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Pasture-Forage Costs-Returns of Management Strategies for Lactating Range Cows with Calves during Mid October to Mid November

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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 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 late lactation production period requires an understanding of the production costs of common traditional practices and the costs of alternative management practices.

Selection of a low-cost management practice for the late lactation period during fall generates considerable confusion. This production period occurs during the transition between summer grazing and winter feeding practices, and whether to graze longer or to start feeding harvested forages early is a difficult decision.

This study evaluated several pasture-forage management strategies to determine the pasture-forage costs and returns for lactating beef cows with calves during mid October to mid November. The pasture management strategies were 4.5-month seasonlong, 5.0-6.0-month seasonlong, 6.0-month seasonlong, 4.0-month deferred, Altai wildrye, and cropland aftermath. The harvested-forage management strategies were mature crested wheatgrass, early crested wheatgrass, and forage barley hay. The management strategy costs evaluated

were pasture or land rent values per acre; production costs per acre; costs per unit of dry matter; costs per unit of nutrient; land area per animal unit; forage feed costs per day, per month, or per production period; and cost per pound of calf weight gain.

Procedure

This study was conducted at the NDSU Dickinson Research Extension Center, located in western North Dakota. Pasture-forage costs and returns were evaluated from cow and calf weight performance data collected on seven grazing management treatments involved in pasture research projects conducted between 1983 and 1998 and from forage production data collected on three harvested-forage types between 1995 and 1999. The livestock weight data used in this study were collected from grazing treatments researched during two periods, 1983 to 1985 and 1993 to 1998. These two data sets were treated separately. The research data collected during severe water stress or drought periods were not included in this study.

Commercial Hereford and Angus-Hereford cows with Charolais-sired calves were allocated to grazing treatments each spring. Individual animals were weighed on and off each treatment and at biweekly or monthly intervals during the grazing season. The livestock weight data collected on the grazing treatments between mid October and mid November were used to determine cow and calf weight performance. Range cow daily nutritional requirements, which change with cow size, level of milk production, and production period, were taken from NRC (1996). An assumed price of $0.70 per pound was used to determine the economic value of calf accumulated weight.

Forage costs for three harvested-forage types used as feed for lactating cows during mid October to mid November were evaluated. Forage dry matter yield per acre and percent crude protein data for perennial domesticated grass hay and annual cereal hay were taken from a previous study (Manske and Carr 2000).

Pasture rent value of $8.76 per acre was used to determine costs for native rangeland and domesticated grass pastures. Pasture rent value for cropland aftermath is not reported with other North Dakota agricultural information, and placing a value per acre on this forage source is problematic. Grazing on cropland aftermath is not without cost even if the costs are charged to the harvested crop. The value of $2.00 per acre was used for cropland aftermath grazing costs in this report. Land rent values of $22.07 per acre for cropland and $14.22 per acre for domesticated grass hayland were used in the determination of forage production costs for the harvested forages.

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. Costs per pound of calf weight gain were determined in two stages: first, accumulated calf weight gain was determined by subtracting calf live weight at the beginning of a growth period from calf live weight at the end of a growth period; then, total pasture costs or forage production costs for a calf growth period were divided by the accumulated calf weight for the growth period.

Grazing Treatments, 1983-1985

The 4.5-month seasonlong (4.5 M SL) management strategy grazed one native range pasture from mid June until late October at an average stocking rate of 3.26 acres per cow-calf pair per month. The 5.0-6.0-month seasonlong (5.0-6.0 M SL) management strategies grazed one native range pasture from between mid May and mid June until mid November at stocking rates between 2.23 acres and 4.04 acres, with an average of 2.53 acres per cow-calf pair per month. The deferred (Def) management strategy grazed one native range pasture from mid July until mid November at an average stocking rate of 2.22 acres per cow-calf pair per month. The Altai wildrye (AWR) management strategy was the complementary domesticated grass fall pasture associated with the twice-over rotation system. The Altai wildrye pastures were grazed from mid October until mid November at an average stocking rate of 1.55 acres per cow-calf pair per month.

