Integrating the Use of Spring- and Fall-Calving Beef Cows in a Year-round Grazing System (A Progress Report)

A.S. Leaflet R1721

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Summary

Animal production, hay production and feeding, and the yields and composition of forage from summer and winter grass-legume pastures and winter corn crop residue fields from a year-round grazing system were compared with those of a conventional system. The year-round grazing system utilized 1.67 acres of smooth bromegrass-orchardgrass-birdsfoot trefoil pasture per cow in the summer, and 1.25 acres of stockpiled tall fescue-red clover pasture per cow, 1.25 acres of stockpiled smooth bromegrass-red clover pasture per cow, and 1.25 acres of corn crop residues per cow during winter for spring- and fall-calving cows and stockers. First-cutting hay was harvested from the tall fescue-red clover and smooth bromegrass-red clover pastures to meet supplemental needs of cows and calves during winter. In the conventional system (called the minimal land system), spring-calving cows grazed smooth bromegrass-orchardgrass-birdsfoot trefoil pastures at 3.33 acres/cow during summer with first cutting hay removed from one-half of these acres. This hay was fed to these cows in a drylot during winter. All summer grazing was done by rotational stocking for both systems, and winter grazing of the corn crop residues and stockpiled forages for pregnant spring-calving cows and lactating fall-calving cows in the year-round system was managed by strip-stocking. Hay was fed to spring-calving cows in both systems to maintain a mean body condition score of 5 on a 9-point scale, but was fed to fall-calving cows to maintain a mean body condition score of greater than 3. Over winter, fall-calving cows lost more body weight and condition than spring calving cows, but there were no differences in body weight or condition score change between spring-calving cows in either system. Fall- and spring-calving cows in the year-round grazing system required 934 and 1,395 lb. hay dry matter/cow for maintenance during the winter whereas spring-calving cows in drylot required 4,776 lb. hay dry matter/cow. Rebreeding rates were not affected by management system. Average daily gains of spring-born calves did not differ between systems, but were greater than fall calves. Because of differences in land areas for the two systems, weight production of calves per acre of cows in the minimal land system was greater than those of the year-round grazing system, but when the additional weight gains of the stocker cattle were considered, production of total growing animals did not differ between the two systems.

Introduction

Because stored feeds represent approximately 46% of the costs associated with cow-calf production, reducing the use of stored feeds by extending the grazing season presents an opportunity to significantly reduce cow-calf production costs. In much of Iowa, corn crop residues represent a considerable resource for extending the grazing season for beef cows. In areas of Iowa in which the acreage of corn crop residues is limited, residual perennial or annual forages, stockpiled during late summer and early fall, presents an alternative forage source for winter grazing. Because most farms have varying quantities of these resources, systems that make optimal use of these resources need to be developed and evaluated. In a system with spring-calving cows grazing corn-crop residues at 1.5 acres per cow and stockpiled grass-legume forages at 3 acres per cow during winter, 390 lb. of hay dry matter were required to maintain cows in the winter compared with 6,312 lb. of hay dry matter that was required by cows maintained in a drylot. Although winter grazing of stockpiled forages reduces the needs for winter hay feeding, the additional acreage of perennial forage required for this system results in excessive forage production that needs to be utilized for maintaining system efficiency. Grazing of stocker cattle in early spring provides a mechanism for utilizing excess forage production. Fall-born calves provide a mechanism for providing stocker cattle without maintaining the animal for an excessive period of time. Furthermore, the different nutritional requirements of fall-calving cows at different seasons of the year provide the opportunity to further diversify grazing management to make optimal use of forage resources. Additional benefits of incorporating the use of fall-calving cows in a management system include the greater efficiency of bull use and the ability to extend the supply of calves for finishing in a branded beef program.

Therefore, the objective of this project was to evaluate cow-calf and forage production from a system integrating the use of spring- and fall-calving beef cow herds with year-round grazing of corn crop residues and stockpiled forages during winter.

