**North Dakota State University * Dickinson Research Extension Center**
1133 State Avenue, Dickinson, ND 58601 Voice: (701) 483-2348 FAX: (701) 483-2005

# ECONOMIC RETURNS AS AFFECTED BY GRAZING STRATEGIES

Llewellyn L. Manske PhD Associate Range Scientist

A simulation study to evaluate general costs and returns for mean cow-calf production from calf birth to weaning was conducted at the Dickinson Research Extension Center in southwestern North Dakota (Manske 1995, 1996). Five management system strategies were evaluated for forage and pasture costs, and the gross and net returns on the live weight accumulated by the calf on each forage type and for the total grazing season were calculated. This study was intended as a comparison of feed and pasture costs and relative dollar values for the different calf weight production levels from the five management strategies. This study was not intended as a complete economic analysis of the grazing treatments or a study in marketing strategies.

The grazing strategies started at the birth date of a calf; an average birth date of 16 March and an average birth weight of 95 pounds were used for all management strategies. Cow-calf pairs (commercial Hereford and Angus-Hereford cows with Charolais sired calves) were simulated to move sequentially through a series of forage types. All five strategies began with a drylot period during which a balanced lactation ration was fed; all strategies had a summer native range grazing period; four strategies had a spring domesticated grass pasture period; and one strategy had a fall domesticated grass pasture period. The simulations ended at the weaning of the calf. Each strategy was identified by the type of grazing system used on the native range: 6.0-month seasonlong, 4.0-month deferred, 4.5-month seasonlong, 4.5-month short duration, and 4.5-month twice-over rotation. The gross and net returns were determined for the potential market value of $0.70 per pound of calf accumulated live weight. Pasture costs were determined from the average rent value of $8.76 per acre for native range, crested wheatgrass, and Altai wildrye pastures. For each strategy, grazing dates, stocking rates, cow and calf average daily gain, and acreages for forage types were determined from previous grazing research projects. Calf gain per acre, calf accumulated weight, feed and pasture costs, and cost/day and cost/lb. gain for each strategy were determined during this study. The net returns per cow-calf pair and per acre differed for the five simulated strategies.

The 6.0-month seasonlong strategy was started in drylot, with a balanced lactation ration fed for 61 days. The grazing portion started on 16 May: one native range pasture was grazed at a stocking rate of 0.25 animal unit months (AUMs)/acre for 183 days, until 15 November.

The 4.0-month deferred strategy was started in drylot, with a balanced lactation ration fed for 46 days. The grazing portion started on 1 May: an unfertilized crested wheatgrass pasture was grazed for 76 days at a stocking rate of 0.60 AUMs/acre. The livestock were moved to one native range pasture on 15 July and grazed at a stocking rate of 0.45 AUMs/acre for 122 days, until 15 November.

The 4.5-month seasonlong strategy was started in drylot, with a balanced lactation ration fed for 46 days. The grazing portion started on 1 May: an unfertilized crested wheatgrass pasture was grazed for 46 days at a stocking rate of 0.55 AUMs/acre. The livestock were moved to one native range pasture on 15 June and grazed at a stocking rate of 0.35 AUMs/acre for 137 days, until 30 October.

The 4.5-month short duration strategy was started in drylot, with a balanced lactation ration fed for 46 days. The grazing portion started on 1 May: an unfertilized crested wheatgrass pasture was grazed for 46 days at a stocking rate of 0.55 AUMs/acre. The livestock were moved to one of eight native range pastures on 15 June and rotated through the eight pastures on a 5-day graze, 35-day rest schedule at a stocking rate of 0.47 AUMs/acre for 137 days, until 30 October. The data used for this treatment were reported by Kirby, Conlon, and Krabbenhoft (1991).

