Evaluation of a Year-Round Grazing System: Winter Progress Report

A.S. Leaflet R1457

Matthew J. Hersom, graduate research assistant
James R. Russell, professor of animal science
Dennis R. Maxwell, livestock supervisor, and
L. J. Secor, superintendent of
McNay Research Farm

Summary

The winter component of a year-round grazing system involving grazing of corn crop residues followed by grazing stockpiled grass legume forages was compared at the McNay Research Farm with that of the winter component of a minimal land system that maintained cows in drylot,. In the summer of 1995, two cuttings of hay were harvested from two 15-acre fields containing "Johnston" endophyte-free tall fescue and red clover, and two cuttings of hay were taken from two 15-acre fields of smooth bromegrass and red clover. Hay yields were 4,236 and 4,600 pounds of dry matter per acre for the tall fescue--red clover and smooth bromegrass--red clover. Following grain harvest four 7.5-acre fields containing corn crop residue were stocked with cows at midgestation at an allowance of 1.5 acres per cow. Forage yields at the initiation of corn crop grazing were 3,766pounds of dry matter per acre for corn crop residue, 1,748 pounds for tall fescue--red clover, and 1,.880 pounds for smooth bromegrass--red clover. Corn crop residues and stockpiled forages were grazed in a strip stocking system.

For comparison, 20 cows were placed in two drylots simultaneously to the initiation of corn crop grazing where they remained throughout the winter and spring grazing seasons. Cows maintained in drylot or grazing corn crop residue and stockpiled forages were supplemented with hay as large round bales to maintain a body condition score of five. No seasonal differences in body weight and body condition were observed between grazing cows or cows maintained in drylot, but grazing cows required 87% and 84% less harvested hay than cows in drylot during the winter and spring respectively. Because less hay was needed to maintain grazing cows, an excess of 11,905 and 12,803 pounds of hay dry matter per cow remained in the year-round grazing system.

During corn crop grazing, organic matter yield decreased at 27.3 pounds of organic matter per day from grazed areas of corn crop residue. Organic matter losses due to weathering were 9.4, 12.9, and 15.8 pounds per day in corn crop residue, tall fescue-red clover and smooth bromegrass-red clover. Organic matter losses from grazed and ungrazed areas during stockpiled grazing were 7.3 and 6.9 for tall fescue--red clover and 2.1, 2.9 for smooth bromegrass--red clover.

Introduction

The profitability of cow-calf production systems is directly related to the amount of stored feed required. Approximately one-third of the cost associated with beef cow-calf production is derived from this need for stored feed. Therefore, strategies that increase the number of days animals are able to graze, and decrease the need for stored feeds should increase profitability.

A system that would reduce the amount of stored feeds necessary to maintain beef cows during the winter and spring involves grazing corn crop residues and stockpiled hay crop forages during the fall, winter, and early spring. In this system, forage is harvested as hay or grazed until late summer. Forage that regrows during the late summer and early fall is grazed in the early winter following fall grazing of corn crop residues. Stored hay is supplemented as necessary.

The efficacy of corn crop residue and stockpiled grazing would seem to be weather dependent, and is now just being implemented in Iowa. Problems imposed by the weather may be overcome by proper management. Previous studies have shown that snow cover does not limit grazing in corn crop residues or stockpiled forages. Frequent observation of body condition will indicate when hay supplementation is required to maintain cow performance. The adverse effects of grazing under muddy conditions in the fall and early spring may be limited by strip-stocking. Strip-stocking through timely cow movement will limit forage removal and limit animal movement on the land area. This method may also control intake and selection of forage during grazing. Delaying grazing of stockpiled forages may result in losses in organic matter of up to 11.4 pounds per acre during the time of corn crop residue grazing. However, the ability to graze further into the winter and spring offsets this loss.

The objectives of this part of the project are to compare three different winter systems for gestating beef cows in terms of cow performance, hay utilization, and nutritive values of corn crop residues and stockpiled forages.

Materials and Methods

In the summer of 1995, two cuttings of hay were harvested as large round bales from tall fescue--red clover and smooth bromegrass--red clover stockpiled pastures. In the fall of 1995 electric fence was installed to make two pastures. Each pasture was further divided into four paddocks using temporary electric fence. Four 7.5-acre fields of corn crop residues were also divided into four paddocks by installation of temporary electric fence after grain harvest. All fields divided into strips were grazed by strip stocking.

