.

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