Materials and Methods

Beginning in November of 1998, a conventional system for management of spring-calving beef cows (minimal land system) was compared with a year-round grazing system for spring- and fall-calving beef cows (Table 1). Because hay production from the minimal land system used in a previous project did not produce an adequate quantity of hay to meet the winter needs of cows in this system, the stocking rate in this system was decreased to .3 cows/total pasture acres in 20-acre smooth bromegrass-orchardgrass-birdsfoot trefoil pastures. In this system, 6 mature cows in midgestation were placed in replicated drylots in November and were fed hay produced from 1.67 acres of pasture per cow in the previous summer to maintain a body condition score of 5 until May. In May, each group of 6 cows with calves were rotationally stocked in replicated 20-acre smooth bromegrass-orchardgrass-birdsfoot trefoil pastures divided into 8 paddocks. For the first 2 months of grazing, cows and calves rotationally grazed 5 acres divided into 4 paddocks First harvest forage was harvested as hay from the remaining 15 acres in late May. After a minimum of 35 days for forage regrowth, these paddocks will be included in the grazing rotation. Grazing continued until November when calves were weaned and cows returned to the winter drylots. Weaned calves were placed in a feedlot and fed a high grain diet until market ready.

In the year-round grazing system, the calves from two groups of six spring-calving cows were weaned in November and placed in a drylot to be fed a high hay diet with small amounts of corn gluten feed supplementation. Each group of spring-calving cows was allotted to replicated 15-acre fields containing corn crop residues to graze until early February with the assumptions that the grazing efficiency of corn crop residues is 15% and that the dry matter intake of pregnant cows is 2.5% of their body weight. In early February, the spring-calving cows were moved to replicated 15-acre fields containing stockpiled smooth bromegrass-red clover pastures to strip-graze until the initiation of summer grazing. Hay was supplemented to these cows to maintain a minimum condition score of 5 on a 9-point scale. Simultaneously to the initiation of corn crop residue grazing by the spring-calving cows, two groups of six fall-calving cows with calves were allotted to replicated 15-acre fields containing stockpiled endophyte-free tall fescue-red clover pasture to strip-graze. A bull was placed in each pasture with the fall-calving cows for a 42 day breeding season in November and December. Fall calves were weaned in early March. Fifty percent of the cows in a group were at a body condition score of 3. Cows were supplemented with hay because of limited forage availability and to increase condition scores above 3. In late April, two groups of six spring-calving cows and their calves, six yearling, and six fall calves lead-grazed in a rotational stocking system in front of six dry pregnant fall-calving cows in replicated 20 acre smooth bromegrass-orchardgrass-birdsfoot trefoil pastures divided into eight paddocks. Hay harvest was taken as large round bales from the tall fescue-red clover and smooth bromegrass-red clover pastures in late May. Bales were stored outside on the ground. In late June, each group of spring-calving cows and calves with a bull strip-grazed the 15-acre smooth bromegrass-red clover, which they had grazed the previous winter until August. Simultaneously, each group of fall-calving cows strip-grazed the 15-acre tall fescue-red clover pasture that they had grazed the previous winter. In August, yearlings and fall calves from the previous year were placed in a feedlot to receive a high grain diet, and spring- and fall-calving cows were returned to the 20-acre smooth bromegrass-orchardgrass-birdsfoot trefoil pastures to rotationally graze until November.

To estimate live forage mass and regulate grazing interval, sward heights were measured with a falling plate meter (4.8 kg/m^2) in 2 locations per paddock when cattle were moved into and out of a paddock in the summer pastures. To measure forage quantity and nutritive value, forage samples from summer and winter perennial forage pastures were hand-clipped monthly from twelve .25-m^2 locations. During fall, available corn crop residue forage was hand-collected from four 4-m^2 locations monthly. To determine the effects of winter weather conditions on forage quality and quantity, samples were collected from four 1-m^2 and two 24-m^2 grazing exclosures in the stockpiled perennial forage pastures and corn crop residue fields, respectively. Hay yields were measured by weighing each bale at harvest and core-sampling six bales per field. Each bale was identified with a cattle ear tag at harvest. Amounts of hay lost by weathering or feeding were determined by weighing and core-sampling each bale at feeding.

Cow, calf, and stocker weights were measured monthly during the summer and bi-monthly during the winter. Cow condition scores were visually measured on a 9-point scale monthly during the summer and biweekly during the winter. Cow reproductive performance was determined by rectal palpation approximately 45 days after the breeding season and by the number and timing of births. Open cows were replaced by bred cows at weaning.