On October 26, 20 cows were allotted from summer grazing experiments to four corn crop residue fields to strip graze for 55 days. Simultaneously to the initiation of corn crop grazing 20 cows were allotted into replicated drylots where they remained throughout the winter and spring grazing period. After grazing corn crop residues, each group of cows was allotted to one of four stockpiled forage pastures containing tall fescue--red clover or smooth bromegrass--red clover. Cows strip grazed the stockpiled forages from late December to May 1; a new paddock was opened every four weeks as necessary to provide for adequate forage. Cows maintained in the drylot and grazing corn crop residues and stockpiled forages were supplemented with large round bales of hay as necessary to maintain a body condition score of five on a nine point scale, or when forage availability was limited by weather conditions or forage density. Cows in the drylot received hay from the first cutting of the tall fescue--red clover followed by hay from the first cutting of the smooth bromegrass--red clover. Cows grazing tall fescue--red clover stockpiled pastures received tall fescue--red clover hay, cows grazing smooth bromegrass--red clover stockpiled pastures received smooth bromegrass--red clover hay. All cows were weighed at the initiation and end of each grazing period (corn crop residue, stockpiled pre-calving, and stockpiled post calving). Body condition scores (1 = very thin, 5 = moderate, 9 = very obese) were recorded biweekly.

Twenty-nine crossbred spring calves (mean body wt 541 lbs) were used to compare maintenance on hay with a period of corn gluten feed (CGF) supplementation followed by summer grazing to complete feedlot finishing of calves as winter management systems. On October 19, 29 yearlings were allotted to a drylot and fed hay as needed throughout the winter and spring. CGF was supplemented at 2.48 lbs/head/day for 32 days at the initiation of the drylot period. Yearling body weight were taken monthly.

To determine the effects of grazing on the botanical composition of stockpiled pastures, hand-clipped samples were taken from twelve 388-square-inch locations on all stockpiled forage pastures before the initiation of corn crop residue grazing and at the termination of the stockpiled grazing period. Forage samples were hand sorted into grass, legume, weed, and dead forages and were then oven-dried and weighed. Samples for the determination of quantity and chemical composition of stockpiled forages were hand clipped monthly from 388-square-inch locations in each grazed and ungrazed paddockMidway through stockpiled grazing, samples of ungrazed forage in stockpiled pastures were collected from a 388-square-inch location within a 4-square-foot grazing cage in each paddock. Samples of corn crop residues were collected from one 43-square-foot location per paddock at the initiation of grazing. Samples of ungrazed corn crop residues were taken from one 43-square-foot location in ungrazed paddocks and one 43-square-foot location in grazing exclosures located in two paddocks. Samples were taken monthly during corn crop grazing and again midway through stockpiled grazing.

To determine hay yield and quantity fed, all bales were weighed at harvest and feeding. Dry matter concentration and recovery were determined by core sampling six bales from each stockpiled pasture at harvest and three bales at mid and late winter. Bales sampled at harvest were core-sampled from the outside of the bale to the bale core on opposite sides to compensate for differences in contribution of different layers of large round bales. Bales sampled in mid and late winter were core-sampled in four location around each bale from the outside to nine inches within the bale and from nine inches to the bale center.

Results

Yields of forage at the initiation of corn crop residue grazing were 3,766 pounds per acre from corn crop residues, 1,748 pounds from stockpiled tall fescue--red clover, and 1,880 pounds from smooth bromegrass--red clover (Table 1). Forage yields as hay harvested during the summer from tall fescue--red clover and smooth bromegrass--red clover were 2,536 and 2,660 pounds per acre.

Total forage yields for 1995 were 3,766 pounds per acre from corn crop residues, 4,284 pounds from tall fescue--red clover and, 4,540 pounds from smooth brome grass--red clover. Similar to dry matter yields, total organic matter yield and digestible organic matter yields were greater in corn crop residue fields than in either of the stockpiled forages (Table 1). Corn crop residue

Table 1. Initial and daily changes in the yields of dry matter, and digestible organic matter from grazed and ungrazed portions of fields containing corn crop residues (CCR), stockpiled tall fescue--red clover (TF-RC), or stockpiled smooth bromegrass--red clover (SB-RC).

