January 2002

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Windrow Grazing and Baled-Hay Feeding Strategies for Wintering Calves

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Windrow grazing of meadow forage was a cost-saving strategy for wintering calves. Quality of windrow-stored forage remained relatively constant through the fall and winter and resulted in adequate calf gains.

Summary

Windrow grazing is a strategy where livestock directly graze windrow-stored forage, generally during a time when packaged hay is provided. We evaluated calf performance, forage quality and waste, and determined economic returns under windrow grazing and bale-fed strategies. Quality of windrow-stored forage remained constant through fall and winter and resulted in adequate calf gains. Forage waste under windrow grazing was closely associated with grazing management. Economic analysis indicated costs for windrow grazing were substantially less than those associated with a bale feeding strategy. Correspondingly, net returns per head and acre were greater for windrow grazing compared to the bale-fed strategy.

Introduction

Using strategies that extend the normal grazing season is one approach to reduce costs in ranch enterprises. This has included using complementary grazing of seeded forages, grazing of stockpiled forages, or any approach that places greater reliance on the grazing animal for harvesting forages. Another strategy to potentially lower harvest and feeding costs is the direct grazing of windrows or swaths in lieu of baling. The objective of this strategy is to produce windrow-stored forage that will match the nutrient requirements of a certain class of livestock.

We initiated a two-year study in 1997 to evaluate windrow grazing of meadow forage with weaned calves as an alternative to the conventional feeding of baled hay. Our approach was unique in that we harvested regrowth meadow hay in an attempt to provide forage that would meet the nutrient requirements of a weaned calf. The objectives were: 1) to quantify calf performance, feed intake, and waste under windrow grazing and baled-hay feeding management strategies; 2) to quantify hay quality changes as affected by storage method and time; 3) to determine effects of windrow coverage on subsequent wet meadow herbage yield and composition; and 4) to compare costs and returns associated with windrow grazing and baled-hay feeding strategies.

Procedure

The study was conducted from 1997 to 1999 at the University of Nebraska, Gudmundsen Sandhills Laboratory, five miles northeast of Whitman, Neb. Experimental pastures (eight acres) were established on a subirrigated range site of a wet meadow that had primarily been used for hay production. Vegetation of the study pastures was dominated by cool-season species including smooth bromegrass, redtop bent, timothy, slender wheatgrass, Kentucky bluegrass, and several species of sedges, rushes, and spikerushes.

Each of three pastures were grazed by mature cows with calves at 39 animal-unit-days (AUD)/acre during the last two weeks of May in 1997 and 1998. This stocking rate resulted in heavy use with nearly all of the available forage being removed. Pasture forage was then allowed to grow until harvesting in September of each year. Cut forage was raked into windrows that were approximately 3 feet wide and 33 feet apart. Alternate windrows were then baled (1,000 lb round), and bales removed. Remaining windrows were left in place.

The grazing and feeding trial began in mid-November and continued through January of each year. Forty-eight steer calves were randomly allocated into three replicate groups (eight head each) for the windrow grazing (windrow) treatment and three replicate groups for the bale-fed (bale) treatment. Calves had an initial weight of 447 lb. Bale-fed calves were kept in dry-lot pens and fed hay packaged from the alternate windrows in the corresponding pastures.

Fecal output for estimation of forage intake was determined with 18 calves during December 1997 and 1998. Three calves from each windrow or bale replication were sampled. Each calf on the intake trial was orally dosed with an intraruminal continuous chromium (Cr)-releasing device five days before a six-day fecal collection period. Concurrent with the fecal collections for the windrow and bale calves, total fecal collections were made on eight steer calves that were similar in weight and age to those under the windrow and bale treatments. Four of the calves were individually fed baled hay and four were individually fed hay collected from windrows.

In the windrow grazing treatment, forage waste was determined from pre- and post-grazing weights of 6-foot sections of windrow. Under the hay-fed treatment, the amount of hay wasted was determined by collecting hay that was discarded and trampled in an area around the round-bale feeder. After the trial ended in late January, cows were placed in the windrow grazing pastures for

(Continued on next page)

additional grazing of the windrows. Pre- and post-grazing measurements of windrows were also made.

To evaluate the effect of time and method of storage on forage quality, samples of windrow, baled, and standing (not cut in September) forage were collected at the time of harvest and each month through February.

Windrows left on the meadow until they are grazed during the winter may have an effect on the vegetation directly underneath. Such effects were evaluated by sampling during the following July of each year. In each meadow pasture, quadrats were clipped in areas that were and were not covered by windrows. Clipped vegetation was sorted into grass, sedge, legume, and other forb components and then dried and weighed.