Table 1. Forage-based beef production systems integrating spring- and fall-calving cows with year-round grazing to be evaluated at the McNay Outlying Research Farm.

	Forage system[a]	
Month	Year-round grazing	Minimal land
November	Spring calves weaned and fed hay in drylot. Six spring-calving cows graze 15 acres of cornstalks for 3 months (.83 ac/cow/mo). Six fall-calving cows with calves and a bull graze 7.5 acres of stockpiled tall fescue-red clover for two months (.54 ac/au[b]/mo).	Wean calves and finish in feedlot. Six cows placed in drylot and fed hay from summer pasture as necessary to maintain a condition score of 5.
January	Six fall-calving cows with calves graze 7.5 acres of stockpiled tall fescue-red clover for four months (.32 ac/cow/mo). Hay fed to maintain a condition score of greater than 3.	
February	Six spring-calving cows graze 15 acres of stockpiled smooth bromegrass-red clover for three months (.83 ac/cow/mo).	
March	Fall calves weaned on hay if not already. Spring-calving cows calve in March and April.	Cows calve in March and April.
April	Six spring-calving cows with calves, yearling calves and fall calves lead-graze in front of six pregnant fall-calving cows on a 20-acre smooth bromegrass-orchardgrass-birdsfoot trefoil pasture (.9 au/ac). Animals moved daily.	Cows rotationally graze 5 ac of a 20-ac smooth bromegrass-orchardgrass-birdsfoot trefoil pasture at .8 au/ac with daily rotation.
May	Bale first cutting on 15 ac tall fescue-red clover and 15 ac smooth bromegrass-red clover.	Hay removed from ungrazed portion (12.5 ac) of the 20-ac pasture.
June	Spring-calving cows with calves and bulls moved to strip-graze 15 ac smooth bromegrass-red clover at .47 au/ac. Breeding initiated for spring-calving cows. Fall-calving cows moved to strip-graze 15 ac tall fescue-red clover at .6 au/ac. Yearlings and fall calves remain to rotationally graze smooth bromegrass-orchardgrass-birdsfoot trefoil at .3 ac/ac. Stockers moved at 50% removal.	Bulls added to pasture to initiate breeding. Cows, calves and bulls continue to graze 7.5 ac of pasture at .93 au/ac with 50% removal. If available forage is inadequate, hay will be fed in pastures.
July		Cows, calves and bulls allowed access to hay area to rotationally graze the entire 20 ac of smooth bromegrass-orchardgrass-birdsfoot trefoil pastures at .35 au/ac.
August	Fall-calving cows and spring-calving cows with calves moved back to 20 ac smooth bromegrass-orchardgrass-birdfoot trefoil to rotationally graze at .6 au/ac. Fall-calving cows calve. Stockpiled pastures fertilized with 40 lb N/ac. Stockers placed in feedlot to finish.	Bulls removed and cows and calves continue to rotationally graze 20 ac of smooth bromegrass-orchardgrass-birdsfoot trefoil at .3 au/ac.
November	System repeated.	System repeated.

[a]Each system is replicated twice.
[b]An animal unit is equal to 1 cow-calf pair, 1 bull or 2 yearling or fall-calf stockers.

Results and Discussion

During winter, spring-calving cows in the year-round grazing system had greater weight gains while grazing corn crop residues than spring-calving cows fed hay in a drylot, but had greater weight losses while grazing stockpiled smooth bromegrass-red clover forage in February (Table 2) However, spring-calving cows in the minimal land system had greater weight losses than spring-calving cows in the year-round grazing system during the calving season and during the entire winter grazing season. While lactating from November 11 to March 3, fall-calving cows in the year-round grazing system had greater weight losses than spring-calving cows in either the year-round grazing or minimal land system. Although post-lactation weight gains in March and April by the fall-calving cows was greater than those of the spring-calving cows, weight loss by the fall-calving cows over the entire winter were greater than of spring-calving cows in either system.

