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An Evaluation of Economic Efficiencies of Two Beef Systems from Calving to Harvest

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Summary

Spring-calving, crossbred cows were used in a three-year experiment to determine the economic efficiencies of two different beef systems. Cows were either wintered on pasture (Control System) or on cornstalks (Treatment System). Control System steers were transported to a feedlot, fed a finishing diet and slaughtered. Treatment System steers were wintered on cornstalks, grazed pasture, fed a finishing diet and slaughtered. The Treatment System had lower weaning and slaughter breakeven, lower cost per weaned calf and greater profit potential when finished steers were sold on a live basis. Profitability was similar when finished steers were sold on a grid basis.

Introduction

Wintering the beef cow is an area of management that offers many producers significant opportunity to decrease input costs. Additionally, growing weaned calves on forages before finishing may produce more total beef at a lower cost per unit. Profit potential of cow/calf systems also is affected by the method of pricing weaned calves into the post-weaning phase of production. The marketing strategy used by a producer can further impact net income. There is limited data regarding the influence of these components on beef systems. Specifically, few studies have analyzed the economics of beef systems from calving to harvest where feed

inputs have been reduced and grazing opportunities have been extended for the cow and calves post-weaning. Production data from this experiment, including cow performance, calf performance and carcass characteristics, are reported in the 2003 Nebraska Beef Report. The objective of this study was to evaluate the economic efficiency of a traditional beef production system with a system that matches cattle to forage resources.

Procedure

Cow/calf Economics

Cow cost, cost per weaned calf, and breakevens at weaning were calculated by evaluating annual inputs and revenues for the control (CON) and treatment (TRT) systems. The amounts of hay and supplements fed to cows and replacement heifers were recorded annually, as well as the number of days that cows grazed pasture and/or cornstalks each year. Input costs did not account for management, labor, or overhead.

Grazing costs were based on 10-year average rental rates for pasture in Southeastern Nebraska of \$20.68 per 1.4 animal unit month (AUM) that included forage intake of a 300-lb calf. In the current experiment, this grazing cost was assigned to a 1200-lb cow. Adjustments in grazing costs were made for dormant season grazing, lactational status and body weight (lower weight of 2-year-olds and replacement heifers compared to mature cows). Cornstalk grazing was priced at \$0.25/cow/day. Ten-year average prairie and alfalfa hay prices were \$55.67/T and \$57.42/T, respectively. Corn was priced at \$2.37/bushel. Protein

and salt and mineral were priced at \$240/T. Costs associated with feeding were priced at \$10/T feed fed. Bull costs were \$20/cow unit, and health inputs per cow unit were priced at \$15 per cow.

Initial cow costs were determined on a cow unit basis and included all costs described above, divided by the total number of females expected to calve within each treatment group each year. Initial cow costs were adjusted for non-calf revenue by accounting for gains/losses on cull cows and heifers. Weaning rates were similar ($P > 0.10$) between treatments, so cost per weaned calf was calculated by dividing the cow cost by the pooled weaning rate (86.5%). Actual weaning weight was similar ($P > 0.10$) between groups; therefore, breakeven at weaning was calculated by dividing cost per calf weaned by a pooled weaning weight (500 lb).

Post-weaning Economics

Steers were priced into the post-weaning phase of the system using both the economic price (15-yr average price received for the month in which the steer was weaned) of the weaned steer, as well as financial cost of producing the steer (cost/weaned calf). Trucking was priced at \$0.005/lb. An operating loan interest annual percentage rate of 8.0 was used. Interest was charged on the initial cost of all steers and on trucking for the entire post-weaning ownership period. All feed inputs for each system were recorded annually, as well as the number of days the TRT steers were drylotted, grazed cornstalks and grazed pasture.

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Control steers were charged \$25/head for processing. Yardage was priced at \$0.30/head/day, and finishing rations were priced at \$126.22/T. Interest was charged on processing, yardage and feed for half of the ownership period each year. An assumed death loss of 2% was applied to the final live weight value of each steer.

Treatment steers were charged a processing cost of \$8.33/head for the wintering period, and interest was charged on processing for the entire ownership period. Drylot yardage before and after cornstalk grazing was priced at \$0.23/head/day. Cornstalk grazing was priced at \$0.12/head/day. The wheat straw offered to steers during the winter period was \$44/T (as-fed) and intake was estimated to be approximately 12 lb/head/day (as-fed). Wet corn gluten feed was priced at \$113.28/T (DM basis) and fed at the rate of 5 lb/head/day (DM basis). Mineral supplement for the TRT steers while in drylot was \$338.82/T and fed at the rate of 0.15 lb/head/day; cornstalk mineral supplementation was fed at the rate of 0.24 lb/head/day and priced at \$446.24/T. Interest was charged on drylot yardage, cornstalk grazing, wheat straw, wet corn gluten feed, and mineral for half of the wintering period and the rest of ownership. A 1% death loss was applied to the live weight value of the steer at the end of the wintering period.