	Initial lb/acre			Grazed lb/acre			Ungrazed lb/acre		
	CCR	TF--RC	SB--RC	CCR	TF--RC	SB--RC	CCR	TF--RC	SB--RC
DM Yield	3766	1748	1880	-23.7	-8.2	-8.9	-2.7	-5.3	-5.3
OM Yield	3842	3863	3684	20	-15.1	-15.5	28.6	-5.5	-10.6
IVOMD	2156	2707	2303	4.5	-14.2	-12.3	12	-11	-10.5

Table 2. Initial concentrations and daily changes in concentrations of chemical components from grazed and ungrazed portions of fields containing corn crop residue (CCR), stockpiled tall fescue--red clover (TF-RC), or stockpiled smooth bromegrass--red clover (SB-RC).

	Initial			Grazed			Ungrazed		
	CCR	TF--RC	SB--RC	CCR	TF--RC	SB--RC	CCR	TF--RC	SB--RC
Ash % of DM	16	9.6	9	.06	-.01	-.01	.04	-.001	-.01
% of organic matter									
IVOMD	56.1	69.9	62.5	-.15	-.23	-.2	-.05	-.23	-.19
NDF	72.3	52.1	55.9	.11	.08	.06	-.02	.09	.05
ADF	45.1	31.9	37.1	.13	.05	.01	.004	.05	.01
CP	6.3	14.5	13.9	-.02	-.02	-.01	0	-.01	-.01

fields lost dry matter, but gained organic matter and digestible organic matter yield during the grazing period. Stockpiled forages lost dry matter, organic matter and digestible organic matter yield. The rate at which these components were lost during grazing did not differ between stockpiled forage species. There were no significant differences in the rates at which dry matter, organic matter, and digestible organic matter were lost from grazed and ungrazed parts of the fields. This result would imply that most of the loss of these components was due to weathering of the forage.

At the initiation of the corn crop grazing period, corn crop residues had a higher concentration of ash, NDF, and ADF, whereas stockpiled forages had higher concentrations of IVOMD and CP (Table 2). Tall fescue--red clover had higher initial concentrations of IVOMD and CP whereas smooth bromegrass--red clover had higher initial concentrations of NDF and ADF.

The concentration of IVOMD decreased with time during grazing. Loss was greater in stockpiled tall fescue--red clover pastures. There was no difference in the rate of loss between grazed and ungrazed areas in stockpiled pastures. The rate at which concentration of CP was lost was not affected by forage species. There was also no difference in rate of loss between grazed and ungrazed forages.

The rate at which the concentration of NDF and ADF increased was greater in grazed corn crop residues than in grazed stockpiled forages. Tall fescue--red clover had a higher rate of concentration increase in NDF and ADF than that of smooth bromegrass--red clover for both grazed and ungrazed areas. The lack of difference in the rate of change in concentration of ash, NDF, ADF, and CP between grazed and ungrazed areas of corn crop residues and stockpiled forages implies that much of the change in concentration was the result of weathering loss rather than loss from selective grazing.

Mean cow-weight of cows maintained on hay in drylots was greater than cows grazing corn crop residues in Period 1 and was greater than cows grazing stockpiled forages in Period 2 (Table 3). However, cows maintained on hay in drylots had greater body weight losses than cows grazing the stockpiled forages in Period 3; therefore, there were no differences in the seasonal body weight changes of cows maintained by either management system. The body weight losses of cows

Table 3. Mean cow-weight and body condition score changes for three winter forage systems containing corn crop residues and tall fescue--red clover or smooth bromegrass--red clover or drylot.

	Forage System		
	Drylot	CCR-TF--RC	CCR-SB--RC
Body Weight, lb			
Initial	1119	1142	1153
Seasonal change			
Period 1[f]	54[c]	37[c]	-14[d]
Period 2	42[d]	-59[c]	-63[c]
Period 3	-75[c]	18[d]	51[d]
Total	21	-4	-27
Body Condition Score[g]			
Initial	4.45	4.95	4.9
Seasonal change			
Period 1	.55[c]	-.05[c]	-.15[e]
Period 2	-.1	.1	-.2
Period 3	-.6[d]	0.0[c]	0.0[c]
Total	-.15	.05	-.35

[c,d,e] Differences between means with different superscripts are significant, P < .05.
[f] Period 1= 10/26/95-12/20/95 Period 2= 12/21/95-3/7/96 Period 3= 3/8/96-5/1/96.
[g] 9-point scale.

maintained in the drylot during Period 3 may have been caused by the decrease in the quality of stored hay over time, whereas body weight gains of cows grazing stockpiled forages may have resulted from an increase in the quality of available forage in late spring. Final weights of cows were taken after all but four cows had calved. Similar to body weight, the body condition scores of cows maintained in the drylots increased, whereas those of cows grazing corn crop residues
decreased during Period 1. However, during Period 3, body condition scores of cows maintained in the drylot decreased more than those of cows grazing either of the stockpiled forage mixtures, Therefore, seasonal body condition score changes did not differ between wintering systems.