Grazing Treatments, 1993-1998

The 6.0-month seasonlong (6.0 M SL) management strategy grazed one native range pasture from mid May until mid November at an average stocking rate of 2.01 acres per cow-calf pair per month. The Altai wildrye (AWR) management strategy pastures were grazed by cattle coming off the twice-over rotation system. These pastures were grazed from mid October until mid November at an average stocking rate of 1.39 acres per cow-calf pair per month. The cropland aftermath (CA) management strategy was the fall pasture type associated with the 4.5-month seasonlong treatment grazed from early June until mid October. The crop aftermath consisted primarily of annual cereal residue of oats, barley, and/or chopped corn stubble. Crop aftermath pastures were grazed from mid October until mid November at an average stocking rate of 6.63 acres per cow-calf pair per month.

Harvested Forages, 1995-1999

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 at the milk stage.

Results

Pasture-forage costs and returns of pasture management strategies between mid October and mid November are shown in tables 1 and 2. Costs per pound of accumulated calf weight are shown in tables 1 and 2.

4.5-Month Seasonlong

Lactating cows that grazed on the 4.5-month seasonlong treatment for 15 days between mid and late October lost 0.52 pounds per day and lost 2.76 pounds per acre. Calf weight gain was 1.35 pounds per day and 6.17 pounds per acre; accumulated weight gain was 20.33 pounds. Each cow-calf pair was allotted an average of 3.26 acres per month, at a cost of $0.95 per day, $28.56 per month, or $14.28 for the 15 days of late October. When calf accumulated weight was assumed to have a value of $0.70/lb, the gross return was $14.23 per calf, and the net returns after pasture costs were a loss of $0.05 per cow-calf pair and a loss of $4.44 per acre. Each accumulated pound of calf weight cost $0.70 on the 4.5-month seasonlong strategy during mid to late October.

5.0-6.0-Month Seasonlong

Lactating cows that grazed native rangeland on the 5.0-6.0-month seasonlong strategies for 30 days between mid October and mid November lost 0.82 pounds to 2.65 pounds per day and lost 9.77 pounds to 39.50 pounds per acre. Calf weight gain ranged from 0.59 pounds to 0.92 pounds per day and from 8.82 pounds to 10.90 pounds per acre; accumulated weight gain ranged from 17.73 pounds to 27.60 pounds. Each cow-calf pair was allotted from 2.01 acres to 2.53 acres per month, at a cost of $0.59 to $0.74 per day, or $17.61 to $22.16 per month. When calf accumulated weight was assumed to have a value of $0.70/lb, the gross return was $12.41 to $19.32 per calf, and the net returns after pasture costs were a loss of $2.84 to $5.20 per cow-calf pair and a loss of $1.13 to $2.59 per acre. The cost of each accumulated pound of calf weight ranged from $0.80 to $0.99 on the 5.0-6.0-month seasonlong strategies during mid October to mid November.

4.0-Month Deferred

Lactating cows that grazed on the 4.0-month deferred strategy for 30 days between mid October and mid November lost 0.74 pounds per day and lost 9.96 pounds per acre. Calf weight gain was 0.77 pounds per day and 10.36 pounds per acre; accumulated weight gain was 23.10 pounds. Each cow-calf pair was allotted 2.22 acres per month, at a cost of $0.65 per day or $19.53 per month. When calf accumulated weight was assumed to have a value of $0.70/lb, the gross return was $16.77 per calf, and the net returns after pasture costs were a loss of $3.36 per cow-calf pair and a loss of $1.51 per acre. Each accumulated pound of calf weight cost $0.85 on the 4.0-month deferred management strategy during mid October to mid November.

