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Pasture and Forage Costs of Management Strategies for Range Cows with Calves during the Early Lactation Production Period

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Introduction

The beef production industry in the Northern Plains has a low profit margin. A logical response to this situation is the scientific evaluation of management-practice effectiveness in reducing production costs by reducing pasture and harvested-forage costs, which constitute the greatest portion of the total annual production costs for a beef cow and calf. Because the daily requirements for cows differ with production period, proper evaluation of management strategies requires two steps: evaluation of pasture and forage costs related to each production period and evaluation of the management strategies for livestock production periods as components within a complete 12-month pasture-forage management system. Achieving reductions in livestock production costs for range cows during the early lactation production period requires an understanding of the production costs of common traditional practices and the costs of readily available alternative management practices.

This study evaluated several pasture-forage management strategies to determine the pasture-forage costs for range cows during the early lactation production period. The pasture management strategy was native rangeland pastures used for repeated early season grazing. The harvested-forage management strategies were crested wheatgrass, forage barley hay, oat hay, pea forage hay, forage lentil hay, and oat-pea hay. The management strategy costs evaluated were pasture or land rent values per acre, production costs per acre, costs per unit of forage dry matter, costs per unit of nutrient, land area per animal unit, and forage feed costs per day, per month, or per production period.

Procedure

This study was conducted at the NDSU Dickinson Research Extension Center, located in western North Dakota. Pasture-forage costs were evaluated from data collected on projects conducted between 1983 and 1999. Native rangeland herbage weight data were collected from ungrazed plots. Forage dry matter yield per acre and percent crude protein data for perennial domesticated grass hay and annual cereal and annual legume hays were taken from a previous study (Manske and Carr 2000). Pasture rent value of $8.76 per acre for native rangeland pasture, land rent value of $22.07 per acre for cropland, and land rent value of $14.22 per acre for domesticated grass hayland were used in the determination of production costs for forage types. Range cow daily nutritional requirements, which change with cow size, level of milk production, and production period, were taken from NRC (1996).

Pasture and forage costs of feed to meet livestock dry matter and crude protein requirements were determined during this study. Production costs per acre were determined by adding average land rent per acre, custom farm work rates, seed costs per acre, and baling costs at per half ton rates. Costs per ton of forage dry matter (DM) were determined by dividing production costs per acre by pounds of forage dry matter yield per acre and multiplying the quotient by 2000 pounds. Costs per pound of crude protein (CP) were determined in two stages: first, pounds of forage dry matter per acre were multiplied by percentage of forage crude protein to derive pounds of crude protein per acre; then, production costs per acre were divided by pounds of crude protein per acre. Pasture land area per animal unit per month was determined in two stages: first, pounds of forage dry matter per acre were divided by pounds of forage dry matter required per animal unit per day to derive number of grazing days per acre; then, the average number of days per month was divided by the number of grazing days per acre. Harvested-forage land area per animal unit per month or per production period was determined in two stages: first, pounds of crude protein required per animal per day during a production period were divided by percentage of crude protein of forage type to derive pounds of forage dry matter to provide as feed per animal unit per day; then, pounds of forage dry matter to feed per day were divided by pounds of forage dry matter per acre, and the quotient was multiplied by 30 days per month, 30.5 days per month, or the number of days per production period. Forage feed costs per animal per day, per month, or per production period were determined in three stages: first, production costs per acre were divided by pounds of forage dry matter per acre, and that quotient was divided by percentage of forage crude protein to derive cost per pound of crude protein; next, the cost per pound of crude protein was multiplied by pounds of crude protein required per animal per day during a production period; then, the feed costs per day were multiplied by 30 days per month, 30.5 days per month, or the number of days per production period.

