Extended Grazing and Byproduct Diets in Beef Growing Finishing Systems

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Maximizing amount of gain on forages reduced costs of production and slaughter breakevens in growing-finishing beef systems.

Summary

Two experiments evaluated methods of reducing costs of finished beef. The first experiment, used lambs as a model for cattle. A dry rolled corn diet served as a control and two byproduct diets: 1) corn gluten feed; or 2) gluten feed plus wheat midds, were supplemented with three levels of tallow. Byproduct diets gave feed efficiencies nearly equal to corn and efficiencies increased with tallow supplementation . In the second experiment, 128 steers were used in grazing systems including smooth brome, warm-season grasses, oats and cornstalks and finished on corn or byproduct diets. High forage gains reduced costs and slaughter breakevens.

Introduction

Forages are an important part of beef production but often are not used to the best extent. We have found (1995 Beef Cattle Report, pp 34) maximizing the amount of gain on forage before entering the feedlot reduces costs of production. There are, however, a number of alternative ways to achieve maximum gain including high rates of forage gains and longer time periods on forage.

For one, cattle can be finished on byproducts (1995 Beef cattle Report, pp 34). Byproducts are generally priced cheaper than corn and are not well utilized by monogastrics. Our objectives in this study were to minimize costs of beef production by increasing forage gains and optimizing byproduct diets.

Procedure

Experiment 1.

Sixty-three cross-bred lambs were randomly assigned to one of seven treatments according to a 2 × 3 + 1 factorial design (Table 1). There were two byproduct diets: one, a wet corn gluten feed which is a blend of 1/3 steep liquor/distiller solubles and 2/3 corn bran; and the second diet, where one-half of the corn bran was replaced with wheat midds. Steep liquor/distiller solubles remained constant across all diets. Tallow was added to each of the byproduct diets at concentrations of 0, 4 and 8% replacing either bran or bran and midds. Corn gluten meal and blood meal were added to the byproduct diets to supply equal undegradable intake protein to the dry rolled control. The lambs were individually fed for 84 days. They were "stepped up" by feeding 2% of body weight initially and increasing intake by .2% body weight each day until ad libitum intake was achieved. Lambs were weighed three times at the initiation and conclusion of the trial. Economic analyses used prices from Feedstuffs magazine for wheat midds from July 18, 1994 to November 6, 1995 which averaged 67% the price of corn grain. Other prices used were actual market prices.

Experiment 2.

One-hundred-twenty eight British-breed steer calves were wintered on cornstalks and hay. On May 5, 1996, they were randomly allotted to 16 groups and eight treatments (Table 2). The calves averaged 579 lb on May 5 when they were implanted with Compudose, fly tagged and placed on pasture. The cattle were fed a common diet at 2% of body weight five days before being weighed on two consecutive days at the beginning and the end of the grazing periods. On June 13,1996, cattle from the two treatments were moved to warm-season grass and returned to brome on August 23, 1996.

For fall grazing, the appropriate cattle were moved to oats on September 18, 1996 and returned to brome on October 22, 1996. The oats had been seeded in wheat stubble. The appropriate cattle were moved to cornstalks on September 30, 1996. The cornstalks were available at that time because the grain had

Table 1. Diet composition as a % of DM.

	1	2	3	4	5	6	7
Dry rolled corn	87.5						
Corn bran		60.71	56.66	52.66	30.02	28.01	26.02
Wheat midds					29.36	27.40	25.44
Steep liquor		29.11	29.12	29.12	29.27	29.26	29.26
Alfalfa hay	5.01	5.09	5.09	5.08	5.11	5.12	5.11
Liquid 32	3.75						
Control supplement[a]	3.81						
Treatment supplement[b]		3.89	3.89	3.89	3.91	3.91	3.90
Fat (tallow)			4.05	8.06		4.06	8.10
Limestone		1.20	1.19	1.19	2.32	2.24	2.16

[a]Control supplement: fine ground corn (54.95%), limestone (24.09%), salt (7.26%), potassium chloride (6.56%), ammonium Sulfate (6.05%), sheep trace minerals(.73%) and vitamins (.36%).
[b]Treatment supplement: corn gluten meal (72.36%), blood meal (13.42%), salt (7.17%), ammonium sulfate (5.97%), sheep trace mineral(.72%) and vitamins (.36%).