Table 2. Weight changes of spring- and fall-calving cows in the year-round grazing and minimal land systems

			System		
	Production stage		Year-round grazing		Minimal land
Item	Fall-calving cows	Spring-calving cows	Fall-calving cows	Spring-calving cows	Spring-calving cows
Initial weight, lb (11/11/98)			1214	1158	1165
Date					
2/2/99	Breeding season	Mid-gestation	-23.5[a]	115.5[b]	-9.5[a]
3/3/99	Late lactation	Pre-calving	-86.5[a]	-83.0[a]	108.0[b]
4/22/99	Post-weaning	Post-calving	48.5[a]	-17.0[b]	-114.0[c]
Total winter			-61.5[a]	15.5[b]	-14.5[c]
6/17/99	Mid-gestation	Pre-breeding	114.5	59.0	11.0
8/5/99	Pre-calving	Breeding season	101.0	-19.0	38.0
9/1/99	Post-calving		11.5[a]	62.5[b]	67.0[b]
10/28/99	Early lactation	Early gestation	-142[a]	-99.0[ab]	-16.0[b]
Total summer			85	3.5	99.5

[abc]Differences between means with different superscripts are significant, P<.05.

During summer, there were no differences in the weight changes of spring-calving cows in either system during any period of the summer or between fall- or spring-calving cows in either system over the total summer. However, during late summer, weight gains during August were lower and weight losses during September and October were greater for fall-calving cows than spring-calving cows in either system. These differences seem related to the weight losses associated with calving and early lactation by the fall-calving cows during a period when pasture growth was limited. The mean rebreeding rate of cows in this experiment was 88.9% and did not differ between cows in different systems or calving seasons.

During winter, there was no difference in condition score change in spring-calving cows in either the year-round grazing or minimal land system (Table 3). From November 11 to February 2, the condition score losses of fall-calving cows did not differ from those of spring-calving cows. During this period, fall-calving cows were moved to a new strip after it was estimated that 50% of the available forage was removed. However, after February 2, all new paddocks were utilized, and the cows were given access to the entire field to graze the residual forage. Thus, body condition score losses of the fall-calving cows in the year-round grazing system during February were greater than those of spring-calving cows in either system. However, post-weaning condition score increases by the fall-calving cows during the last two months of winter grazing and the first two months of summer grazing were greater than those of the spring-calving cows even though they continued to graze residual forage to the end of winter grazing and they consumed residual forage in a leader-follower grazing system during the first two months of summer grazing. After the first two months of summer grazing, condition score changes did not differ between cows in different systems or calving seasons.

Hay production from tall fescue-red clover (2.5 acres per cow), smooth bromegrass-red clover (2.5 acres per cow) or smooth bromegrass-orchardgrass-birdsfoot trefoil fields (1.67 acres/cow) did not differ either on a per harvested acre or per cow basis (Table 4). As designed, cows in the year-round grazing required 3,611 lb. less hay DM per cow than cows maintained in a drylot. Furthermore, fall-calving cows grazing stockpiled tall fescue-red clover at 3 acres per cow

Table 3. Condition score changes of spring- and fall-calving cows in the year-round grazing and minimal land systems

			System		
	Production stage		Year-round grazing		Minimal land
Item	Fall-calving cows	Spring-calving cows	Fall-calving cows	Spring-calving cows	Spring-calving cows
Initial weight, lb. (11/11/98)			5.17	4.92	5.00
Date					
2/2/99	Breeding season	Mid-gestation	-.83	-.36	-.67
3/3/99	Late lactation	Pre-calving	-.75[a]	-.06[b]	-.09[b]
4/22/99	Post-weaning	Post-calving	1.17[a]	.17[b]	.31[b]
Total winter			-.41	-.25	-.45
6/17/99	Mid-gestation	Pre-breeding	1.36[a]	1.09[b]	.43[c]
8/5/99	Pre-calving	Breeding season	.12	-.84	.13
9/1/99	Post-calving		.33	.65	.39
10/28/99	Early lactation	Early gestation	-.72	-.59	-.2
Total summer			1.08	.31	.75

[abc]Differences between means with different superscripts are significant, P<.05.

