Comparison of Four Beef-Forage Systems for March-Calving Cows Effect on Costs & Net Return in Minnesota

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Feed costs are the largest expense in the cow/calf production sector, representing 65-75% of the cost of raising a calf. In conventional production systems, grazing cheaper grass pasture is supplanted by more expensive winter feeding of harvested feedstuffs. In some areas, however, the cost of pasture grass has equaled or eclipsed the cost of winter feed. Alternative production systems such as dormant-season grazing, extending grazing season, and grazing cover crops have been studied for years. However, little information is available on a comparison of multiple grazing methods incorporated into a year-round system providing corresponding economic feasibility data. Thus, in this study, we are comparing three alternative beef-forage systems and a conventional system to determine effect on cow costs and net return.

The study was conducted in 2018 and 2019 on private Minnesota farms. Dedicated acreage was only used for the study. Three beef-forage systems were designed to incorporate forage grazing in summer, winter, or both; the fourth system is a reflection of what would be considered a conventional Minnesota cow/calf system (Table 1). A total of 35 Angus-based cows were used in each system. Mean body weight of cows was 1,325 lbs. Cows were bred for March calving in all systems by turning out one bull per system. Bulls were pulled after 75 days. No heifers were used.

Table 1. Forage systems descriptions for treatments tested in 2018 and 2019.

Beef-Forage System	System description
SYS 1	Year-round forage grazing
SYS 2	Summer grass pasture; fall, winter & spring forage grazing
SYS 3	Spring, summer, fall forage grazing; winter-harvested forage
SYS 4	Spring, summer, fall grass pasture, winter-harvested forage

A description of the application of each system is outlined in Table 2. The study was replicated in 2019 and all data were averaged. Specific agronomic information (seeding dates, rates, varieties, equipment, etc.) pertaining to the systems is not included here to conserve space, but is available upon request. Summer grazing of grass pasture was conducted by calculating forage availability based on recommended stocking rates. Pasture acreage was then adjusted to estimated forage availability. Harvested forages for winter feed included multiple roughage types from multiple sources. Harvested forages for winter feeding components were not entirely acquired from the operators own acreage.

Table 2. Field description, mean acres, feed description, mean forage yield (lbs DM/ac), grazing date in, grazing date out, and days of grazing for each beef-forage system in 2018-2019.

System	Field	Acres	Forage crop	Mean yield lb DM/ac	Grazing date in	Grazing date out	Days of grazing
SYS 1	1	15	Oats	3,000	JUN 1	JUL 20	49
SYS 1	2	15	Foxtail millet	6,800	JUL 21	NOV 1	103
SYS 1	1	15	Winter rye	1,500	NOV 2	NOV 25	23
SYS 1	3	25	Field corn	7,000	NOV 26	MAY 1	156
SYS 1	1	15	Winter rye	3,100	MAY 2	MAY 31	29
SYS 2		110	Grass pasture	1,300	MAY 15	OCT 15	153
SYS 2	1	15	Oats	3,000	OCT 16	NOV 25	40
SYS 2	2	25	Field corn	7,000	NOV 26	MAY 15	170
SYS 3	1	15	Oats	3,000	JUN 1	JUL 20	49
SYS 3	2	15	Foxtail millet	6,800	JUL 21	NOV 1	103
SYS 3	1	15	Winter rye	1,500	NOV 2	NOV 25	23
SYS 3			Winter feed	180,000	NOV 26	MAY 1	157
SYS 3	1	15	Winter rye	3,100	MAY 2	MAY 31	29
SYS 4		110	Grass pasture	1,300	MAY 15	OCT 15	153
SYS 4			Winter feed	210,000	OCT 16	MAY 14	210

Costs of establishment of seeded forages for grazing are included in Table 3. Grass pasture values were established as the mean value of Minnesota grass pasture according to the 2019 University of Minnesota Cow Calf Business Report. All winter feed roughages were according to market values at Sauk Centre, MN, regardless of source. Roughage values were combined into a single value to be used in the analysis.

Table 3. Mean costs of establishing and grazing different systems in 2018-2019.