Native Rangeland

The cost of grazing native rangeland during the fall is considerably higher than the cost of grazing native rangeland during the summer. The

weight of the herbage on fall pastures is only about 40% to 60% of the mid summer herbage weight on grasslands that have had no grazing all growing season. The number of acres required to provide sufficient dry matter for each cow-calf pair during the fall is about double the number required during the summer: on grasslands where 2.18 acres per month are required by an animal unit during the summer, 4.40 acres per month will be required during the fall. When the rent value per acre is the same for both summer and fall pastures, the cost per ton of dry matter nearly doubles and the cost per pound of crude protein quadruples on each acre of grassland grazed during the fall. On fall-grazed native range pasture with rent at $8.76 per acre, the forage portion of the herbage dry matter available for livestock intake costs $80.37 and $97.33 per ton during early and late fall, respectively. The forage dry matter available for livestock intake costs $48.26 per ton on summer-grazed native range pastures. During July, native rangeland has about 9.6% crude protein, at a cost of $0.25 per pound of forage crude protein. The nutritional quality of mature herbage during fall is about 4.8% crude protein. The forage portion of the crude protein available for livestock intake costs $0.34 and $1.01 per pound during early and late fall, respectively. About 1.2 pounds of additional crude protein per day need to be supplemented for each lactating cow grazing native range during the fall.

Altai Wildrye

Lactating cows that grazed Altai wildrye pastures between mid October and mid November gained 0.22 pounds to 1.57 pounds per day and 4.69 pounds to 30.27 pounds per acre. Calf weight gain ranged from 1.24 pounds to 1.80 pounds per day and from 26.76 pounds to 34.79 pounds per acre; accumulated weight gain ranged from 37.20 pounds to 53.92 pounds. Each cow-calf pair was allotted from 1.39 acres to 1.55 acres per month, at a cost of $0.41 to $0.45 per day, or $12.18 to $13.58 per month. When calf accumulated weight was assumed to have a value of $0.70/lb, the gross return ranged from $26.04 to $37.74 per calf, and the net returns after pasture costs ranged from $13.86 to $24.16 per cow-calf pair and from $9.97 to $15.59 per acre. The cost of each accumulated pound of calf weight ranged from $0.25 to $0.33 on the Altai wildrye pasture treatments during mid October to mid November.

Altai wildrye pastures have an average rent value of $8.76 per acre. The land area required to provide adequate herbage for a cow and calf for 30 days was from 1.39 acres to 1.55 acres. The forage portion of the herbage dry matter available for livestock intake cost $25.37 to $28.29 per ton, with an average of $26.83 per ton, and the forage portion of the crude protein available for livestock intake cost $0.13 to $0.15 per pound, with an average of $0.14 per pound.

Cropland Aftermath

Lactating cows that grazed cropland aftermath of annual cereal residue between mid October and mid November lost 1.26 pounds per day and lost 7.27 pounds per acre. Calf weight gain was 0.42 pounds per day and 1.90 pounds per acre; accumulated weight gain was 12.57 pounds. Each cow-calf pair was allotted 6.63 acres per month; when the value of crop aftermath was assessed at $2.00 per acre, the cost was $0.44 per day, or $13.26 per month. When calf accumulated weight was assumed to have a value of $0.70/lb, the gross return was $8.80 per calf, and the net returns after pasture costs were a loss of $4.46 per cow-calf pair and a loss of $0.67 per acre. Each accumulated pound of calf weight cost $1.05 on cropland aftermath during mid October to mid November.

Harvested-Forage Hay

Forage costs of harvested-forage management strategies between mid October and mid November are shown in table 3.

Forage costs for a 1200-pound lactating cow that required a daily intake of 27 lbs dry matter (DM) at 9.6% crude protein (CP) (2.51 lbs CP/day) during mid October to mid November were determined for three harvested-forage types.

