Reducing cow wintering cost grazing stockpiled grass and crop residues

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Abstract

A 2-year (2013, 2014), 134-day, cow wintering experiment was designed to evaluate gestating cow overwintering methods and cost. One hundred forty-four, 3-10 year old, May-June calving crossbred cows were used in the study (3 treatment replicates, 8 cows/replicate).

A control (C) group of cows received hay only in drylot pens. Compared to the C, one group grazed a 7-species cover crop followed by corn and sunflower residues (CC-RES) and a second group grazed stockpiled improved grass followed by corn stalk residue (GRAS-RES). Cows in all treatments received 1.74 lb (DM) of a 32% CP supplement ($339.25/T). After grazing approximately 50 - 60% of the available low-quality residue or stockpiled grass, the cows received hay until the study ended in April.

Overall, total gain during the 134-day wintering period for the C, CC-RES, and GRAS-RES treatments was 205, 146, and 112 lb., respectively. Body condition score for the C and CC-RES cows increased 0.79 and 0.71 of a condition score/cow, respectively (P = 0.05), but the GRAS-RES group's BCS did not change (5.4). Reproductively, subsequent calving percentage did not differ for the first (P = 0.12), second (P = 0.15), and third (P = 0.26) calving cycles, percent of non-pregnant cows (P = 0.47), and total percent calving (P = 0.46).

Overwintering cost for the three methods compared was markedly different. Hay cost/cow for the C, CC-RES, and GRAS-RES was $172.51, $67.74, and $29.94/cow, respectively (P = 0.001). Accounting for supplement, farming, and tax expenses total wintering cost for the C, CC-RES, and GRAS-RES was $208.81, $140.59, and $73.33/cow, respectively. On a calendar year basis, C, CC-RES, and GRAS-RES cows grazed 7.6, 10.0, and 11.1 months of the year, respectively.

Caution. North Dakota winters are unpredictable and harsh. The authors suggest cattle producers considering winter grazing have one and, preferably, two years hay supply on hand as a precaution for weather conditions that preempt winter grazing.

Introduction

Beef cattle production cost for harvested and grazed forages, grain, co-products and commercial supplements constitute the majority of cattle ranching expenses (Lardy and Caton, 2010). Feeding harvested and processed feeds are more expensive than grazing forages directly. North Dakota farmers and ranchers grow corn, sunflower, and cover crops that are suitable low-quality forages for grazing by non-lactating, gestating cows, after weaning. Stockpiled improved grasses (brome- and crested wheatgrass) are also suitable low-quality forage sources. Cline et al. (2009) documented that N content of mixed-grass prairie grazed by cattle in western North Dakota declined after September and, with advancing season, improved grasses decline as well. The metabolizable protein system divides feed protein fractions into rumen degradable (DIP) and undegradable protein (UIP) (NRC, 1996) and, for low-quality forage, response to increasing levels of supplemental protein is variable; however, the DIP fraction is responsible for increased forage organic matter intake and digestion (Hollingsworth-Jenkins, et al., 1996; Olson et al., 1999; Mathis et al., 2000). Grazing crop residues and stockpiled grasses with supplemental protein represent opportunities to extend the grazing season and potentially reduce cow overwintering feed cost.

A diverse crop rotation consisting of spring wheat, cover crop, corn, field-pea barley, and sunflower grown at the Dickinson Research Extension Center was a source for corn and sunflower residue as well as stockpiled improved grasses for this extended winter grazing investigation.

The objective of the 2-year study was to evaluate three winter feeding methods for non-lactating, gestating, beef cows, during the late-fall and winter period from November to April, to determine total grazing days, cow weight change, body condition score change, post-wintering reproductive performance, and wintering method economics.

Experimental Procedures

The North Dakota State University Institutional Animal Care and Use Committee approved research procedures used in this study.

One hundred forty-four, 3-10 year old, May-June calving crossbred cows (3 treatment replicates, 8 cows/replicate) were used in the 134-day study to evaluate gestating cow overwintering methods and cost.