Treatments

Native rangeland pastures were used for repeated early season grazing and had no grazing during the remainder of the growing season. Harvested forages were cut by swathing and were then rolled into large round bales. Mature crested wheatgrass hay was cut at a mature plant stage. Early crested wheatgrass hay was cut at the boot stage. Forage barley hay was cut both at the milk stage and at the hard dough stage. Oat hay was cut both at the milk stage and at the hard dough stage. Pea forage hay was cut at both early and late plant stages. Forage lentil hay was cut at both early and late plant stages. Oat-pea forage was cut for hay.

Results

Costs of forage dry matter and crude protein (tables 1, 2, and 3) to meet the requirements of a 1200-pound range cow during the early lactation production period were determined. The cow required a daily intake of 27 lbs dry matter (DM) at 10.1% crude protein (CP) (2.7 lbs CP/day).

During early spring, forage on native range pasture has a crude protein content of around 9.2%. Early spring native range forage has production costs of $8.76 per acre, forage dry matter costs of $140.16 per ton, and crude protein costs of $0.76 per pound. A cow grazing during the early lactation period requires 7.20 acres of native range pasture per month, at a cost of $2.10 per day, or $63.07 per month. The crude protein content of early spring native range forage is below the requirements of a cow during early lactation, and crude protein would need to be supplemented at 0.25 lbs per cow per day, or 7.5 lbs per cow per month.

Crested wheatgrass cut late, at a mature plant stage, has a crude protein content of around 6.4%. This low-quality hay has production costs of $28.11 per acre, forage dry matter costs of $34.80 per ton, and crude protein costs of $0.28 per pound. This late-cut hay would need to be fed at 42.2 lbs DM/day to provide 2.7 lbs CP/day. The nutrient content of mature crested wheatgrass hay is below the dietary requirements of a cow during early lactation. An additional 1.00 lb of crude protein per day would need to be provided when mature crested wheatgrass hay is fed at the dry matter requirement. Production of mature crested wheatgrass hay to feed a cow during early lactation requires 0.80 acres per month and costs $0.75 per day, or $22.48 per month.

Crested wheatgrass hay cut early, at the boot stage, has a crude protein content of around 14.5%. This high-quality hay has production costs of $26.50 per acre, forage dry matter costs of $40.80 per ton, and crude protein costs of $0.14 per pound. This early cut hay would be fed at 18.8 lbs DM/day to provide 2.7 lbs CP/day. An additional 8.2 lbs of roughage per day would need to be provided. Production of early cut crested wheatgrass hay to feed a cow during early lactation requires 0.43 acres per month and costs $0.38 per day, or $11.51 per month.

Forage barley hay cut early, at the milk stage, has a crude protein content of 13.0%. This forage barley hay has production costs of $68.21 per acre, forage dry matter costs of $28.80 per ton, and crude protein costs of $0.11 per pound. Early cut forage barley hay would be fed at 21.0 lbs DM/day to provide 2.7 lbs CP/day. An additional 6.0 lbs of roughage per day would need to be provided. Production of early cut forage barley hay to feed a cow during early lactation requires 0.13 acres per month and costs $0.30 per day, or $9.08 per month.

Forage barley hay cut late, at the hard dough stage, has a crude protein content of 9.2%. This forage barley hay has production costs of $70.35 per acre, forage dry matter costs of $27.40 per ton, and crude protein costs of $0.15 per pound. Late-cut forage barley hay would be fed at 29.7 lbs DM/day to provide 2.7 lbs CP/day. An additional 0.25 lbs of crude protein per day would need to be provided when late-cut forage barley is fed at the dry matter requirement. Production of late-cut forage barley hay to feed a cow during early lactation requires 0.17 acres per month and costs $0.41 per day, or $12.20 per month.

Oat hay cut early, at the milk stage, has a crude protein content of 11.5%. This oat hay has production costs of $69.17 per acre, forage dry matter costs of $29.60 per ton, and crude protein costs of $0.13 per pound. Early cut oat hay would be fed at 23.7 lbs DM/day to provide 2.7 lbs CP/day. An additional 3.3 lbs of roughage per day would need to be provided. Production of early cut oat hay to feed a cow during early lactation requires 0.15 acres per month and costs $0.35 per day, or $10.56 per month.