The 4.5-month twice-over rotation strategy was started in drylot, with a balanced lactation ration fed for 46 days. The grazing portion was started on 1 May: fertilized (50 lbs N/acre on 1 April) crested wheatgrass pasture was grazed for 31 days at a stocking rate of 1.33 AUMs/acre. The livestock were moved to one of three native range pastures of equal size, with each pasture grazed for two periods, a 15-day period between 1 June and 15 July (third leaf stage to flowering stage) followed by a 30-day period after 15 July and prior to mid October. The livestock grazed native pasture for 137 days at a stocking rate of 0.49 AUMs/acre. The first pasture grazed in the sequence was the last pasture grazed the previous year. The livestock were moved to an Altai wildrye pasture on 15 October and grazed at a stocking rate of 0.72 AUMs/acre for 30 days, until 15 November.

Successful grazing strategies for western North Dakota must incorporate adaptations to plant phenological development and to the environmental conditions of the Northern Great Plains. In this region, nearly all the growth in graminoid leaf and flower stalk height occurs during May, June, and July (Goetz 1963, Manske 1994). Grazing native range too early causes negative effects on plant growth. Grazing applied when grass is between the third leaf stage and flowering has the potential to stimulate accumulation of increased herbage biomass through development of secondary tillers. This stimulation period has been found to be 1 June to 15 July in western North Dakota. After July, the vegetation on native range that has not been manipulated is primarily residual. Ungrazed grasses are low in nutritional quality during the later portion of the grazing season, and around mid July the crude protein content of the major graminoids drops below 9.6% (Whitman et al. 1951, Manske 1994, Sedivec and Manske 1994), the level required to fulfill the nutritional needs of a lactating cow.

Because no perennial grass forage species with the phenological maturity to withstand grazing pressure in March and April is available, a drylot period is needed for calves born before late April. Under the conditions of this study, the drylot period showed positive economic returns for all five strategies.

Starting seasonlong grazing treatments on native range before early June results in a loss of 45-60% of the potential peak herbage biomass (Campbell 1952, Rogler et al. 1962, Manske 1994). Spring domesticated grass pasture provides forage during May when grazing is detrimental to native range grass growth. Crested wheatgrass reaches the third leaf stage around 20 April at Dickinson an average of eight of ten years. Other cool-season domesticated grass species that have very early phenological development could possibly be used as spring pastures also. Crested wheatgrass pastures accumulated weight on calves at a lower cost per pound than did drylot. Grazing crested wheatgrass spring pastures in May (as on the 4.0-month deferred, 4.5-month seasonlong, 4.5-month short duration, and 4.5-month twice-over rotation strategies) showed positive economic returns and a biological advantage over grazing native range pastures early during the same period (as on the 6.0-month seasonlong strategy). Fertilization of crested wheatgrass with 50 lbs N/acre (as on the 4.5-month twice-over rotation strategy) showed increased stocking rates, calf average daily gain and gain per acre as well as a reduction in the acreage required to carry a cow-calf pair; these results greatly improved the net returns per acre over unfertilized crested wheatgrass pastures.

A combination of grazing multiple pastures (three to six) and restricting access in each pasture to one period of grazing between the third leaf stage and flowering (1 June to 15 July) and a second grazing period after flowering and before winter senescence (15 July to 15 October) provides a period during which grass may be stimulated to produce secondary tillers and a later period during which the resulting increase in herbage production may be harvested. Native range grazing strategies that incorporated multiple pastures with multiple grazing periods (4.5-month short duration and 4.5-month twice-over rotation) had economic advantages in net returns per cow-calf pair and per acre over strategies with single native range pastures grazed for one period (6.0-month seasonlong, 4.0-month deferred, and 4.5-month seasonlong). Grazing native range for 6.0 months on one pasture showed an economic disadvantage because of the low stocking rate and calf gain per acre and high costs for a pound of weight gain. Grazing native range from mid July to mid November (as on the 4.0-month deferred strategy) improved the stocking rate over seasonlong strategies but produced lower calf average daily gain than did the 4.5-month seasonlong strategy. Data collected at the Dickinson Research Extension Center show that the three-pasture, twice-over rotation system on native range grazed between 1 June and 15 October had a biological and economic advantage over the other four treatments (6.0-month seasonlong, 4.0-month deferred, 4.5-month seasonlong, and 4.5-month short duration).