Cover crop and crop residues grazed were grown as sequence crops in an integrated crop and beef cattle

study in which yearling steers grazed unharvested corn before the wintering study and sunflower was combined for oilseed. For the CC&RES treatment, the residues and 7-species cover crop consisted of warm- and cool-season annuals. Table 1, describes the 7-species cover crop blend, pounds/acre seeded, cost/acre, and grazing cost/cow. The stockpiled GRAS&RES treatment was comprised of perennial improved grasses (bromegrass and crested wheatgrass) and forage corn residue. Control cows received hay in drylot pens after weaning until the end of the study in April. Nutrient analysis for starting and ending stockpiled grass, cover crop, and annual forage residues are summarized in Table 2. Grazing treatment cows (CC&RES and GRAS&RES) grazed their respective annual forage residues, or stockpiled grass, until 50-60% removal and then transferred to drylot pens, and fed hay until the end of the study. Cows in all treatments received an average 1.74 lb (DM) of a 32% crude protein (CP) distiller's dried grain with solubles supplement daily ($339.25/T, As Fed) based on the average starting weight of all cows in the study (0.12% of BW). Cow weight and visual BCS were determined at the start and end of the study. The breeding season for the May-June calving cows started August 10 each year for calving to begin approximately May 20. The effect of wintering treatment on calving cycle, non-pregnant cows, and total percent of cows calving was determined during the subsequent calving season.

For comparative cost analysis, all annual forage crop expenses were charged to the previous enterprises (cropping and yearling steer grazing) and land was considered to be owned. Hay price was $65/T (As Fed). The only direct farming expenses incurred were for cover crop production in the CC&RES treatment and Dunn County, ND, property tax was included for both grazing treatments. Data analysis conducted using MIXED procedure of SAS.

Results and Discussion

Table 3, summarizes cow weight fluctuations and BCS change for the periods when CC-RES and GRAS-RES cows grazed cover crops, grass, and residues. Grazing length was greatest for the GRAS-RES (107 days) compared to the CC-RES cows (73 days), because the grazing goal was to remove only 50-60% of the grass residue in the stockpiled grass treatment. Therefore, GRAS-RES had twice as many acres of forage to graze before grazing corn residue. Comparing cow performance during the grazing period (CC-RES: 73 days; GRAS-RES: 107 days), CC-RES cows gained less than the GRAS-RES (P = 0.001); however, body condition score at the end of grazing was similar for the two grazing groups (P = 0.76). In drylot after grazing, the CC-RES cows received hay for 61 days compared to the GRAS-RES cows that received hay for 27 days. During the 61-day period on hay, BCS for the CC-RES cows increased from the end of residue grazing to the end of the wintering study. On a calendar year basis, C, CC-RES, and GRAS-RES cows grazed 7.6, 10.0, and 11.1 months of the year, respectively.

Overall, total gain during the 134-day wintering period, for the C, CC-RES, and GRAS-RES treatments, was 205, 146, and 112 lb., respectively (Table 4). Body condition score change for the C and CC-RES were 0.79 and 0.71 of a full condition score/cow, respectively, which was significantly greater than the GRAS-RES condition score that did not change over the wintering period (P = 0.05). Although C and CC-RES cow's BCS increased, GRAS-RES cow's BCS of 5.4 remained the same from the beginning to the end the study.

The percent of cows calving in the first through third calving cycles, percent open, and the total percent calving established the basis for reproductive performance (Table 5). There were no differences measured for first (P = 0.12), second (P = 0.15), and third (P = 0.26) calving cycles, percent of non-pregnant cows (P = 0.47), and the total percent calving (P = 0.46). Since May-June calving cows calve on lush spring grass and the breeding season did not begin until August 10, grazing nutrition, and environmental conditions supported reproductive efficiency. The amount of low-quality forage grazed during the third trimester of pregnancy is reduced, because later calving cows graze spring forage before and during calving (April-June).

Expenses for the three wintering methods was markedly different (Table 6). Hay cost/cow for the C, CC-RES, and GRAS-RES was $172.51, $67.74, and $29.94/cow, respectively (P = 0.001). Combining expenses for supplement, hay, cover crop (seed, farming, and property tax), and stockpiled grass on owned land (property tax), total wintering cost for the C, CC-RES, and GRAS-RES was $208.81, $140.59, and $73.33/cow, respectively. Comparing wintering cost of the C cows with the CC-RES cows, the wintering cost reduction was $68.22/cow, and comparing to the GRAS-RES cows, overwintering cost reduction was $135.48/cow, or 2.8 times less ($208.81/$73.33).

Replacing hay feeding with supplemented low-quality forage and stockpiled grass grazing, reduces winter feed cost, labor, fuel, maintenance and repair, and improves quality of life without negatively effecting reproductive performance.

Caution. Any extended winter grazing program must have a backup plan for harsh winter weather. Blizzards and deep snow are impediments to grazing

and the only alternative is to feed hay. Extended winter grazing conserves hay, but having one to two years reserve hay supply on hand is essential insurance, when weather impedes grazing.

