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Grazing Systems Utilizing Forage Combinations

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Summary

One hundred ninety-two medium framed, British-breed steers were used to evaluate combinations of grazed forages during the summer and fall of 1994, and subsequent finishing performance. Steers were wintered on a low-input wintering system consisting of cornstalk grazing followed by feeding of alfalfa hay. Steers were allotted to one of six September (removed September 7) or two November (removed November 12) pasture removal grazing systems. Systems in the September removal consisted of grazing (1) bromegrass and native Sandhills range, (2) native Sandhills range, (3) continuous bromegrass, (4) rotational bromegrass, (5) rotational red clover inter-seeded in bromegrass, and (6) brome and warm season grasses. Systems in the November removal included grazing of (7) bromegrass, warm-season grasses, and turnips/rye, and (8) bromegrass and turnips/rye. Following grazing, steers were finished on a 93% concentrate diet. Systems in the September removal using native Sandhills range or grazing red clover inter-seeded in bromegrass had the lowest slaughter breakeven costs. Maximizing grazed forage gain, while cost of gain is low, reduces overall breakeven costs of forage systems.

Introduction

Grazing bromegrass throughout the summer provides weight gains of up to two pounds a day during early and late summer. However, during July and August bromegrass growth and quality is low and weight gains of cattle grazing bromegrass are reduced. Grazing combinations of warm and cool season forages allows for optimizing forage quality by rotating to warm season grasses during July and August. Another alternative may be to inter-seed red clover in bromegrass to optimize forage quality. Inter-seeding red clover would provide a higher quality forage when bromegrass growth and quality is low and, in addition, provide a source of nitrogen for the bromegrass, thus reducing nitrogen fertilization costs. Grazing these forages during the summer when quality is high, and following a winter and spring period of limited animal growth, should produce excellent animal weight gains while reducing cost of gain.

Objectives of the research were to evaluate the influence of different forage combinations on summer and fall grazing gains and to evaluate the effect of each of these combinations on the economics of the entire growing/finishing system.

Procedure

One hundred ninety-two medium framed, British-breed steers (488 lb) were purchased in the fall, processed and allowed a 28-day weaning and acclimation period. Steers were then assigned to a low-input wintering system consisting of grazing irrigated cornstalks from December 3, 1993 to January 31, 1994. Following cornstalk grazing, steers were fed alfalfa hay and a mineral supplement ad libitum until May 7, 1994. This diet allowed for .42 lb/day gain and maintained animal health while keeping costs to a minimum.

On May 7, 1994, steers were implanted with Compudose, blocked by weight and assigned to one of eight grazing systems (Table 1): (1) bromegrass or native Sandhills range until September 7, (2) native Sandhills range until September 7, (3) continuous bromegrass until September 7, (4) rotational bromegrass until September 7, (5) rotational red clover inter-seeded in bromegrass until September 7, (6) brome or warm-season grasses until September 7, (7) brome or warm-season grasses until September 7 with bromegrass or turnip/rye grazing until

Table 1. Summer systems grazing acreage.

Forage system	Treatment #	Total acre/head	Acres	Days grazed
September Removal				
Bromegrass	1	.4	9.6	34
Sandhills range		4.95	119	95
Sandhills range	2	6.9	166	129
Continuous bromegrass	3	1	24	129
Rotational bromegrass	4	1	24	129
Red clover/bromegrass	5	.75	18	141
Bromegrass rest		.25	6	
Bromegrass	6	.4	9.6	34
Warm season grasses		.6	14.4	95
November Removal				
Bromegrass	7	.6	14.4	149
Warm season grasses		.6	14.4	
Turnips/rye		.62	14.9	40
Bromegrass	8	1.2	29	149
Turnips/rye		.62	14.9	40

November 12, (8) bromegrass until September 7 with bromegrass or turnip/rye grazing until November 12. Bromegrass, warm-season grass and turnip/rye pastures were located at the University of Nebraska ARDC, Mead location. Native Sandhills range pasture was located approximately 20 miles north of North Platte, Nebraska. Days of grazing and assigned acres for each system are listed in Table 1.

Cattle in the red clover/bromegrass system (5) grazed a seven-paddock rotation. Six of these paddocks were in the first, second or third year following red clover seeding, two paddocks each. The seventh paddock was only bromegrass, was twice the size of the other paddocks, and was used as an area for animals to graze while allowing appropriate rest for the red clover/bromegrass paddocks. Cattle were rotated among paddocks every 5 days. Cattle in the rotational bromegrass system (4) served as the control group for the red clover/bromegrass system with paddock size, paddock number and rotation time the same as the red clover/bromegrass system.

Cattle in systems using a combination of forages (excluding red clover/bromegrass) were rotated based upon forage quality and quantity to assure that the highest quality forage was available at all times. Warm season grass pastures were predominately switchgrass and big bluestem seeded. Grazing of warm-season grass pastures began on June 10, 1994. Turnips and rye were drilled into wheat stubble following a one disked tillage of wheat stubble in late July. Grazing of turnips and rye began on October 2.