Oat hay cut late, at the hard dough stage, has a crude protein content of 7.8%. This oat hay has production costs of $74.53 per acre, forage dry matter costs of $26.40 per ton, and crude protein costs of $0.17 per pound. Late-cut oat hay would be fed at 35 lbs DM/day to provide 2.7 lbs CP/day. An additional 0.62 lbs of crude protein per day would need to be provided when late cut oat hay is fed at the dry matter requirements. Production of late-cut oat hay to feed a cow during early lactation requires 0.19 acres per month and costs $0.46 per day, or $13.81 per month.

Pea forage hay cut at an early plant stage has a crude protein content of 18.9%. This pea hay has production costs of $79.96 per acre, forage dry matter costs of $55.00 per ton, and crude protein costs of $0.15 per pound. Early cut pea forage hay would be fed at 14.4 lbs DM/day to provide 2.7 lbs CP/day. An additional 12.6 lbs of roughage per day would need to be provided. Production of early-cut pea forage hay to feed a cow during early lactation requires 0.15 acres per month and costs $0.41 per day, or $12.37 per month.

Pea forage hay cut at a late plant stage has a crude protein content of 14.4%. This pea hay has production costs of $86.87 per acre, forage dry matter costs of $37.40 per ton, and crude protein costs of $0.13 per pound. Late-cut pea forage hay would be fed at 19.0 lbs DM/day to provide 2.7 lbs CP/day. An additional 8.0 lbs of roughage per day would need to be provided. Production of late-cut pea forage hay to feed a cow during early lactation requires 0.12 acres per month and costs $0.35 per day, or $10.63 per month.

Forage lentil hay cut at an early plant stage has a crude protein content of 21.8%. This lentil hay has production costs of $59.69 per acre, forage dry matter costs of $71.60 per ton, and crude protein costs of $0.17 per pound. Early cut lentil hay would be fed at 12.5 lbs DM/day to provide 2.7 lbs CP/day. An additional 14.5 lbs of roughage per day would need to be provided. Production of early cut forage lentil hay to feed a cow during early lactation requires 0.23 acres per month and costs $0.45 per day, or $13.45 per month.

Forage lentil hay cut at a late plant stage has a crude protein content of 14.7%. This lentil hay has production costs of $71.48 per acre, forage dry matter costs of $37.00 per ton, and crude protein costs of $0.13 per pound. Late-cut lentil hay would be fed at 18.6 lbs DM/day to provide 2.7 lbs CP/day. An additional 8.4 lbs of roughage per day would need to be provided. Production of late-cut forage lentil hay to feed a cow during early lactation requires 0.14 acres per month and costs $0.34 per day, or $10.30 per month.

Oat-pea forage hay has a crude protein content of 12.5%. This oat-pea hay has production costs of $95.52 per acre, forage dry matter costs of $37.20 per ton, and crude protein costs of $0.15 per pound. Oat-pea hay would be fed at 21.8 lbs DM/day to provide 2.7 lbs CP/day. An additional 5.2 lbs of roughage per day would need to be provided. Production of oat-pea hay to feed a cow during early lactation requires 0.13 acres per month and costs $0.41 per day, or $12.17 per month.

Pasture-Forage Costs

Pasture and forage costs of pasture and harvested-forage management strategies for range cows during the early lactation production period are shown in table 4.

Production costs per acre for harvested forages were greater than pasture rent per acre. Production costs per acre for annual cereal and annual legume hays were considerably greater than those for perennial grass hay. Harvested forages cut late have greater production costs per acre than the same forage type cut early because the greater dry matter yield of the late-cut forages results in increased baling costs. The relationships of forage production costs among pastures, perennial hays, and annual hays are often interpreted to indicate that feeding livestock annual cereal and annual legume hays is more expensive than feeding livestock perennial grass hay, which in turn is more expensive than grazing livestock on perennial grass pasture. This interpretation of pasture-forage production costs per acre has been the basis for numerous management strategies for range cows during the early lactation production period. However, neither production costs per acre nor pasture rent per acre accurately reflects livestock production costs because forage dry matter weight per acre and nutrient weight per acre captured through grazing or haying vary with forage type and plant growth stage, and the variations are not proportional to these per acre costs.