Acknowledgements

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Table 1. Seven-species cover crop blend, cost/Ac, and grazing cost/cow

Crop Blend	lb/Ac	Cost/lb, $	Cost/Ac, $
Sunflower	2	4.50	9.00
Everleaf Oat - 114	20	0.37	7.40
Winter Pea	20	0.40	8.00
Hairy Vetch	5	1.75	8.75
Winfred Forage Rape	1	3.50	3.50
Ethiopian Cabbage	1	4.00	4.00
Hunter Leaf Turnip	1	3.50	3.50
Total Seed Cost/Ac, $			44.15
Farming Cost & Property Tax/Ac, $			23.85
Cover Crop Cost/Ac, $			68.00
Grazing Cost/Cow, $			36.55

Table 2. Nutrient analysis of stockpiled improved grasses and annual forage crop residue.

	CP[1] (%)	NDF[1] (%)	ADF[1] (%)	Fat (%)	IVDMD[1] (%)	IVOMD[1] (%)	Ca[1] (%)	Phos[1] (%)	TDN[1] (%)
Stockpiled Brome & Crested Wheatgrass									
Start (Nov. 6)	7.1	75.0	44.6	1.20	41.1	39.9	0.34	0.20	48.2
Mid (Dec. 22)	5.6	80.9	50.4	0.41	34.1	32.7	0.28	0.18	43.6
End (Jan. 15)	5.0	83.6	52.9	0.82	30.8	29.2	0.34	0.11	41.6
Cover Crop									
Start (Nov. 18)	12.3	32.8	20.5	1.03	82.9	82.3	0.97	0.33	67.4
End (Dec. 15)	12.9	54.9	36.8	0.86	62.3	61.5	1.26	0.25	54.5
Corn Stalk Residue									
Start (Dec. 15)	5.4	70.3	41.7	0.67	60.0	59.8	0.25	0.17	51.3
End (Dec. 29)	4.7	74.6	43.7	0.39	51.0	49.5	0.32	0.14	49.4
Corn Trash Residue on Ground									
Start (Dec. 15)	7.0	58.4	29.8	1.43	66.7	67.4	0.16	0.23	60.9
End (Dec. 29)	5.0	74.7	43.6	0.58	49.8	48.5	0.29	0.12	49.6
Sunflower Residue (Combine)									
Start (Dec. 29)	5.9	58.0	44.3	4.50	54.2	49.7	1.37	0.16	48.4
End (Jan. 20)	4.0	76.6	58.1	0.44	34.7	28.6	1.17	0.07	37.5

[1] **CP:** Crude Protein; **NDF:** Neutral Detergent Fiber; **ADF:** Acid Detergent Fiber; **IVDMD:** Invitro dry Matter Disappearance; **IVOMD:** Invitro organic Matter Disappearance; **Ca:** Calcium; **Phos:** Phosphorus; **TDN:** Total Digestible Nutrients

Table 3. Cow winter grazing and drylot weight and condition score change.

				P- Value[3]		
	C[1]	CC-RES[1]	GRAS-RES[1]	SEM[2]	Trt	Yr	Trt x Yr
Grazing:							
Number of Cows	48	48					
Number of Days Grazed	73	107					
Start Weight, lb	1500	1470	59.61	0.36	0.24	0.24	
End Weight, lb	1518	1536	42.3	0.58	0.29	0.94	
Gain, lb	18.0[a]	66.0[b]	19.12[c]	0.001	0.84	0.003	
ADG, lb	0.25[a]	0.62[b]	0.19[c]	0.001	0.40	0.001	
BCS							
Start BCS	5.6	5.4	0.16	0.10	0.006	0.94	
End BCS	5.5	5.2	0.16	0.15	0.51	0.46	
BCS Change	-0.10	-0.20	0.11	0.76	0.05	0.29	
Drylot - Hay:							
Number of Cows	48	48					
Number of Days Fed Hay	61	27					
Start Weight, lb	1518	1536	42.3	0.58	0.29	0.94	
End Weight, lb	1646	1582	46.5	0.06	0.90	0.84	
Gain, lb	128[a]	46[b]	5.58[c]	0.001	0.001	0.21	
ADG, lb	2.10	1.70	0.25	0.18	0.40	0.53	
BCS							
Start BCS	5.5	5.1	0.15	0.13	0.58	0.52	
End BCS	6.3	5.4	0.14	0.001	0.60	0.45	
BCS Change	0.80	0.30	0.088	0.001	0.69	0.009	

[1] **CC&RES**: Cover Crop & Residue (Corn and Sunflower), **GRAS&RES**: Stockpiled Grass & Corn Residue
[2] **SEM:** Pooled standard error of the mean
[3] **P-Values: Trt**; (Treatment), **Yr**; (Year), and **Tr x Yr**; (Treatment x Year interaction)
[a-c] Means with different superscripts within a line are significantly different, (P≤0.05)

Table 4. Combined grazing and drylot hay feeding effect on weight and condition score change.