The twice-over rotation grazing system has been able to manipulate the level of secondary tiller development and improve the nutritional quality of forage available during the later portion of the grazing season but has not been able to extend this period beyond mid October. Therefore, a fall domesticated grass pasture is needed to provide forage of adequate nutritional quality from mid October to mid November. A perennial forage type that can supply adequate nutrition without supplementation after mid November is currently not available, but in this study (on the 4.5-month twice-over rotation strategy), Altai wildrye provided adequate nutrition between mid October and mid November; other types of wildrye may be as good or better. The calf average daily gain in the late portion of the grazing season was less than 2.00 lbs on Altai wildrye, but between mid October and mid November the net returns per acre were greater on the Altai wildrye pastures than on the native range pastures. Fall domesticated pastures showed an economic advantage in net return per acre and had a lower cost per pound of weight gain than did native range and unfertilized crested wheatgrass.

Implementation of a management strategy that promotes the vigor of the vegetation and provides cattle with adequate nutrition for the entire grazing season can sustain effective livestock production on native range and domesticated grass pastures. Of the five strategies, the 4.5-month twice-over rotation grazing strategy showed the most beneficial effects on perennial forages. The 4.5-month twice-over rotation strategy also produced the highest calf weaning weight, calf weight per day of age, calf average daily gain, calf gain per acre, total calf accumulated weight gain per season, gross returns per calf, net returns per cow-calf pair, and net returns per acre. The strategy also showed the lowest acreage required to carry a cow-calf pair per season, total feed and pastures costs, cost per day, and cost per pound of gain. Of the five strategies studied, the 4.5-month twice-over rotation strategy proved best suited to conditions of the Northern Great Plains.

## Acknowledgment

I am grateful to Amy M. Kraus for assistance in preparation of this manuscript.

## Literature Cited

**Campbell, J.B. 1952.** Farming range pastures. Journal of Range Management 5:252-258.

**Goetz, H. 1963.** Growth and development of native range plants in the mixed grass prairie of western North Dakota. M.S. Thesis, NDSU, Fargo, North Dakota. 165 p.

**Kirby, D.R., T.J. Conlon, and K.D. Krabbenhoft. 1991.** A short duration grazing experience in western North Dakota. Proceedings of North Dakota Cow/Calf Conference. Bismarck, North Dakota. p. 46-53.

**Manske, L.L. 1994.** Problems to consider when implementing grazing management practices in the Northern Great Plains. NDSU Dickinson Research Extension Center. Range Management Report DREC 94-1005. Dickinson, North Dakota. 11 p.

**Manske, L.L. 1995.** Economic returns as affected by grazing strategies. NDSU Dickinson Research Extension Center. Range Research Report DREC 95-1012. Dickinson, North Dakota. 20 p.

**Manske, L.L. 1996.** Economic returns as affected by grazing strategies. pages 43-55. *in* Z. Abouguendia, ed. Total Ranch Management in the Northern Great Plains. Grazing and Pasture Technology Program, Saskatchewan Agriculture and Food. Regina, Saskatchewan, Canada.

**Rogler, G.A., R.J. Lorenz, and H.M. Schaaf. 1962.** Progress with grass. N.D. Agr. Exp. Sta. Bul. 439. 15 p.

**Sedivec, K.K. and L.L. Manske. 1994.** Nutritional quality of native range. Proceedings of North Dakota Cow/Calf Conference. Bismarck, North Dakota. p. 21-25.

**Whitman, W.C., D.W. Bolin, E.W. Klosterman, H.J. Klostermann, K.D. Ford, L. Moomaw, D.G. Hoag, and M.L. Buchanan. 1951.** Carotene, protein, and phosphorus in range and tame grasses of western North Dakota. N.D. Agr. Exp. Sta. Fargo, North Dakota. Bul. 370. 55 p.

---

**Back to 1999 Research Reports Table of Contents**
**Back to Research Reports**
**Back to Dickinson Research Extension Center** (http://www.ag.ndsu.nodak.edu/dickinso/)
**Email:** drec@ndsuext.nodak.edu

---