Table 2. Treatment description and days in summer, fall and finishing phases.

Item Treatment:	1	2	3	4	5	6	7	8
Summer								
Bromegrass	130[a]	130	59	59	130	130	130	130
Warm season[b]			71	71				
Fall								
Bromegrass	18	47	18	47	18	47	18	18
Oats		35		35		35		
Cornstalks	64		64		64		105	105
Finishing								
Dry rolled corn[c]	94	94					86	
All byproducts[d]			94	94	94	94		86

[a]Days allowed to forage or finishing diet
[b]Composed of the following species: big bluestem (*Andropogon gerardii)*, indian grass *(Sorghastrum nnutans),* sideoats grama *(Bouteloua curtipendula),* little bluestem (*Schizachyrium scoparium*) and switchgrass (*Panicum virgatum*).
[c]Dry-rolled corn 85.46%, alfalfa 7.5%, molasses 5.6% and 1.98% supplement (dry-rolled corn .52%, limestone 1.40%, salt .3%, tallow .1%, potassium chloride .146%, Rumensin .0165%, and Tylan .011%)
[d]Wet corn gluten feed 60%, wheat midds 30%, alfalfa 7.5% and 2.5% supplement (dry-rolled corn .67%, limestone 1.35%, salt .3%, tallow .1%, beef trace mineral .02%, Rumensin .0165%, Tylan .011%, vitamin premix .01%, cuO .007% and thiamin 006%).

Table 3. Lamb performance and economical analyses by treatment.

Treatment	ADG[ab]	DMI[b]	Gain/ Feed	Feed/ Gain	Cost/ 100 lb feed	Cost/ 100 lb gain
Dry rolled corn	0.48	2.44	0.19	5.15	$6.45	$33.24
Corn bran[c], 0 %fat	0.48	2.88	0.17	5.92	5.43	32.12
Corn bran, 4 %fat	0.64	3.04	0.21	4.73	5.93	28.02
Corn bran, 8%fat	0.62	2.68	0.23	4.41	6.43	28.37
Wheat midds[c], 0 % fat	0.57	2.97	0.19	5.30	5.04	26.70
Wheat midds, 4 % fat	0.59	2.97	0.20	4.94	5.57	27.57
Wheat midds, 8 % fat	0.64	2.84	0.22	4.53	6.10	27.66

[a]Linear effect for fat addition (P<.10).
[b]Quadratic effect for fat addition (P<.10)
[c]No substitution effect among byproducts (P>.05).

been harvested and stored as high-moisture grain. On December 3, 1996, the early removal treatments were moved to the feedlot for finishing. Late-removal cattle were moved to fresh cornstalks for grazing until January 13, 1997. Cattle were finished on a dry rolled corn (DRC) diet or a byproduct diet (Table 2). All cattle were implanted with Revalor S upon entry in the feedlot. The early removal cattle were fed for 94 days; the late removal for 86 days. Carcass weights at slaughter divided by .62 (common dressing percentage) were used as final weights. Yield and quality grades, fat thickness, percentage choice and ribeye area were obtained at the slaughter plant.

Results

Experiment 1.

Lambs on the byproducts diets without added fat gained as rapidly as did those on DRC (Table 3). Fat content of the DRC diet was slightly higher than the byproduct diets. With 8% fat additions, byproduct diets had total fat contents of 12 to 12.6%. Dry matter intakes were higher on the byproduct diets than on the DRC diet. Feed conversion was slightly poorer for the byproduct diets without fat than for the DRC diet. Fat addition linearly increased gains (P<.10) and decreased feed conversions (P<.05). Corn bran and wheat midds had equal feeding values.

When compared to DRC, feed costs were reduced when byproducts were included, however, fat addition increased costs. Costs of gain were reduced by byproduct feeding.

Experiment 2.