Crested wheatgrass hay cut at a mature plant stage has a crude protein content of around 6.4%. This low-quality hay had production costs of $28.11 per acre, 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 39.1 lbs DM/day to provide 2.5 lbs CP/day. Lactating cows could not acquire adequate quantities of crude protein from this mature hay, and animal performance would be unsatisfactory. An additional 0.78 lbs of crude protein per day would need to be provided with mature crested wheatgrass hay fed to meet the dry matter requirements. Production of mature crested wheatgrass hay to feed a lactating cow during mid October to mid November required 0.73 acres per month and cost $0.70 per day, or $21.00 per month.

Crested wheatgrass hay cut early, at the boot stage, has a crude protein content of around 14.5%. This high-quality hay had production costs of $26.50 per acre, 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 17.2 lbs DM/day to provide 2.5 lbs CP/day. An additional 10 lbs of roughage per day would need to be provided. Production of early cut crested wheatgrass hay to feed a lactating cow during mid October to mid November required 0.40 acres per month and cost $0.35 per day, or $10.50 per month.

Forage barley hay cut at the milk stage has a crude protein content of around 13.0%. This hay had production costs of $68.21 per acre, dry matter costs of $28.80 per ton, and crude protein costs of $0.11 per pound. This forage barley hay would be fed at 19.2 lbs DM/day to provide 2.5 lbs CP/day. An additional 7.8 lbs of roughage per day would need to be provided. Production of forage barley hay to feed a lactating cow during mid October to mid November required 0.12 acres per month and cost $0.28 per day, or $8.25 per month.

Pasture-Forage Costs

Pasture and forage costs of pasture and harvested-forage management strategies for range cows during late lactation between mid October and mid November are shown in table 4. Costs per pound of calf weight gain 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 hay were considerably greater than those for perennial grass hay. Production costs for annual cereal hay include 68% for labor and equipment expenses; the remaining costs consist of land rent values of $22.07 per acre. Production costs for perennial grass hay include 45% to 50% for labor and equipment expenses; the remaining costs consist of land rent values of $14.22 per acre. Production costs for perennial grass pastures consist of pasture rent values of $8.76 per acre. These relationships of forage production costs are often interpreted to indicate that feeding livestock annual cereal hay is more expensive than feeding livestock perennial grass hay, which in turn is more expensive than grazing livestock on perennial grass pasture. Numerous types of pasture-forage management strategies based on this interpretation of the forage production costs per acre have been implemented in the Northern Plains with the confident assumption that the management practices were the lowest-cost alternative strategies available for beef production. 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 relationship between pasture rent per acre or production costs per acre and the amount of dry matter consumed by grazing livestock or the amount 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 of fall forage on native range pastures were very high ($97.33/ton) and were considerably higher than the dry matter costs of Altai wildrye pasture forage ($26.83/ton), crested wheatgrass hays ($34.80 and $40.80/ton), and forage barley hay ($28.80/ton).

Traditional pasture-forage management strategies have been designed to maximize the quantity of dry matter removed by grazing or haying. The greater the amount of dry matter removed per acre, the lower the cost per unit of weight. However, 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. Mature crested wheatgrass hay has lower dry matter costs than early cut crested wheatgrass hay, but costs to feed mature created wheatgrass to lactating cows are double the costs to feed the higher-quality early cut crested wheatgrass hay. Traditional harvested forages used as fall and winter feed for beef cows are usually selected by the costs of dry matter weight and are generally low quality and relatively expensive.

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. Crude protein costs ($1.01/lb) on fall-grazed native range pastures are very high because the aboveground herbage weight is only about 50% of the mid summer herbage weight and the crude protein content is very low, at around 4.8%. Crude protein costs for mature crested wheatgrass hay are fairly high, at $0.28 per pound. Crude protein costs for Altai wildrye pasture forage, early cut crested wheatgrass hay, and forage barley hay are all less than $0.25 per pound, at $0.14, $0.14, and $0.11 per pound, respectively. 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.