The costs per unit of forage dry matter reflect the relationships between the pasture rent per acre or production costs per acre and the amount of dry matter consumed by grazing livestock or cut for hay. Cost of harvested forage per unit of weight is commonly used to compare different forage types, but cost of pasture forage dry matter livestock consume by grazing is generally not considered by livestock producers when they compare costs of management strategies. The dry matter costs for early spring forage on native range pastures were very high ($140.16/ton) and were greater than the dry matter costs for perennial grass hays ($34.80 and $40.80/ton) and annual cereal ($26.40 to $29.60/ton) and annual legume ($37.00 to $71.60/ton) hays. Forage dry matter costs per ton were greater for harvested forages cut early than for the same forage type cut late because the production costs per acre were shared by fewer pounds of forage dry matter yield for the early cut forages. Forage dry matter costs per unit of weight do not accurately reflect livestock production costs because of the variable quantity of nutrients contained within the dry matter and the resulting differences in the amount of dry matter needed to provide adequate quantities of nutrients for livestock.

Cost per unit of nutrient is an important indicator of livestock pasture-forage costs. Nutrient cost per unit of weight is related to the forage dry matter cost and the quantity of nutrients per unit of forage weight. The crude protein costs ($0.76/lb) on early spring native range pastures were very high and were considerably greater than the crude protein costs per pound for harvested forages. Crude protein costs for early cut perennial grass hay ($0.14/lb) and annual cereal hays ($0.11 and $0.13/lb) were lower than crude protein costs for the same forage types cut late ($0.28, $0.15 and $0.17/lb, respectively). Crude protein costs for late-cut annual legume hays ($0.13 and $0.13/lb) were lower than crude protein costs for the same forage types cut early ($0.15 and $0.17/lb). High-quality forages have lower costs per unit of nutrient than low-quality forages at the same cost per unit of dry matter. Even high-quality forages with a higher cost per unit of dry matter may actually be less costly feed because less of the high-quality forage is needed to meet the nutritional requirements of the livestock. Crude protein content of early spring native range pastures, mature crested wheatgrass hay, late-cut forage barley hay, and late-cut oat hay was below the requirements of cows during the early lactation production period.

Land area per animal unit has not been traditionally recognized as an important factor in beef production costs. On early spring native range pastures, land area per month required to provide forage for a cow during the early lactation production period was high (7.2 acres).

Land area required to produce one month of forage for a cow during early lactation ranged between 0.12 and 0.80 acres for harvested forages: production of crested wheatgrass hay cut at a mature plant stage required the larger land area, and production of pea forage cut late required the smaller land area. Costs of the land area required to provide adequate quantities of forage for a cow contribute substantially to total production costs. The greater the amount of the produced nutrients captured from a land base, the smaller the land area required by an animal unit and the lower the production costs.

Livestock forage feed costs on native range pastures with repeated early season grazing were high ($2.10/day and $63.07/month) because the forage quantity and quality were low. Feed costs per day and per month for early cut crested wheatgrass hay ($0.38/day and $11.51/month) were about half the feed costs for mature-cut crested wheatgrass hay ($0.75/day and $22.48/month). The feed costs for annual cereal and annual legume hays were less than $0.46 per day and $14.00 per month. The feed costs for early cut annual cereal hays ($0.30 and $0.35/day) were lower than the feed costs for late-cut annual cereal hays ($0.41 and $0.46/day). The feed costs for late-cut annual legume hays ($0.34 and $0.35/day) were lower than the feed costs for early cut annual legume hays ($0.41 and $0.45/day). The feed costs for oat-pea hay ($0.41/day) were similar to those for late-cut annual cereal hays and early cut legume hays.