required 461 lb. less hay DM per cow than spring-calving cows grazing corn crop residues and stockpiled smooth bromegrass-red clover at 1.5 and 3 acres per cow, respectively. Because the amounts of hay fed during winter backgrounding of spring- and fall-calves were 2,072 and 311 lb. hay DM per calf, total hay use from each cow-calf pair increased. However, even when this additional hay is added, the amounts of hay required for the year-round grazing system were 2,420 lb. dry matter per cow-calf pair lower than those required to maintain cows from the minimal land system in the drylot. Hay fields in the year-round grazing system produced 2,160 lb. more hay DM than was required during winter for each cow-calf pair. In contrast, hay production in 1998 from summer pastures in the minimal land system was 1,783 lb. hay DM per cow lower than required. In 1999 and subsequent years, the number of hay acres harvested in the minimal land system was increased to 2.5 acres/cow. If hay production in 1998 had been this high, the deficit in hay production would have been 288 lb. DM/cow.

Table 4. Hay production, feeding and balance for the year-round grazing and minimal land systems.

	System			
	Year-round grazing			
	Fall-calving cows	Spring-calving cows	System mean	Minimal land system
Hay production,				
lb./harvested acres[a]	1598	2035	1817	1796
lb./cow	3995	5088	4541	2992
Hay fed,				
lb./cow	934[b]	1395[c]	1165[x]	4776[dy]
lb./cow-calf	1245[b]	3495[c]	2356[x]	4776[dy]
Hay balance,				
lb./cow	3061	3693	3377[x]	-1783[y]
lb./cow-calf	2750	1620	2160[x]	-1783[y]

[a]Hay was harvested from tall fescue-red clover and smooth bromegrass-red clover fields from 2.5 acres/cow for fall- and spring-calving cows in the year-round grazing system and from smooth bromegrass-orchardgrass-birdsfoot trefoil pastures at 1.67 acres/cow for spring-calving cows in the minimal land system.
[bcd]Differences between means of different cow groups with different superscripts are significant, P<.05.
[xy]Differences between means of different systems with different superscripts are significant, P<.05.

Daily pre-weaning body weight gains of spring-calves grazing with their dams did not differ between the two systems (Table 5). However, pre-weaning bodyweight gains of fall calves grazing with their dams during the winter were lower than those of spring-calving cows in either system.

Although the differences in daily body weight gains between calves were small, the total body weight of spring or fall calves in the year-round grazing system were considerably lower than those of calves in the minimal land system (Table 6). The reason for this difference is that although the minimal land system utilizes 3.33 acres per cow, the year-round grazing system utilizes 8.33 acres of perennial forage per spring- or fall-calving cow or 4.16 acres of perennial forage per total cow. When the weight gains of spring- and fall-born stocker cattle and fall calves born in 1999 were added to those of spring- and fall-calves, total growing animal production from the two systems did not differ.

Table 5. Average daily gains of calves of cows in different systems

	Systems		
	Year-round grazing		Minimal land
	Fall calves	Spring calves	Spring calves
Average daily gain, lb/day	1.8[a]	2.2[b]	2.2[b]

[ab]Differences between means with different superscripts are significant, P<.05.

Table 6. Growing animal production by calves and stockers grazing in the year-round grazing and minimal land systems

	Systems	
	Year-round grazing[a]	Minimal land[b]
Pre-weaning	lb/acre perennial pasture	
Spring calves (1999 to weaning)	49.7	126.3
Fall calves (1998 to weaning)	24.2	-
Fall calves (1999 to 10/28/99)	13.9	-
Stockers		
Spring calves (1998)	16.3	-
Fall calves (1998)	18.7	-
Total[c]	122.8	126.3

[a]Year-round grazing system consisted of 4.2 acres of perennial pasture per cow and 1.25 acres of cornstalks per cow.
[b]Minimal land system consisted of 3.3 acres of perennial pasture per cow.
[c]There was no difference in total growing animal production between systems, P>.05.

Implications

Preliminary results imply that integrated use of the cows and calves from fall- and spring-calving cow herds in a year-round grazing system of perennial forage can significantly reduce the amount of hay needed to maintain cows and growing animal production per acre.

Acknowledgment

This project was funded, in part, by a grant from the Leopold Center for Sustainable Agriculture, Iowa State University, Ames, IA.