Partial budgeting techniques were used to compare the windrow grazing and bale feeding strategies. Some costs common to both strategies were included to determine whether either strategy could be profitable over a range of calf prices. For purposes of comparison, a 100 acre field, typical of ranch-scale operations, was assumed.

Results

Calf Weight Gain and Forage Intake

There was a year by treatment interaction effect for calf weight gain ($P < 0.05$; Table 1). During the first year of the trial, windrow-fed calves gained 81 lb compared to 59 lb for bale-fed calves. There was no difference in weight gain between treatments during the second year of the trial ($P > 0.05$). The greater weight gain for windrow calves during 1997-98 was likely due to the presence of high quality regrowth that occurred after haying. The fall of 1997 was relatively mild and our hay harvest date was three weeks earlier compared to 1998. Diet samples collected from esophageal-fistulated cows on December 8, 1997 contained 14.6% CP compared to 10.4% CP for hand-collected samples of windrows. Some of the regrowth in windrow pastures was observed to remain green as late as December 20, 1997.

In vivo organic matter digestibility of baled hay and windrow forage, as determined from steers that were individually fed and subject to total fecal collection, averaged 67.3% and was not affected by year or treatment ($P > 0.05$). Dry matter *in vivo* digestibility was 60.4%. Forage intake by individually fed steers was also similar between years and treatments and averaged 11.2 lb organic matter/head/day.

Table 1. Body weights and gains of calves grazing windrows or fed baled meadow hay.

		Treatment		
Trial year	Item	Windrow grazing	Bale-fed	SEM[a]
1997-98	Initial weight, lb.	449	447	4.19
	Final weight, lb.	531[b]	507[c]	4.49
	Total gain, lb.	81[b]	59[c]	2.88
	Daily gain, lb./day	1.16[b]	0.86[c]	0.04
1998-99	Initial weight, lb.	443	449	3.96
	Final weight, lb.	485	487	3.33
	Total gain, lb.	42	38	3.17
	Daily gain, lb./day	0.57	0.52	0.04

[a]Standard error of the mean, N = 6.
[b,c]Within rows, treatment means with unlike superscripts differ ($P<0.05$).

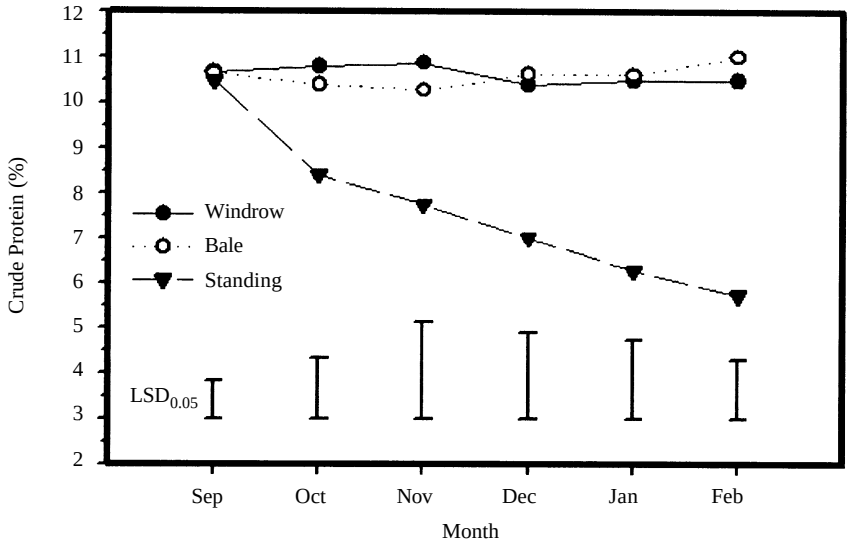

Figure 1. Effect of time and method of storage on crude protein content of wet meadow hay (organic matter basis), 1997-98 and 1998-99.

Forage Waste

Pregrazing weight of windrow-stored forage averaged 2.8 lb/linear-foot and pre-feeding weight of bales was 990 lb. Under our grazing management, forage waste (refusal) by windrow calves averaged 29% and was higher than waste by bale calves (12.5%, $P < 0.05$). We allowed cows to graze in the windrow pastures after the calf grazing period ended. This resulted in an additional 23% utilization of the windrow forage left by calves during the first year of the trial and an additional 75% utilization during the second year. Forage waste after the combined calf and cow grazing periods averaged 18% and 4% during the first and second year of the trial, respectively. The difference between years was largely due to the cow stocking rates that were applied.