Treatment combinations and grazing days are shown in Table 2. Summer rates of gain were typical for smooth brome (1.30 lb/day; Table 4). Rotation of cattle to warm-season grasses improved gain to 1.97 lb/day (P<.01). Fall grazing was a combination of brome regrowth and oats or cornstalks. Early removal steers, which grazed only brome in the summer, averaged 1.86 lb/day gain in the fall. Those also on warm-season grass in the summer gained 1.28 lb/day in the fall.

Early removal cattle gained 1.97 lb/day when grazing oats and brome, versus 1.36 lb/day for those grazing cornstalks and brome (P<.01). While forage quality and cattle performance were excellent for the oats, carrying capacity was poor . Cornstalks did not provide previously obtained animal performance (1996 Nebraska Beef Report, pp 48-51 and 1997 Nebraska Beef Report, pp 56-59). Cornstalk quality is variable and heavily influenced by the amount of dropped ears. While harvesting corn early for high-moisture corn provides earlier grazing, it is likely there is less corn on the ground available for cattle.

Cattle grazing oats in the fall and gaining more weight than those on cornstalks also gained more weight in the feedlot (3.04 vs 2.66) and had better feed conversion (9.11 vs 10.83). The extra weight gained in the fall was maintained and actually enhanced feedlot performance.

Cattle fed the byproduct diet gained less (2.78 vs 3.51 lb/day) and had poorer feed conversions (10.34 vs 7.95; Table 4) than cattle fed the DRC diet. It is unclear why the cattle performed poorer on the byproduct diet when the lambs performed equally well on byproducts versus DRC.

Carcass data were similar across treatments. Cattle had .32 to .44 inches

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Table 4. Total performance for steers in different growing-finishing combinations.

Removal:	Early (12/1/96)						Late (1/13/97)	
	BG[a]	BG	BG-WS	BG-WS	BG	BG	BG	BG
	CS	OATS	CS	OATS	CS	OATS	CS	CS
	DRC	DRC	BYP	BYP	BYP	BYP	DRC	BYP
Item	1	2	3	4	5	6	7	8
Weight, lb								
May 5	576	579	578	578	579	579	578	581
Sept. 12	750	758	830	837	731	749	758	737
Dec. 1	876	934	898	979	873	916		
Jan. 13							917	905
Final	1173^{bf}	1258^{c}	1129^{e}	1236^{cd}	1094^{e}	1193^{bd}	1255^{c}	1203^{bd}
Daily Gain, lb								
Summer	1.33^{bc}	1.39^{c}	1.94^{d}	2.00^{d}	1.17^{b}	1.31^{bc}	1.38^{bc}	1.20^{bc}
Fall	1.53^{bc}	2.15^{d}	0.83^{f}	1.73^{c}	1.72^{c}	2.04^{d}	1.30^{e}	1.37^{bc}
Total	1.43^{b}	1.77^{ce}	1.39^{bd}	1.86^{e}	1.45^{b}	1.68^{c}	1.34^{bd}	1.28^{d}
Finishing performance								
ADG, lb.	3.16^{bc}	3.44^{c}	2.45^{f}	2.73^{ef}	2.36^{f}	2.94^{bc}	3.92^{d}	3.46^{c}
DMI, lb/d	25.8^{ab}	27.1^{bc}	25.8^{c}	27.0^{d}	27.3^{d}	26.1^{b}	28.7^{f}	28.2^{e}
Feed/Gain	8.40^{b}	8.04^{b}	11.15^{d}	10.19^{cd}	12.95^{e}	9.09^{bc}	7.43^{b}	8.35^{b}
DOF[f]	93	93	93	93	93	93	86	86
Carcass data								
Back fat, in	.39^{bcd}	.40^{bd}	.32^{cd}	.44^{b}	.37^{cd}	.38^{bcd}	.39^{bd}	.40^{bd}
Ribeye, sq in	13.22^{b}	13.39^{b}	13.07^{bd}	13.08^{bd}	12.46^{bd}	13.39^{b}	14.20^{c}	13.74^{bc}
Percent choice	37.5	77.3	31.3	50.0	37.5	43.8	68.8	37.5
Yield grade	2.13^{bc}	2.46^{cd}	2.06^{b}	2.69^{d}	2.25^{bc}	2.31^{bc}	2.25^{bc}	2.44^{cd}

[a]BG=smooth brome continuous, BG-WS=smooth brome rotation with warm season, OATS=oats pasture, CS=cornstalks, DRC=dry-rolled corn and BYP=byproduct.
[b,c,d,e,f]Means with unlike superscripts differ (P<.05)
[g]Days on feed.