Mean yearling body weight gains were greater during the period of CGF supplementation than the period following supplementation. Mean body weight gains were 33 lbs for the 28 days during supplementation. Thereafter, hay was fed at a level that would result in lower body weight gains throughout the remaining drylot period. Mean body weight gains were .39 lbs/day for the remaining 166 days. Mean total seasonal body weight gain was 94 lbs, resulting in a gain of.48 lbs/day.

Cows sequentially grazing corn crop residues and stockpiled grass-legume forages required 5,300 lb hay dry matter per cow less than cows maintained in a drylot (Table 4). During Periods 1 and 2, the amounts of hay required by cows sequentially grazing corn crop residue and either stockpiled TF-A-RC or SB-RC forages did not differ. However, during Period 3, cows grazing stockpiled TF-A-RC forage required 2.1 times less hay than cows grazing stockpiled SB-RC forage. Therefore, seasonal hay feeding tended to be lower for cows grazing stockpiled TF-A-RC forage than stockpiled SB-RC forage. Because of the hay produced from fields used in the stockpiled grazing system, the TF-A-RC and SB-RC produced 11,905 and 12,803 lb hay DM per cow in excess of that required to maintain those cows grazing the stockpiled forages. In contrast, the 6,201 lb hay DM per cow required by cows maintained in the drylot would have had to either come from some field within the farm or be purchased. Yearlings maintained in drylot required 2,778 lb hay DM during the winter and spring grazing periods. Daily hay use by the yearlings was 13.3, 12.2, and 15.5 lbs hay DM per yearling per day during periods 1,2, and 3. Cow-calf pair hay balance was decreased with the feeding of yearlings through the winter and spring.

Implications

The utilization of corn crop residues followed by grazing of stockpiled forages can greatly reduce the amount of stored hay needed to supplement gestating cows. As a result considerable amounts of excess hay which may be sold or used for other animals on the farm, is produced in this system. One option may be to retain the spring calf crop through the winter and utilize the excess hay produced. In the spring the yearlings may then be put into a feedlot or grazed on summer pastures. Corn crop residues offer a low cost grazing resource that can be utilized throughout the fall and early winter. Body weight and body condition scores can be maintained or show only small losses over the course of a 55 day grazing

season. Corn crop residue grazing followed by the grazing of stockpiled legumes containing forages can have positive effects on body weight gain and body condition scores. Increases in body weight and body condition scores approaching calving have been shown to be beneficial in cow maintenance and subsequent rebreeding rates. Having cows at a desirable body weight and body condition scores through the grazing corn crop residues and stockpiled forages will reduce the amount of stored forage required by gestating cows in the fall and winter.

Acknowledgments

This project was funded in part by a grant from the Leopold Center for Sustainable Agriculture, Iowa State University. The authors gratefully acknowledge the assistance of Bill Alley, Robert Webb, Kelly Greiner, Andy Hitz, Sonja Jensen, Amanda Maile, Joel Morrical, Beth Pellet, Jodie Ross and Jodi Western.

Table 4. Hay use and hay balance of different winter forage systems containing corn crop residues and tall fescue--red clover or smooth bromegrass--red clover or drylot.

	Forage System			
	Drylot	CCR-TF--RC	CCR-SB-RC	Yearlings
Hay Feeding				
lb DM / cow				
Period 1	2024[i]	241[h]	245[h]	731
Period 2	2478[i]	392[h]	392[h]	1197
Period 3	1700[i]	172[h]	360[h]	850
Total	6201[i]	805[h]	997[h]	
Hay Balance[j]				
lb DM / cow	-6202[i]	11,905[h]	12,803[h]	-2,778
lb DM / cow-calf pair	-8980	9,127	10,025	

[h i] Differences between means with different superscripts are significant, $P < .05$.

[j] lb hay DM produced-lb hay DM fed/ number of cows.