Perennial grass hays yield greater pounds of crude protein per acre when harvested during early developmental stages, around the boot stage to the flowering stage. Annual cereal hays yield greater pounds of crude protein per acre when harvested during early developmental stages, around the flowering stage to late milk stage. Annual legume hays generally yield greater pounds of crude protein per acre when harvested during the middle and late stages of development. Cereal-legume mixed hays have generally not produced greater quantities of forage dry matter or pounds of crude protein per acre than have annual cereals or annual legumes seeded separately, because of the differences in optimum harvest times for annual cereals and annual legumes. Cutting forage hays at their optimum harvest times reduces livestock feed costs per day and per month because the cost per pound of crude protein is lower when greater pounds of crude protein per acre are captured during harvest. The pasture-forage management strategies with livestock forage feed costs at $0.35 or lower per day and lower than $11.00 per month were forage barley cut at the milk stage, oat hay cut at the milk stage, pea forage cut at the late stage, and forage lentil cut at the late stage. Forage barley cut at the milk stage had the lowest feed costs for range cows during the early lactation production period.

Discussion

Grazing native rangeland during early spring is a commonly accepted practice because of the assumed reduction in the costs of the harvested forage fed to livestock. However, costs of forage dry matter and crude protein on native rangeland during early spring are greater than the costs of most harvested forages, and early spring grazing can degrade grassland ecosystems by removing leaf area that the grass plant depends on to provide nourishment for healthy spring growth.

The cost of grazing native rangeland during early spring is high because the weight of the herbage on early spring pastures is only about one third of the mid summer herbage weight and livestock grazing native rangeland therefore require about three times the number of acres per month in the early spring that they do during the summer. The nutritional quality of early spring herbage is increasing but still below the crude protein requirements of early lactating cows, and supplementation is needed.

Cool-season grasses initiate lead tiller growth during late summer and early fall and resume active growth the next spring. Spring growth of cool-season grass leaves depends both on carbohydrate reserves and on photosynthetic products from the portions of fall-initiated tiller leaves that have overwintered and regreened. Spring growth of warm-season grass leaves depends initially on carbohydrate reserves and later both on carbohydrate reserves and on photosynthetic product from young leaves.

Grass plant growth and development depend on adequate carbohydrate reserves in early spring because the amount of photosynthetic product synthesized by early growing leaves is insufficient to meet the requirements for leaf growth. Grass growth also requires that the plant have adequate leaf area to provide photosynthetic product for early growing leaves. The total nonstructural carbohydrates of a grass plant are at low levels following the reduction of reserves during the winter respiration period. The quantity of reserve carbohydrates remaining in the roots and stems during early spring may not be adequate to support root growth and leaf growth until sufficient leaf area is produced to provide the photosynthetic assimilates required for plant growth and other processes. Removal of aboveground material deprives plants of foliage needed for photosynthesis and increases the demand upon already low levels of carbohydrate reserves when sequential leaves grow.

The quantity of herbage produced by a grass plant after it has been grazed is dependent on the levels of carbohydrates remaining in the plant after defoliation. Grass plants are not physiologically ready to withstand defoliation until after they have reached the third-leaf stage. Defoliation of the tiller when the plant is low in carbohydrates, before the third-leaf stage, results in reduced rates of herbage production and reduced peak herbage biomass production later in the year. Starting spring grazing on native range in early May results in a loss of 75% of the potential herbage, and starting grazing in mid May results in a loss of 45% to 60% of the potential herbage (Manske 2000). Reductions in the amount of herbage produced lead to reductions in stocking rate, calf average daily gain, calf gain per acre, net returns per cow-calf pair, and net returns per acre. Delaying grazing until early June, after cool-season grasses have arrived at the third-leaf stage, results in improved herbage production and livestock performance that produce greater economic returns for the cow-calf operation.