Table 5. Economical analyses by treatment for steer in different growing-finishing combinations.

Removal:	Early (12/1/96)						Late (1/13/97)	
	BG[a]	BG	BG-WS	BG-WS	BG	BG	BG	BG
	CS	OATS	CS	OATS	CS	OATS	CS	CS
	DRC	DRC	BYP	BYP	BYP	BYP	DRC	BYP
Item	1	2	3	4	5	6	7	8
Steer cost, $[b]	478.81	479.05	479.74	479.50	480.20	480.51	480.08	482.52
Interest[c]	36.13	36.15	36.20	36.18	36.23	36.26	40.13	40.33
Health[d]	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Summer & fall costs, $								
Grazing[e]	59.48	86.10	59.48	86.10	59.48	86.10	64.40	64.40
Supplement[f]	10.24		10.24		10.24		16.8	16.8
Finishing costs,								
Yardage[g]	28.2	28.2	28.2	28.2	28.2	28.2	25.8	25.8
Feed[h]	123.01	129.10	103.83	108.85	109.8	105.0	125.71	104.42
Total costs, $[i]	764.51^{jkl}	789.04^{m}	747.35^{j}	768.91^{kl}	753.94^{jk}	766.10^{jkl}	783.27^{lm}	764.25^{jkl}
Final weight, lb[p]	1173^{jh}	1258^{k}	1129^{mn}	1236^{kl}	1094^{m}	1193^{jl}	1255^{k}	1203^{jl}
Slaughter Breakeven,								
$/100 lb[a]	65.71^{jl}	62.91^{jk}	66.45^{l}	62.48^{k}	69.27^{m}	64.33^{jkl}	62.59^{k}	63.63^{jk}

[a]BG=smooth brome continuous, BG-WS=smooth brome rotation with warm season, OATS=oats pasture, CS= cornstalks, DRC= dry-rolled corn and BYP=byproduct.
[b]Initial weight × $83/100 lb.
[c]9% Interest rate=Steer cost × (days owned × 9% annual interest)/365 d.
[d]Health costs=implants, fly tags, antibiotics, etc.
[e]Bromegrass=$.35/hd/day, warm season $.35/hd/day, oats $.69/hd/d, cornstalks $.12/hd/day.
[f]Supplement=$.16/hd/day during fall on cornstalks.
[g]Yardage=$.30/hd/day.
[h]Feed=Dry-rolled corn $.0489/hd/d, and all-byproduct $.0413/hd/day. Plus 9% interest for half the feed.
[i]Includes a 2% death loss.
[j,k,l,m,n,o]Means with unlike superscripts differ (P<.05).
[p]Calculated from carcass weight ÷ .62.
[q]Calculated with last 5 year average corn price of $2.36/bu.

of fat cover and yield grades 2.06 to 2.69. These are below industry averages. The cattle were finished with minimal time in feedlot, however, some of the cattle were produced with no grain feeding.

Dry-rolled corn diets produced lower slaughter breakevens than byproduct diets ($62.73/cwt vs $65.23) even though the cost of the byproduct diets was less (Table 5). This resulted from poorer feed efficiency from the byproduct diets. Additional fat in the diet might have been economical, based on the improved feed efficiencies in the lamb experiment.

Slaughter breakevens averaged less for cattle grazing oats compared to those grazing cornstalks ($63.24 vs $65.53/cwt) even though grazing oats was more expensive. The good gains on oats which carried through the feedlot phase increased carcass weights and reduced the breakevens. Grazing warm-season grass during the summer reduced breakevens, compared to grazing bromegrass alone ($64.46 vs $65.55/cwt). Extra gain from late grazing reduced breakevens compared to similar treatments removed in November ($63.11 vs $67.14/cwt). Lowest breakevens included oats grazing in early fall or late removal from cornstalks in January and dry-rolled corn diets for finishing.

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