Effect of Time and Method of Storage on Forage Quality

Year did not affect CP content, ADF, or NDF of windrow, baled, or standing (stockpiled) forage ($P > 0.05$). A treatment by month interaction was detected

Table 2. Effect of windrow coverage on subsequent wet meadow herbage yield and composition, July 1998 and 1999.

	Treatment		
Plant group	Windrow covered	Control	SEM[a]
	- - - - - - - - - lb/acre - - - - - - - - -		
Grasses	2,590[b]	3,730[c]	416
Sedges and rushes	1,800	1,780	387
Legumes	330	310	91
Forbs	200	80	47
Total	4,920[b]	5,900[c]	272

[a]Standard error of the mean, N = 9.
[b,c]Within plant group, treatments means with unlike superscripts differ (P < 0.05).

Table 3. Costs of forage production and grazing or feeding for windrow grazing and bale-fed strategies.[a]

Item	Windrow grazing	Bale-fed
Forage production	- - - - - - - - - - $/acre - - - - - - - - - -	
Fertilizer and application	32.35	32.35
Mow and rake	10.00	10.00
Bale (large round)	—	19.30
Move bales	—	6.13
Total	42.35	67.78
Grazing or feeding[b]	- - - $/acre - - -	- - $/ton - -
Hay cost	42.35	33.88
Feeding cost		
Labor	—	1.60
Bale feeder (depreciation, interest, repair)	—	5.06
Tractor (depreciation, interest, repair, fuel)	—	4.35
Fence	3.52	—
Labor	1.68	—
Total costs per acre or ton	$47.55/acre	$44.89/ton
Feed cost/head	$11.60	$21.24
Feed cost/head/day	$ 0.16	$ 0.30

[a]Based on 100 acres meadow, 410 calves (500 lb) and a 72 day windrow grazing or bale feeding period.
[b]Costs for windrow grazing are dollars/acre and costs for the bale-fed strategy are dollars/ton.

for CP content (P < 0.05). Crude protein content under windrow, baled, and standing storage treatments was similar in September (10.6%), but CP of standing forage declined to 5.7% by February (Figure 1). Crude protein content of windrow- and baled-stored forage was similar over all sampling months (P > 0.05).

Effect of Windrow Coverage on Subsequent Vegetation Production and Composition

In July of the growing seasons following windrow grazing, composition of wet meadow herbage averaged 63% grasses, 30% sedges and rushes, 6% legumes, and 1% forbs. Total herbage yield was 20% less in the area directly covered by windrows compared to the control (P < 0.05; Table 2). This difference was due to 1,140 lb/acre less grass yield under the windrow covered treatment compared to the control. Treatment did not affect yield of the sedge/rush, legume, and forb plant groups. Although our data indicate a 20% reduction in total herbage yield in the area covered by windrows, only about 9% of the total area of a pasture is affected by windrow-coverage when 3-feet wide windrows are created 33 feet apart. Applying this percentage to our data shows that for the entire pasture the net effect due to windrow coverage would be about 90 lb/acre or 1.5% less yield.

Economics

Estimated costs for producing and harvesting hay were about $25/acre (37%) higher for the bale-feeding strategy compared to windrow grazing due to baling and bale moving costs (Table 3). The costs of feeding bales are a major addition to the bale-fed strategy and are $11/ton or about 33% of the costs for harvesting hay. Additional costs for windrow grazing are for fencing materials and labor to install the fence and move the temporary fence while grazing windrows. The resulting strategy feed costs were $0.16/head/day for windrow grazing compared to $0.30/head/day for the bale-fed.

During the 1997-1998 trial year, net returns for windrow grazing were $72.26/head compared to $52.31/head for the bale-fed strategy. This difference reflects both the lower costs and the fact that animals gained better under windrow grazing that year. Net returns during 1998-1999 were $62.96/head for windrow grazing and $49.34/head for bale-fed with the difference primarily due to strategy costs since animal gains were similar. These returns do not include costs for land, management, or overhead.

In an analysis that projected net returns by strategy for the years 1992 through 1999, gain from the windrow grazing averaged $29.04/head compared to $19.86/head for bale-fed. This analysis held costs constant at 1998 level and permitted steer calf prices to vary according to actual prices, 1992-1999. Animal gains were held constant at 0.5 lb/day so the year to year differences reflect only calf price variations. Net returns for bale-fed were more variable compared to the mean as reflected by a coefficient of variation of 125% compared to 84% for windrow grazing.

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