During the summering period, TRT steers were charged \$8.33/head for health care. Grazing costs were \$0.45/head/day, and interest was charged on both health care and grazing costs for half of the summering period and the rest of ownership. A 0.5% death loss was applied to the live weight value of the steer at the end of the summering period.

Costs for TRT steer finishing period were similar to those of CON steer finishing, with the exception of processing charge being \$8.33/head for TRT steers entering the

Table 1. Yearly cow cost, cost per weaned calf, and breakeven excluding management, labor and overhead for control (CON) and treatment (TRT) systems.

Item	CON	TRT	P-value	SE
Number ^a	99	100		
Initial cow cost,\$	339.75	316.46		
Non-calf revenue ^b ,\$	(53.93)	(48.08)		
Adjusted cow cost ^c ,\$	393.68	364.54		
Cost/weaned calf ^d ,\$	455.12	421.43	0.07	6.83
Breakeven ^e ,\$/lb	0.91	0.84	0.07	0.01

^aNumber of females expected to calve.

^bNon-calf revenue = gain/loss cull cows + gain/loss cull heifers.

^cAdjusted cow cost = cow cost + non-calf revenue.

^dCost per weaned calf = adjusted cow cost / weaning rate (0.865).

^eBreakeven at weaning = (cost/weaned calf) / weaning weight (500 lb).

Table 2. Post-weaning cost per head, breakeven, revenue, and net profit/loss for the control (CON) and treatment (TRT) systems when steers are priced in on an economic basis excluding management, labor, and overhead.

Item	CON	TRT	P-value	SE
Winter period				
Initial steer cost ^a ,\$/hd	433.95	433.95		
Trucking,\$/hd	2.53	2.53		
Processing,\$/hd		8.33		
Drylot yardage,\$/hd		27.60		
Cornstalks,\$/hd		9.28		
WCGF,\$/hd		55.79		
Mineral,\$/hd		5.04		
Wheat straw,\$/hd		32.55		
Death loss,\$/hd		5.79		
Interest ^b ,\$/hd		27.93		
Total cost,\$/hd		608.79		
Weight, lb		730		
Breakeven, \$/lb		0.83		
Revenue,\$/hd		578.61		
Net profit/loss,\$/hd		(30.18)		
Summer period				
Initial steer cost ^a ,\$/hd		578.61		
Grazing,\$/hd		52.95		
Processing,\$/hd		8.33		
Death loss,\$/hd		3.53		
Interest ^b ,\$/hd		13.37		
Total cost,\$/hd		656.80		
Weight, lb		953		
Breakeven, \$/lb		0.67		
Revenue,\$/hd		706.86		
Net profit/loss,\$/hd		50.07		
Finishing period				
Initial steer cost ^a ,\$/hd	706.86			
Feed,\$/hd	251.07	174.26		
Yardage,\$/hd	63.20	27.00		
Processing,\$/hd	25.00	8.33		
Death loss,\$/hd	14.95	4.46		
Interest ^b ,\$/hd	27.21	11.08		
Total steer cost,\$/hd	817.91	932.00		
Final weight, lb	1058	1283		
Breakeven, \$/lb	0.77	0.72	0.01	0.01
Revenue, live basis ^c ,\$/hd	747.55	892.23		
Net profit/loss, live basis,\$/hd	(70.36)	(39.77)	0.14	9.17
Revenue, grid basis ^d ,\$/hd	770.75	885.14		
Net profit/loss, grid basis,\$/hd	(47.16)	(46.86)	0.99	20.34

^aEconomic steer cost = cost of steer if it had been purchased using the 15-year average price for steers for the appropriate month and weight.

^b8.0 Annual Percentage Rate.

^cRevenue generated from the sale of a steer using weight and price categories for the month in which the steer was sold at the end of the feedlot period.

^dRevenue generated from the sale of a steer using the pricing grid.

feedlot. Interest was charged on processing, yardage and feed for half of the finishing period each

year. A 0.5% death loss was applied to the final live weight value of the TRT steer.

Table 3. Post-weaning cost per head, breakeven, revenue, and net profit/loss for the control (CON) and treatment (TRT) systems when steers are priced in on a financial basis excluding management, labor, and overhead.