Following grazing, steers were re-implanted with Compudose and fed a 93% dry rolled corn diet during the finishing period which averaged 98 days and 93 days for the early and late grazing groups, respectively. Steers were adjusted to the final diet using four adaptation diets containing 45, 35, 25, and 15% (DM basis) forage (alfalfa hay and corn silage mixture) and were fed for 3, 4, 7, and 7 days, respectively. The final diet contained 80% dry rolled corn, 10% supplement, 5% alfalfa hay, and 5% corn silage (DM basis) and was formulated (DM basis) to contain 12% CP, .7% calcium, .35% phosphorus, .7% potassium, 25 g/ton Rumensin, and 10 g/ton Tylan. Steers were fed in pens of 12 head each with two pens per forage system.

Initial and final weights for each stage of the system were the average of two weights taken on consecutive days following a three-day feeding of a 50% alfalfa hay and 50% corn silage diet (DM basis). Intakes during these periods were limited to 2% (DM) of body weight. Final weights were estimated from hot carcass weight using a 62% dressing percentage. Carcass measurements included hot carcass weight, liver abscess score, fat thickness, quality grade, and yield grade.

Breakeven cost was used as the measure of success of each system and included all input costs. Data were analyzed as a completely randomized design with grazing treatment as the main effect and feedlot pen as the observation unit for statistical analysis. Breakeven correlation coefficients (r) for amount of gain achieved during the summer grazing, combined summer and fall grazing, and finishing periods were determined to evaluate which period, within each system, had the most influence on breakeven cost.

Results

Winter Period

Calves grazed cornstalks for 56 days and were fed alfalfa hay for an additional 99 days. Gain during the winter period was .42 lb/day.

Summer Period

The amount of red clover in the red clover/bromegrass paddocks was variable. A previous wet summer (1993) reduced the amount of red clover present in paddocks in their third year following seeding with an estimated red clover amount of 5% of the available biomass. Paddocks in their second year following seeding had an estimated red clover amount of 15% of the available biomass. Red clover in paddocks in their first year following seeding did not germinate resulting in no red clover in these paddocks. In addition, cattle in the red clover/bromegrass treatment were allowed access to their pastures 12 days earlier to reduce bromegrass competition with the red clover.

Gains for cattle grazing bromegrass and Sandhills range or only Sandhills range were higher ($P<.05$, Table 2) than cattle grazing bromegrass (continuous or rotational) or cattle in the November removal systems. Gains for cattle grazing red clover/bromegrass or bromegrass and warm season pastures in the September removal were greater ($P<.05$) than cattle grazing continuous

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Table 2. Total system performance for steers grazing different forage combinations.

Forage System:	September removal						November removal	
	Bromegrass Sandhills	Sandhills	Continuous bromegrass	Rotational bromegrass	Red Clover bromegrass	Brome-grass, warm season	Brome-grass, warm season turnips/rye	Brome-grass turnips/ rye
Item — Treatment:	1	2	3	4	5	6	7	8
Weight, lb								
May 7	619	623	624	623	612	619	622	623
Sept., 13	868	879	828	836	878	851	837	833
Nov., 16	——	——	——	——	——	——	879	905
Final[a]	1227	1236	1160	1187	1241	1201	1193	1225
Daily gain, lb								
Summer[b]	2.01^{c}	2.06^{c}	1.64^{d}	1.72^{de}	1.89^{ce}	1.87^{ce}	1.74^{de}	1.70^{de}
Fall[f]							.70^{c}	1.20^{d}
Total grazing	2.01	2.06	1.64	1.72	1.89	1.87	1.40	1.54
Finishing performance								
DMI, lb/day	28.64^{cde}	28.44^{cde}	27.70^{ce}	27.03^{ce}	28.91^{de}	26.81^{c}	27.83^{ce}	30.03^{d}
Daily gain, lb	3.70^{cd}	3.65^{cd}	3.38^{cd}	3.61^{cd}	3.73^{c}	3.58^{cd}	3.36^{d}	3.45^{cd}
Feed/gain[g]	7.74^{cd}	7.78^{cd}	8.19^{ce}	7.47^{d}	7.75^{cd}	7.48^{d}	8.27^{ce}	8.69^{e}
Carcass data								
Fat, in	.34	.42	.35	.41	.42	.40	.47	.42
Yield grade	2.2	2.6	2.3	2.4	2.4	2.4	2.4	2.3
% Choice	50	67	63	54	65	61	54	67

[a]Calculated from carcass weight adjusted for 62% dressing percentage.
[b]May 7 to September 13.
[cde]Means in the same row with unlike superscripts differ (P<.05).
[f]September 14 to November 16.
[g]Feed/gain was analyzed as gain/feed. Gain/feed is the reciprocal of feed/gain.

bromegrass. In general, cattle grazing only bromegrass tended (P=.15) to have the lowest daily gains compared to cattle grazing forage combinations.

