Effect of Grazing Cover Crops, Stockpiled Improved Grass, and Crop Residues on Cow Wintering Performance, Economics, and Calving Rate

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Project Brief:

Winter maintenance cost for gestating cows is the highest single cost in beef cattle production. After weaning in November each year in this 2-year study, one hundred forty-four, medium-large frame, 3-10 year old May-June calving cows were used to evaluate two approaches for extending the grazing season as methods for reducing winter feed cost.

Compared to feeding hay and supplement to control (C) treatment of gestating cows in confinement, one group of cows grazed a sequence of forages beginning with a 7-species cover crop followed by corn and sunflower residues (CC&RES), and a second group of cows grazed stockpiled crested and bromegrass pastures followed by corn residue (GRAS&RES). There were three pen replicates of C cows and three field replicates of each forage type grazed. There were 8 cows in each pen or field replicate for a total of 24 cows/treatment. When each grazing treatment sequence was completed, the cows were moved to confinement and fed hay until the wintering study was completed in April.

Cover crop and crop residues grazed in the study were grown as part of in an integrated crop and beef cattle study (SARE project LNC 11-335) in which unharvested corn had been previously grazed with yearling steers and sunflower was harvested for oilseed. For the CC&RES treatment, the residues and 7-species cover crop (Table 1) were warm- and cool-season annuals. However, the stockpiled GRAS&RES treatment was comprised of perennial improved grasses (bromegrass and crested wheatgrass) and forage corn residue. The corn residue grazed in both grazing treatments had been previously grazed by yearling steers. The C cows were moved to drylot pens after weaning and were fed hay until the end of the study in April. The two cow grazing treatments (CC&RES and GRAS&RES) grazed their respective forage-residue sequences and when sufficiently grazed the cows were moved to drylot and fed hay until the end of the study.

The 7-species cover crop blend, pounds/acre seeded, cost/acre, and grazing cost/cow is shown in Table 1. Cow body weight and body condition score (BCS) change during grazing and drylot (hay) after grazing is show in Table 2, for the CC&RES and GRAS&RES systems, and weight and BCS change for the entire 134 day wintering period has been summarized in Table 3. The breeding season for the May-June calving cows in the study started on August 10 each year for calving to begin approximately May 20 each year. The effect of wintering treatment on calving cycle and total percent of cows calving is shown in Table 4. The system wintering treatments were designed to reduce the amount of hay fed, which was replaced with forage and residue grazing. Cows in all treatments were fed and average 1.74 lb (DM) of a 32% CP supplement ($339.25/T). The total amount fed in each treatment group was 214 lb/cow and cost $36.30/cow. The hay price used was $65/T. The amount of hay fed, 32% CP supplement, and total winter cost/cow for each system is shown in Table 5. For the system 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 land. The only direct farming expenses were incurred for cover crop production in the CC&RES treatment and property tax was incurred for both of the grazing treatments.

Grazing length was greatest for the GRAS&RES treatment (107 days) compared to the CC&RES treatment (73 days). Cows grazing GRAS&RES gained more weight during the 107 day period compared to the CC&RES treatment (P=0.0001). Although there was a grazing difference measured for body weight there was no difference observed between treatments for BCS (P=0.76). In drylot after grazing, the CC&RES cows were fed hay for 61 days compared to the GRAS&RES cows that were fed hay for 27 days. The BCS of the CC&RES cows increased 0.80 BCS score, which was a significant increase compared to the GRAS&RES cows that increase 0.30 BCS (P=0.0001). 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 change for the C and CC&RES were 0.79 and 0.71 score change/cow, respectively, which was significantly greater than the

GRAS&RES condition score that did not change over the wintering period (P=0.05).