Land area per animal unit has not been traditionally recognized as an important factor in beef production costs. Costs of the land area required to provide adequate quantities of forage for a cow-calf unit contribute substantially to total production costs. The greater the quantity of produced nutrients captured from a land base, the smaller the amount of land area required by an animal unit and the lower the production costs.

The land area allotted per cow-calf pair on the native range grazing treatments ranged from 2.01 acres to 3.26 acres per month. These allotted land areas were less than the 4.40 acres determined from herbage weight data to be needed for a cow-calf pair. The poor performance of animals on the native range treatments between mid October and mid November can be attributed to both the low quality

and the low quantity of forage available for livestock consumption. The land area required to provide one month of forage for each cow-calf pair grazing Altai wildrye pastures was between 1.39 acres and 1.55 acres, at land area costs between $12.18 and $13.58. Production of mature crested wheatgrass, early crested wheatgrass, and forage barley to provide harvested forage for a cow-calf unit for a month required 0.73 acres, 0.40 acres, and 0.12 acres, respectively, at land area costs of $10.38, $5.69, and $2.65, respectively. The land area cost for the 4.40 acres of properly stocked native range was $38.54 for one month of forage.

Livestock forage feed costs on fall-grazed native range pastures were high, between $0.59 and $0.95 per day. These costs were high because the forage quantity and quality were low. The costs of calf weight gain on these management strategies were also high, ranging from $0.70 to $0.99 per pound. Livestock forage feed costs for mature crested wheatgrass hay were high, at $0.70 per day, because of the low quality of the dry matter.

Livestock forage feed costs on cropland aftermath were fairly low, at $0.44 per day, because of the low value per acre assessed to this forage source. However, the cost of calf weight gain on cropland aftermath was extremely high, at $1.05 per pound.

The pasture-forage management strategies with livestock forage feed costs lower than $0.62 per day were Altai wildrye pasture, early cut crested wheatgrass hay, and forage barley hay, which had forage feed costs of $0.43, $0.35, and $0.28 per day, respectively. The cost of calf weight gain on Altai wildrye pastures was relatively low, averaging $0.29 per pound.

Discussion

The alternative management strategies evaluated showed wide differences in pasture and land rent per acre; production costs per acre; costs per unit of forage dry matter; costs per unit of nutrient; land area per animal unit; forage costs per day, per month, or per production period; and costs per pound of calf weight gain. Effectiveness of a management strategy in reducing the costs of pasture and harvested forage for livestock production can be evaluated a number of ways. The rankings of the costs can be based on the input costs of the value of land rent and market value of bulk weight of harvested forages, or the rankings can be based on the costs related to the per unit cost of saleable product. Selection of a low-cost management strategy to implement during mid October to mid November would differ with the cost criteria used to formulate the decisions. When a traditional production cost criterion of pasture or land rent per acre, production costs per acre, or cost per unit of harvested forage dry matter is used, grazing native range, grazing cropland aftermath, and feeding mature crested wheatgrass are identified as the most cost-efficient management strategies. When cost per unit of nutrient; land area per animal unit; forage feed costs per day, per month, or per production period; or cost per pound of calf weight gain is the criterion used, grazing Altai wildrye pastures, feeding early cut crested wheatgrass hay, and feeding forage barley cut in the milk stage are identified as the most cost-efficient management strategies. Selection of a cost-effective strategy for mid October to mid November therefore requires that calculations be based on appropriate criteria. Calculations based on traditional production cost criteria will identify as cost efficient those strategies that are seemly inexpensive because they require the smallest cash expenditure but are in fact not cost effective because they yield low animal performance and low or negative net returns. Calculations based on cost per unit of nutrient; land area per animal unit; forage feed costs per day, per month, or per production period; or cost per pound of calf weight gain accurately identify cost-efficient strategies: these strategies are seemingly costly because they require a greater expenditure of cash than traditional practices but are in

fact cost effective because these alternative management strategies yield strong animal performance and greater net returns.