Fall Period

Cattle grazing bromegrass and turnips/rye (treatment 8) exhibited greater (P<.05, Table 2) gains than cattle grazing the combination of bromegrass, warm season grasses, and turnips/rye (treatment 7).

Finishing Period

Differences among treatments for daily gain, dry matter intake, and feed efficiency varied (Table 2). Cattle with the lowest summer daily gains tended (P=.22) to have the lowest finishing daily gains (treatments 3, 7, and 8). No differences were noted in carcass measurements (fat thickness, yield grade, or quality grade) among treatments indicating that all cattle were finished to a similar endpoint.

Economics

Cattle on the red clover/bromegrass treatment (5), bromegrass and Sandhills range (treatment 1) or only Sandhills range (treatment 2) had the most desirable breakeven costs (Table 3). Cattle grazing continuous bromegrass and cattle in the November removal systems had the least desirable breakeven costs. Breakeven cost correlation coefficients (r) for summer gain, the combined summer and fall gain, feedlot gain, and feedlot efficiency were -.76 (P<.001), -.42 (P<.10), -.80 (P<.001), and -.58 (P<.02), respectively, indicating that summer grazing gain and feedlot gain had the most effect on breakeven cost.

Gains for cattle on the red clover/bromegrass treatment were lower than anticipated. However, cattle had access to red clover approximately one half of the grazing time due to the variable amount of red clover present. Therefore, if red clover was available in paddocks as planned, gains should have been higher.

Transporting cattle to warm season grasses to optimize forage quality rather that developing warm season pastures is economical as evidenced by the Sandhills range treatments (Treatments 1 & 2). The stress and body weight shrink associated with transporting animals did not negatively influence weight gain. The transportation costs associated with the Sandhills range treatments would increase breakeven cost by $.91/100 lb resulting in no change in ranking of breakeven costs among treatments.

Breakeven values at slaughter reflect the final weight of each system. Further, the final weight for each system was influenced by the amount of gain achieved during the summer grazing period. In addition, systems with a higher gain during the summer maintained a higher gain during the finishing period. Forages that maximize summer grazing gain, when grazing cost is fixed, result in a lower cost of gain. Therefore, cattle entering the feedlot at a heavier weight and having achieved a low summer cost of gain, maintained their weight advantage through the finishing period resulting in heavier final weights and lower breakeven values.

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Table 3. Total system economics of steers grazing different forage combinations.

Forage System:	September removal						November removal	
	Bromegrass Sandhills	Sandhills	Continuous bromegrass	Rotational bromegrass	Red Clover bromegrass	Brome-grass warm season	Brome-grass, warm season turnips/rye	Brome-grass turnips/ rye
Item Treatment:	1	2	3	4	5	6	7	8
Steer cost,$[a]	462.65	465.50	473.10	458.85	465.50	465.50	455.05	458.85
Interest[b]	46.14	46.43	47.19	45.77	46.43	46.43	51.56	51.99
Health[c]	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00
Winter costs,$								
Feed[d]	72.64	72.64	72.64	72.64	65.84	72.64	72.64	72.64
Supplement[e]	18.60	18.60	18.60	18.60	16.60	18.60	18.60	18.60
Summer & Fall costs,$								
Grazing[f]	43.40	43.40	43.40	43.40	49.35	43.40	64.40	64.40
Finishing costs,$								
Yardage[g]	29.25	29.25	29.25	29.25	29.25	29.25	27.75	27.75
Feed[h]	167.54	166.37	162.05	158.13	169.12	156.84	154.46	166.67
Total costs, $[i]	873.20	875.12	878.97	859.23	874.97	865.20	880.10	897.11
Final weight, lb[j]	1227	1236	1160	1187	1241	1201	1193	1225
Slaughter Breakeven, $/100 lb[k]	71.18[lm]	70.81[lm]	75.75[n]	72.41[lm]	70.54[l]	72.12[lm]	73.77[mn]	73.24[lmn]

[a]Initial weight x $95/100 lb.
[b]9% interest rate.
[c]Health costs = implants, fly tags, etc.
[d]Receiving = 28 days at $.74/day; stalk grazing = 56 days at $.12/day; alfalfa hay = 99 days at $.30/day; grazing and alfalfa hay feeding yardage = 155 days at $.10/day.
[e]Supplement = 155 days at $.12/day.
[f]Grazing costs = $.35/hd/day.
[g]$.30/day.
[h]Average diet cost = $.06/lb (DM) and 9% interest for 1/2 of feed.
[i]Total costs include 2% death loss for each system.
[j]Calculated from hot carcass weight adjusted for 62% dressing percentage.
[k]Trucking cost to Sandhills range would increase breakeven ($/100 lb) by $.0019/mile.
[lmn] Means in the same row with unlike superscripts differ ($P<.05$).