Item	CON	TRT	P-value	SE
Winter period				
Initial steer cost ^a ,\$/hd	455.12	421.43		
Trucking,\$/hd	2.53	2.53		
Processing,\$/hd		8.33		
Drylot yardage,\$/hd		27.60		
Cornstalks,\$/hd		9.28		
WCGF,\$/hd		55.79		
Mineral,\$/hd		5.04		
Wheat straw,\$/hd		32.55		
Death loss,\$/hd		5.79		
Interest ^b ,\$/hd		27.12		
Total cost,\$/hd		595.46		
Weight, lb		730		
Breakeven, \$/lb		0.81		
Revenue,\$/hd		578.61		
Net profit/loss,\$/hd		(16.85)		
Summer period				
Initial steer cost ^a ,\$/hd		595.46		
Grazing,\$/hd		52.95		
Processing,\$/hd		8.33		
Death loss,\$/hd		3.53		
Interest ^b ,\$/hd		12.74		
Total steer cost,\$/hd		673.02		
Weight, lb		953		
Breakeven, \$/lb		0.69		
Revenue,\$/hd		706.86		
Net profit/loss,\$/hd		33.84		
Finishing period				
Initial steer cost ^a ,\$/hd		673.02		
Feed,\$/hd	251.07	174.26		
Yardage,\$/hd	63.20	27.00		
Processing,\$/hd	25.00	8.33		
Death loss,\$/hd	14.95	4.46		
Interest ^b ,\$/hd	28.20	10.74		
Total cost,\$/hd	840.07	897.81		
Final weight, lb	1058	1283		
Breakeven, \$/lb	0.79	0.70	0.03	0.01
Revenue, live basis ^c ,\$/hd	747.55	892.23		
Net profit/loss, live basis,\$/hd	(92.52)	(5.58)	0.07	17.23
Revenue, grid basis ^d ,\$/hd	770.75	885.14		
Net profit/loss, grid basis,\$/hd	(69.32)	(12.67)	0.28	27.72

^aFinancial steer cost = cost to produce a weaned steer.

^b8.0 Annual Percentage Rate.

^cRevenue generated from the sale of a steer using weight and price categories for the month in which the steer was sold at the end of the feedlot period.

^dRevenue generated from the sale of a steer using the pricing grid.

The live value was determined using average final weights for each year and the 15-year average live weight price for fed steers in Nebraska for month of slaughter. Breakevens were calculated by dividing the total costs of the post-weaning phase by final weight. Profit/loss per steer (live basis) was determined using total costs and live weight value.

Profit/loss per steer was determined for each system using a value-based grid. The basis used was the 1990-2000 average Nebraska dressed fed cattle price each year for the appropriate

month. The 1990-2000 average USDA Quality Grade Choice/Select price spreads for the appropriate month were used to calculate premiums and discounts for marbling.

Systems Economics

Control and treatment systems were compared each year on an economic and a financial basis. Costs and revenues were calculated on a per cow exposed basis by assuming a 100-head cow herd, accounting for weaning rate (86.5%), and assuming a 50:50 ratio of steers and heifers at weaning.

Economic and financial-based analysis used the summation of adjusted cow cost and the accrued costs of producing a steer for slaughter that included interest and excluded initial cost of purchasing the steer into the feedlot. Systems revenues accounted for the sale of weaned, non-replacement heifers as well as the sale of finished steers. Net system revenue was determined from the difference between systems costs and revenues, and then divided by 100 to establish net revenue per cow exposed.

Results

Cow/calf Economics

A summary of the economic evaluation of the control and treatment systems before weaning is reported in Table 1. Cost per weaned calf and weaning breakeven were higher ($P = 0.07$) for CON cows than for TRT cows. As functions of adjusted cow cost, cost per weaned calf and breakeven represent input costs. The most noticeable difference between input costs was in hay expense. Control cows consumed about 3144 lb/head while TRT cows consumed about 2057 lb/head of hay each year. This resulted in all costs associated with harvested forages feeding being \$120.83 per cow for CON cows and \$90.69 per cow for TRT cows, illustrating the impact that harvested forage feeding costs have on cost per unit of production.

Post-weaning Economic Analysis

Post-weaning steer costs and revenues for the CON and TRT groups when steers are purchased into the system on an economic basis are presented in Table 2. Slaughter breakeven was greater ($P = 0.01$) for the CON system than for the TRT system. Net profit/loss derived from live animal sale tended to be lower ($P = 0.14$) for the CON system; in the finishing period, the CON system lost \$30.59

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more per steer than the TRT system. When steers were sold using the grid, profit/loss was not different between groups. Treatment steers had lower breakevens and improved profit potential when steers were sold on a live weight basis each year compared to CON steers. CON steers had higher marbling scores compared to TRT steers and TRT steers had heavier final weights compared to CON steers and these factors influenced breakevens when steers were sold on either a grid or live weight basis.