Reproductive performance was based on the percent of cows calving in the first through third calving cycles, percent of non-pregnant cows, and the total percent of cows calving (Table 4). There were no differences measured for 1st (P=0.12), 2nd (P=0.15), and 3rd (P=0.26) calving cycles, percent of non-pregnant cows (P=0.47), and the total calving percent calving (P=0.46). Since the cows in this study were calving on lush spring grass and the breeding season for these May-June calving cows did not begin until August 10 each year, grazing nutrition and environmental conditions supported high reproductive efficiency.

Wintering cost for the three wintering methods compared was markedly different (Table 5). Hay cost/cow for the C, CC&RES, and GRAS&RES was $172.51, $67.74, and $29.94/cow, respectively (P=0.0001). 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 wintering method in which cover crop grazing was integrated with corn and sunflower residues, the wintering cost was reduced by $68.22/cow. But when the wintering cost for C cows was compared to the GRAS&RES cows that grazed stockpiled brome and crested wheatgrass fields, the wintering cost/cow was $135.48 less. In other words, feeding harvested hay for the entire 134 day wintering period cost 2.8 times more than grazing stockpiled improved grasses and corn residue.

This greater margin of savings for grazing GRAS&RES compared to the CC&RES resulted from the combination of grazing established perennial improved grasses, longer grazing time, and fact that there was no cover crop establishment cost.

The results of this cow wintering research imply that wintering costs can be reduced when suitable forages, protein supplement, frost free water, fencing, and winter wind protection are available. The results also suggest that May-June calving cows can be fed lower quality forage for an extended period of time, when supplemental protein is fed, without negatively impacting rebreeding and calving performance.

Table 1. 7-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. Cow wintering treatment effect on grazing and drylot hay body weight and condition score change

	CC&RES[1]	GRAS&RES[1]	SEM[2]	P –Value[3]		
				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]	0.0001	0.84	0.0003
ADG, lb	0.25[a]	0.62[b]	0.19[c]	0.0001	0.40	0.0001
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]	0.0001	0.0001	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	0.0001	0.60	0.45
BCS Change	0.80	0.30	0.088	0.0001	0.69	0.0009

[1] **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)

Table 3. Combined grazing and drylot hay wintering treatment effect on body weight and condition score change

	C[1]	CC&RES[1]	GRAS&RES[1]	SEM[2]	P- Value[3]		
					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	0.0001	<0.0007	<0.0001
ADG, lb	1.53[a]	1.10[b]	0.84[c]	0.13	0.0002	0.23	<0.0001
BCS							
Start BCS	5.7	5.6	5.4	0.25	0.57	0.0008	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 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)

Table 4. Cow wintering treatment effect on calving cycle and total calving percent.

	C[1]	CC&RES[1]	GRAS&RES[1]	SEM[2]	P- Value[3]		
					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 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)

Table 5. Cow wintering treatment effect on feed intake and winter feeding system economics.

	C[1]	CC&RES[1]	GRAS&RES[1]	SEM[2]	P- Value[3]		
					Trt	Yr	Trt x Yr
Hay & Supplement (DM)							
Hay/Cow, lb	4724[a]	1824[b]	891[c]	44.33	<0.001	<0.0001	<0.0001
Hay/Cow/Day, lb	35.3	30.6	33.1	0.47	0.40	<0.0001	0.002
32% CP Suppl./Cow, lb	214	214	214				
32% CP Suppl./Cow/Day, lb	1.74	1.74	1.74				
Economics (Owned Land)							
Days Hay Fed	133.5	61	27				
Days Grazing	0	73	107				
Hay Cost/Cow, $	172.51[a]	67.74[b]	29.94[c]	1.62	0.0001	0.0001	0.0001
32% CP Suppl Cost/Cow, $	36.30	36.30	36.30				
Cover Crop Cost/Cow, $	-	36.55	-				
Property Tax, $	-		7.09				
Total Winter Feeding Cost/Cow, $	208.81[a]	140.59[b]	73.33[c]	1.9	<0.0001	<0.0001	<0.0008

[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, ($P \leq 0.05$)