Feeding low-cost harvested forages is an economically and ecologically sound alternative to grazing livestock on early spring native range pasture. Harvested forages are usually viewed as expensive feeds because the production costs per acre are greater than pasture rent per acre and a high percentage of the harvested-forage production costs consist of labor and equipment costs. Some harvested forages are expensive, but not all harvested forages are high-cost feeds. Harvested forages cut at plant stages that yield great amounts of dry matter and low amounts of crude protein per acre have high costs per unit of nutrient and are generally expensive forages that increase livestock production costs. However, harvested forages cut at plant stages that yield greater amounts of crude protein per acre have lower costs per unit of nutrient and are relatively low-cost forages that help reduce livestock production costs. Early crested wheatgrass, early forage barley, early oat hay, late pea forage, late forage lentil, and oat-pea hay have crude protein costs below $0.25/lb and feed costs below $0.62/day. Use of these forages should help reduce livestock production costs so that profit margins are positive even when calves are sold at $0.70/lb.

Conclusion

The traditional pasture-forage management strategies used in the Northern Plains were developed during the era of low-performance livestock. During the past several decades the type of livestock in the region has shifted to a fast-growing, high-performance animal, but pasture-forage management strategies have not been adjusted to take full advantage of the livestock's genetic potential. The use of slightly modified low-performance pasture-forage management strategies with high-performance livestock results in calves with weaning weights below potential and in high annual expenses for cow maintenance.

Attempts to produce high-performance livestock by using traditional low-performance management strategies have resulted in high production costs and low profit margins. Evaluation of production costs and profit margins from total cash expenses and cash receipts or from the information included on income tax and bank loan forms may be adequate to determine the financial status of a livestock operation, but these financial records do not provide adequate information for the evaluation of the effectiveness of specific pasture-forage management strategies. Traditional comparisons of pasture or land rent values, forage production costs per acre, and forage dry matter bulk weight costs do not accurately reflect livestock production costs and the effectiveness of pasture-forage management strategies.

High-performance pasture-forage management strategies combine pasture and forage types so that herbage production curves and nutritional quality curves coordinate with the twelve-month dietary quantity and quality requirement curves of cow production periods. Such management strategies meet the nutritional requirements of livestock during the entire year at low costs per unit of saleable product. Evaluation of the effectiveness of management strategies in reducing livestock production costs can be accomplished through comparisons of costs per unit of nutrient; land area per animal unit; forage feed costs per day, per month, or per production period; and costs per pound of calf weight gain. Implementation of high-performance pasture-forage management strategies will result in improved livestock weight performance, reduced livestock production costs, and increased profit margins.

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Table 1. Pasture-forage costs of pasture and perennial grass harvested-forage management strategies for range cows during the early lactation production period.				
		Native Rangeland Pasture	**Crested Wheatgrass Hay**	**Crested Wheatgrass Hay**
Growth Stage		**Early Spring**	**Mature**	**Boot stage**
Herbage Weight	lb/ac	480	-	-
Forage DM Weight	lb/ac	125	1600	1300
Costs/Acre				
Land Rent	$	8.76	14.22	14.22
Custom Work	$	-	5.31	5.31
Seed Cost	$	-	-	-
Baling Costs	$	-	8.58	6.97
Production Costs	$/ac	8.76	28.11	26.50
Forage DM Costs	$/ton	140.16	34.80	40.80
Land Area/Month	ac	7.20	0.80	0.43
Land Cost/Month	$/month	63.07	11.57	6.17
Feed Costs/Day	$/day	2.10	0.75	0.38
Feed Costs/Month	$/month	63.07	22.48	11.51
Crude Protein	%	9.2	6.4	14.5
Crude Protein Yield	lb/ac	11.50	102	189
Crude Protein Cost	$/lb	0.76	0.28	0.14

Table 2. Forage costs of annual cereal management strategies for range cows during the early lactation production period.					
		Forage Barley Hay	**Forage Barley Hay**	**Oat Hay**	**Oat Hay**
Growth Stage		**Milk**	**Hard Dough**	**Milk**	**Hard Dough**