Post-weaning Financial Analysis

Table 3 reports results of the post-weaning phase when steers are priced into the system on a financial basis. Slaughter breakeven was lower ($P = 0.03$) for the TRT steers than for the CON steers. This difference was due to reduced initial steer cost and greater final feedlot weight for TRT steers. Profit potential when finished steers were marketed using a live sale price was also different ($P = 0.07$) between groups. When grid pricing was used, net profit/loss was not different.

Systems Economics

Tables 4 and 5 report the economic and financial analyses of the CON and TRT systems. Net profit/loss from live-based sale of finished steers was improved ($P < 0.10$) for the TRT system when compared to the CON system, regardless of method used to price steers into the feedlot or marketing technique of finished steers. The improved profit/loss for the TRT system is a function of the reduced cow costs and more revenue generated in the TRT system.

In conclusion, coordinating management of production with forage resources offers beef producers the opportunity to enhance sustainability and longevity in their operations. Net profitability of any

Table 4. Net revenue or loss generated for control (CON) and treatment (TRT) systems when steers are priced into the post-weaning phase of production on an economic basis, excluding management, labor, and overhead.

Item	CON	TRT	P-value	SE
Cow cost ^a , \$	39367.67	36454.00		
Steer cost (economic) ^b , \$	16510.28	21416.15		
Total system cost, \$	55877.95	57870.15		
Steer revenue(live basis) ^c , \$	32145.65	38365.89		
Heifer revenue ^d , \$	17790.39	17790.39		
System revenue (live basis), \$	49936.04	56156.28		
Net revenue/cow exposed (live basis), \$	(59.42)	(17.14)	0.08	9.44
Steer revenue(grid basis) ^e , \$	33142.25	38061.16		
Heifer revenue ^d , \$	17790.39	17790.39		
System revenue (grid basis), \$	50932.64	55851.55		
Net revenue/cow exposed (grid basis), \$	(49.45)	(20.19)	0.28	14.45

^aCow Cost = adjusted cow cost (Table 1) * 100 head of cows.

^bTotal steer cost from weaning through slaughter with steer priced into the post-weaning phase on an economic basis, excluding initial steer cost (Table 2) * (100*0.865*0.5).

^cSteer revenue derived from live weight sale (Table 2) * (100*0.865*0.5).

^dWeaned heifer revenue using heifer weaning weight (494 lb) and the 15-year average price for heifers for the month weaned (\$83.75/100 lb) * (100*0.865*0.5).

^eSteer revenue derived from grid-based sale (Table 2) * (100*0.865*0.5).

Table 5. Net revenue or loss generated for control (CON) and treatment (TRT) systems when steers are priced into the post-weaning phase of production on a financial basis, excluding management, labor, and overhead.

Item	CON	TRT	P-value	SE
Cow cost ^a , \$	39367.67	36454.00		
Steer cost (financial) ^b , \$	16552.99	20484.34		
Total system cost, \$	55920.66	56938.34		
Steer revenue(live basis) ^c , \$	32145.65	38365.89		
Heifer revenue ^d , \$	17790.39	17790.39		
System revenue (live basis), \$	49936.04	56156.28		
Net revenue/cow exposed (live basis), \$	(59.32)	(8.35)	0.06	9.75
Steer revenue(grid basis) ^e , \$	33142.25	38061.16		
Heifer revenue ^d , \$	17790.39	17790.39		
System revenue (grid basis), \$	50932.64	55851.55		
Net revenue/cow exposed (grid basis), \$	(49.88)	(10.87)	0.19	14.61

^aCow Cost = adjusted cow cost (Table 1) * 100 head of cows.

^bTotal cost from weaning through slaughter with steer priced into the post-weaning phase on a financial basis, excluding initial steer cost (Table 3) * (100*0.865*0.5).

^cSteer revenue derived from live weight sale (Table 3) * (100*0.865*0.5).

^dWeaned heifer revenue using heifer weaning weight (494 lb) and the 15-year average price for heifers for the month weaned (\$83.75/100 lb) * (100*0.865*0.5).

^eSteer revenue derived from grid-based sale (Table 3) * (100*0.865*0.5).

beef production system is highly dependent on the feed costs, price received or paid for weaned calves and marketing strategies for finished cattle. Evaluation of the relative efficiencies of different cow/calf systems involves the comparison of these factors.

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