Harvested forages are usually viewed as expensive 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. Interpretation of this information has led to the common assumption that if the amount of harvested forages were reduced and the length of grazing increased, the production costs for a cow would be reduced. This assumption is not supported by the data in this study. Some harvested forages are expensive, but not all harvested forages are high-cost feeds. Generally, grass forages that are cut late, at a mature plant stage, in order to increase the quantity of dry matter and reduce production costs per bulk weight are low-quality, high-cost forages that increase production costs for a cow-calf pair. Grass forages cut at an early plant stage are high-quality, low-cost forages that reduce production costs for a cow-calf pair.

The pasture-forage management strategies that efficiently capture nutrients produced on a land base and convert these nutrients into a saleable product, like calf weight, will provide low-cost forage for beef cow-calf production. These strategies will have low costs per unit of nutrient; low land area per animal unit; low forage feed costs per day, per month, or per production period; and low costs per pound of calf gain. Implementation of such effective pasture-forage management strategies can reduce cow-calf production costs and increase the profit margin for the beef production industry in the Northern Plains.

Conclusion

Reductions in weight performance of livestock on native rangeland during the later portion of the grazing season result from decreases in the quantity and nutritional quality of the herbage. The nutritional quality of grass plants diminishes sharply after the flowering stage. During mid to late July the crude protein content of the herbage on traditional grazing systems drops below the 9.6% required by lactating cows. Cows draw on stored body fat to provide for a portion of their milk production, and their weight decreases. The loss of weight leads to decreased milk production, which results in reduced calf average daily gain.

Secondary tillers of grass plants are less mature and have greater nutritional quality than older lead tillers during the later portion of the grazing season. Stimulation of secondary tiller growth requires grazing that is coordinated with grass growth stages and removes a small amount of leaf material from the grass plants between the third-leaf stage and flowering stage to trigger tiller development from axillary buds located on the crowns. Grazing management strategies that stimulate secondary tiller growth have improved livestock performance until late September or mid October, but the biology of native grass plants does not permit extending this improved performance longer. The nutritional quality of native range herbage is below the requirements of a lactating cow after mid October, and grazing animals must be moved to an alternative forage source if their nutritional requirements are to be met.

Traditional grazing systems do not stimulate growth of increased numbers of secondary tillers. Herbage production and nutritional quality of the existing herbage continue a sharp decline from late July until the end of the grazing season. Livestock weight performance on these traditional management strategies follows the same sharp decline as the herbage quantity and quality. The cows lose a considerable amount of weight, the calves gain very little weight, and feed costs and costs per pound of calf weight gain are high.

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 led to 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 high-performance 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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Tables and Graphs

Table 1. Pasture-forage costs and returns for cow-calf production on grazing treatments during mid October to mid November, 1983-1985.

		Native Rangeland			Domesticated Grass
		Seasonlong 4.5 M	Seasonlong 5.0-6.0 M	Deferred 4.0 M	Altai Wildrye
Length of period	(days)	15	30	30	30
Acres/month	(ac)	3.26	2.53	2.22	1.55
Acres/period	(ac)	1.63	2.53	2.22	1.55
Calf ADG	(lbs)	1.35	0.92	0.77	1.80
Calf gain/acre	(lbs)	6.17	10.90	10.36	34.79
Calf gain/period	(lbs)	20.33	27.60	23.10	53.92
Cow ADG	(lbs)	-0.52	-0.82	-0.74	1.57
Cow gain/acre	(lbs)	-2.76	-9.77	-9.96	30.27
Cow gain/period	(lbs)	-7.74	-24.60	-22.20	46.92
Gross return @ $0.70/lb	($)	14.23	19.32	16.17	37.74
Pasture rent/acre	($)	8.76	8.76	8.76	8.76
Pasture cost/period	($)	14.28	22.16	19.53	13.58
Net return/c-c pr	($)	-0.05	-2.84	-3.36	24.16
Net return/acre	($)	-4.44	-1.13	-1.51	15.59
Cost/lb calf gain	($)	0.70	0.80	0.85	0.25

Table 2. Pasture-forage costs and returns for cow-calf production on grazing treatments during mid October to mid November, 1993-1998.