Herbage Weight	lb/ac				
Forage DM Weight	lb/ac	4733	5133	4667	5667
Costs/Acre					
Land Rent	$	22.07	22.07	22.07	22.07
Custom Work	$	16.08	16.08	16.08	16.08
Seed Cost	$	4.69	4.69	6.00	6.00
Baling Costs	$	25.37	27.51	25.02	30.38
Production Costs	$/ac	68.21	70.35	69.17	74.53
Forage DM Costs	$/ton	28.80	27.40	29.60	26.40
Land Area/Month	ac	0.13	0.17	0.15	0.19
Land Costs/Month	$/month	2.87	3.83	3.37	4.08
Feed Costs/Day	$/day	0.30	0.41	0.35	0.46
Feed Costs/Month	$/month	9.08	12.20	10.56	13.81
Crude Protein	%	13.0	9.2	11.5	7.8
Crude Protein Yield	lb/ac	606	468	535	435
Crude Protein Cost	$/lb	0.11	0.15	0.13	0.17

Table 3. Forage costs of annual legume management strategies for range cows during the early lactation production period.

		Pea Forage Hay	**Pea Forage Hay**	**Forage Lentil Hay**	**Forage Lentil Hay**	**Oat-Pea Hay**
Growth Stage		**Early**	**Late**	**Early**	**Late**	
Herbage Weight	lb/ac					
Forage DM Weight	lb/ac	2800	4650	1667	3867	5143
Costs/Acre						
Land Rent	$	22.07	22.07	22.07	22.07	22.07
Custom Work	$	16.08	16.08	16.08	16.08	16.08
Seed Cost	$	23.80	23.80	12.60	12.60	29.80

Baling Costs	$	15.01	24.92	8.94	20.73	27.57
Production Costs	$/ac	79.96	86.87	59.69	71.48	95.52
Forage DM Costs	$/ton	55.00	37.40	71.60	37.00	37.20
Land Area/Month	ac	0.15	0.12	0.23	0.14	0.13
Land Cost/Month	$/month	3.42	2.65	4.97	3.18	2.81
Feed Costs/Day	$/day	0.41	0.35	0.45	0.34	0.41
Feed Costs/Month	$/month	12.37	10.63	13.45	10.30	12.17
Crude Protein	%	18.9	14.4	21.8	14.7	12.5
Crude Protein Yield	lb/ac	526	685	361	567	611
Crude Protein Cost	$/lb	0.15	0.13	0.17	0.13	0.15

Table 4. Pasture and forage costs of pasture and harvested-forage management strategies for range cows during the early lactation production period.

	Production Costs	Forage Dry Matter Costs	Crude Protein Costs	Land Area per month	Feed Costs per day	Feed Costs per month
	$/ac	**$/ton**	**$/lb**	**ac**	**$**	**$**
Native Rangeland Reserve Pasture	8.76	140.16	0.76	7.20	2.10	63.07
Crested Wheatgrass Mature Hay	28.11	34.80	0.28	0.80	0.75	22.48
Crested Wheatgrass Early Hay	26.50	40.80	0.14	0.43	0.38	11.51
Forage Barley Milk Stage Hay	68.21	28.80	0.11	0.13	0.30	9.08
Forage Barley						

Hard Dough Stage Hay	70.35	27.40	0.15	0.17	0.41	12.20
Oat Milk Stage Hay	69.17	29.60	0.13	0.15	0.35	10.56
Oat Hard Dough Stage Hay	74.35	26.40	0.17	0.19	0.46	13.81
Pea Forage Early Stage Hay	79.96	55.00	0.15	0.15	0.41	12.37
Pea Forage Late Stage hay	86.87	37.40	0.13	0.12	0.35	10.63
Forage Lentil Early Stage Hay	59.69	71.60	0.17	0.23	0.45	13.45
Forage Lentil Late Stage Hay	71.48	37.00	0.13	0.14	0.34	10.30
Oat-Pea Hay	95.52	37.20	0.15	0.13	0.41	12.17