				P- Value[3]		
	C[1]	CC-RES[1]	GRAS-RES[1]	SEM[2]	Trt	Yr	Trt x Yr
Number of Cows	48	48	48				
Total Winter Feeding Days	134	134	134				
Start Weight, lb	1490	1500	1470	59.8	0.62	0.15	0.40
End Weight, lb	1695	1646	1582	47.1	0.87	0.58	0.55
Gain, lb	205[a]	146[b]	112[c]	17.3	0.001	<0.007	<0.001
ADG, lb	1.53[a]	1.10[b]	0.84[c]	0.13	0.002	0.23	<0.001
Hay & Supplement (DM)							
Hay/Cow, lb	4724.0[a]	1824.0[b]	891.0[c]	44.33	<0.001	<0.001	<0.001
Hay/Cow/Day, lb	35.3	30.6	33.1	0.47	0.40	<0.001	0.002
32% CP Suppl./Cow, lb	214.0	214.0	214.0				
32% CP Suppl./Cow/Day, lb	1.74	1.74	1.74				
BCS							
Start BCS	5.7	5.6	5.4	0.25	0.57	0.008	0.93
End BCS	6.5	6.3	5.4	0.21	0.38	0.10	0.30
BCS Change	0.79[a]	0.71[a]	0.0[b]	0.15	0.05	0.15	0.49

[1] **C:** Control (Drylot Hay), **CC&RES**: Cover Crop & Residue (Corn and Sunflower), **GRAS&RES**: Stockpiled Grass & Corn Residue
[2] **SEM:** Pooled standard error of the mean
[3] **P-Values: Trt**; (Treatment), **Yr**; (Year), and **Tr x Yr**; (Treatment x Year interaction)
[a-c] Means with different superscripts within a line are significantly different, (P≤0.05)

Table 5. Cow winter treatment effect on calving cycle and total calving percent.

					P- Value[3]	
	C[1]	CC-RES[1]	GRAS-RES[1]	SEM[2]	Trt	Yr	Trt x Yr
Number of Cows	48	48	48				
First Calving Cycle, %	72.6	69.3	60.5	3.92	0.12	0.005	0.035
Second Calving Cycle, %	10.4	23.8	20.8	4.66	0.15	0.18	0.52
Third Calving Cycle, %	6.3	2.1	8.3	2.79	0.26	0.004	0.27
Open, %	10.7	4.8	10.4	3.70	0.47	0.45	0.48
Total Calving, %	89.3	95.2	89.6	3.70	0.46	0.44	0.47

[1] **C:** Control (Drylot Hay), **CC&RES**: Cover Crop & Residue (Corn and Sunflower), **GRAS&RES**: Stockpiled Grass & Corn Residue
[2] **SEM:** Pooled standard error of the mean
[3] **P-Values: Trt**; (Treatment), **Yr**; (Year), and **Tr x Yr**; (Treatment x Year interaction)

Table 6. Cow wintering treatment effect on feed intake and winter-feeding method economics (Owned Land).

					P- Value[3]	
	C[1]	CC-RES[1]	GRAS-RES[1]	SEM[2]	Trt	Yr	Trt x Yr
Economics							
Days Hay Fed	133.5	61.0	27.0				
Days Grazing	0.0	73.0	107.0				
Hay Cost/Cow, $	172.51[a]	67.74[b]	29.94[c]	1.62	0.001	0.001	0.001
32% CP Suppl Cost/Cow, $	36.30	36.30	36.30				
Cover Crop Cost/Cow, $	-	36.55	-				
Total Winter Feeding Cost/Cow, $[4]	208.81[a]	140.59[b]	73.33[c]	1.9	<0.001	<0.001	<0.008

[1] **C:** Control (Drylot Hay), **CC&RES**: Cover Crop & Residue (Corn and Sunflower Residues), **GRAS&RES**: Stockpiled Grass & Residue (Corn Residue)
[2] **SEM:** Pooled standard error of the mean
[3] **P-Values: Trt**; (Treatment), **Yr**; (Year), and **Tr x Yr**; (Treatment x Year interaction)
[a-c] Means with different superscripts within a line are significantly different, (P≤0.05)
4 Grazing treatments include Dunn County, ND, property tax.