Item	Oats	Foxtail millet	Winter rye	Field corn	Grass pasture	Winter feed
Seed, $/ac	$22.50	$7.00	$35.00	$105.00		
Fertilizer, $/ac	$18.00	$18.00	$22.00	$78.00	$7.91	
Herbicide, $/ac	$12.00	$12.00	$12.00	$43.00		
Tillage, $/ac	$7.50	$7.50	$7.50	$15.00		
Planting, $/ac	$12.25	$12.25	$12.25	$15.00		
Fertilizing, $/ac	$0	$0	$0	$12.00		
Spraying, $/ac	$5.75	$5.75	$5.75	$5.75		
Land cost, $/ac	$15.00	$30.00	$15.00	$30.00	$30.00	
Fencing, $/ac	$4.50	$5.25	$4.50	$4.50	$4.50	
Livestock water, $/ac	$2.75	$2.25	$2.25	$2.25	$2.25	
Winter roughage, $/ton						$90.00
Winter feed machine cost, $/ton						$12.50
Total cost, $/ac	$100.25	$100.00	$116.25	$310.50	$44.66	$102.50/ton

All calves were marketed at Tri-County Livestock in Motley, MN, in October of both years. A composite sale price was used in this analysis based on the actual sale prices of the calves to avoid skewing returns as a result of wildly different selling prices for calves basically the same size and weight. Costs and returns were calculated for each system and compared to determine the most effective beef-forage system of the four tested.

Outcomes. Feed costs were highest for SYS 4 (conventional system) and SYS 2, and lowest for SYS 1 and SYS 3 (Table 4). Total costs per cow were 11.5% lower for SYS 1 and SYS 3 compared to SYS 4. There was no significant difference in weaning weight between the systems and no differences in gross income.

Net income per head was calculated by subtracting total costs from gross income. SYS 3 had a 3.9%, 35.5%, and 47.5% higher return than SYS 1, SYS 2, and SYS 4, respectively. Additionally, return per acre for SYS 3 was 47.6%, 85.6%, and 87% higher than for SYS 1, SYS 4, and SYS 2, respectively. However, it is difficult to judge whether return per acre in the systems utilizing winter feeding is a relevant value as we had no way of incorporating acreage in purchased roughage.

Even though we are confident in the economic evaluation of the systems, results may seem skewed. Note, of the two poorest performing systems on a return-per-acre basis, one had a winter feeding harvested forage component and one did not. Similarly, of the higher performing systems, one had a winter feeding harvested forage component and one did not. Thus, more thought will need to be put into how to effectively address results before a final conclusion can be reached.

Table 4. Mean costs, weaning weight, sale price, gross income, and net income for four beef-forage systems analyzed in 2018-2019.

	SYS 1	SYS 2	SYS 3	SYS 4
Feed cost, $/cow	$357.43	$411.54	$354.21	$447.86
Non-feed operating and fixed costs[1], $/cow	$325.26	$325.26	$325.26	$325.26
Total cow cost, $/cow	$682.69	$736.80	$679.47	$773.12
Weaning weight, lb	537	531	540	538
Sale price[2], $/lb	$1.635	$1.635	$1.635	$1.635
Gross income, $/head	$878.00	$868.19	$882.90	$879.63
Net income, $/head	$195.31	$131.39	$203.43	$106.51
Net return[3], $/ac	$124.29	$30.65	$237.33	$33.88

[1]Mean non-feed operating and fixed costs per cow (Mousel, E.M. 2019. Minnesota Cow Calf Business Report. University of Minnesota Extension. St. Paul, MN).
[2]Composite sale price of all calves sold.
[3]Does not include harvested feedstuffs acreage for winter feeding program since they often are not from operator's acreage ; including acres in the calculation is nearly impossible.

Management Implications

- The two systems containing a component of grazing grass pasture performed the poorest on a return-per-acre basis, as would be expected. Grass pasture is generally not exceptionally productive on a per-acre basis, even when well-managed, compared to the intensification of tillable land for grazing forage production.
- Opportunities to intensify grazing forage production in beef systems will likely yield better profit results.