		Native Rangeland	Domesticated Grass	Annual Cereal Residue
		Seasonlong 6.0 M	Altai Wildrye	Cropland Aftermath
Length of period	(days)	30	30	30

Acres/month	(ac)	2.01	1.39	6.63
Acres/period	(ac)	2.01	1.39	6.63
Calf ADG	(lbs)	0.59	1.24	0.42
Calf gain/acre	(lbs)	8.82	26.76	1.90
Calf gain/period	(lbs)	17.73	37.20	12.57
Cow ADG	(lbs)	-2.65	0.22	-1.26
Cow gain/acre	(lbs)	-39.50	4.69	-7.27
Cow gain/period	(lbs)	-79.40	6.53	-48.17
Gross return @ $0.70/lb	($)	12.41	26.04	8.80
Pasture rent/acre	($)	8.76	8.76	2.00
Pasture cost/period	($)	17.61	12.18	13.26
Net return/c-c pr	($)	-5.20	13.86	-4.46
Net return/acre	($)	-2.59	9.97	-0.67
Cost/lb calf gain	($)	0.99	0.33	1.05

Table 3. Forage costs of harvested-forage types used to feed lactating cows with calves during mid October to mid November, 1995-1999.

		Crested Wheatgrass	Crested Wheatgrass	Forage Barley
Growth Stage		**Mature**	**Boot stage**	**Milk stage**
Costs/acre				
Land Rent	$	14.22	14.22	22.07
Custom Work	$	5.31	5.31	16.08
Seed Costs	$	-	-	4.69
Baling Costs	$	8.58	6.97	25.37
Production Costs	$/ac	28.11	26.50	68.21
Dry Matter Biomass Yield	lb/ac	1600	1300	4733
Forage Biomass Costs	$/cwt	1.74	2.04	1.44

Crude Protein	%	6.4	14.5	13.0
Crude Protein Yield	lb/ac	102	189	606
Crude Protein Costs	$/cwt	27.56	14.02	11.26

Table 4. Pasture and forage costs of pasture and harvested-forage management strategies for range cows with calves during the late lactation production period from mid October to mid November.

	Production Costs $/ac	Forage Dry Matter Costs $/ton	Crude Protein Costs $/lb	Land Area per month ac	Feed Costs per day $	Feed Costs per month $	Cost/lb Calf Gain $
Native Rangeland Reserve Pasture							
Early Fall	8.76	80.37	0.34	4.20	1.21	36.79	
Late Fall	8.76	97.33	1.01	5.00	1.46	43.80	
4.5 M Seasonlong	8.76			3.26	0.95	28.56	0.70
5.0-6.0 M Seasonlong	8.76			2.53	0.74	22.16	0.80
6.0 M Seasonlong	8.76			2.01	0.59	17.61	0.99
4.0 M Deferred	8.76			2.22	0.65	19.53	0.85
Altai Wildrye	8.76	26.83	0.14				
1980's Data				1.55	0.45	13.58	0.25
1990's Data				1.39	0.41	12.18	0.33
Cropland Aftermath	2.00			6.63	0.44	13.26	1.05
Crested Wheatgrass Mature Hay	28.11	34.80	0.28	0.73	0.70	21.00	
Crested Wheatgrass Early Hay	26.50	40.80	0.14	0.40	0.35	10.50	
Forage Barley							

Milk Stage Hay	68.21	28.80	0.11	0.12	0.28	8.25	

[Back to 2002 Annual Report Index] [Back to Grassland Reports]

[DREC Home] [Contact DREC] [Top of Page]