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Summary

Crude protein contents of diets were compared for steers grazing introduced, high condition native and low condition native grass pastures under spring-deferment or season-long grazing systems. This study was conducted at the SDSU Cottonwood Research Station near Cottonwood, SD, in 1990, 1991, and 1992. Esophageally fistulated steers were used to obtain diet samples throughout the grazing season on all treatments. Esophageal samples were analyzed for crude protein content and data were compared among grazing treatments within each year. In all three years, cattle diets were not limiting until late summer. Contrary to what was expected, diets of cattle on introduced grass pastures were typically higher in crude protein throughout the summer than diets of cattle grazing native pastures. Average daily gains were similar for all pastures and grazing systems for all years.

Key Words: Diet Quality, Grazing System, Native Grass, Introduced Grass

## Introduction

The performance of grazing livestock is a function of forage quality and quantity of intake. Quantity of grazeable forage on the grasslands of the Northern Great Plains (NGP) generally increases from early spring through summer and then begins to decline as plants mature. Forage quality decreases as the growing season progresses, however, due to relative increases in plant structural components and decreases in crude protein and metabolizable energy. Crude protein is often limiting in mature range grasses. Grazing systems can affect both quality and quantity of intake by regulating the time of year and length of time livestock are allowed to graze a pasture. Specialized grazing systems have long been promoted as limiting the impacts of livestock defoliation by controlling, both in time and space, the amount of forage demanded. A period of nonuse for uninterrupted growth during a critical phase in the development of a plant is beneficial. For cool season grasses, such as western wheatgrass (*Agropyron smithii*, Rydb.) this would occur during the spring. Spring-deferment, a commonly used grazing regime in the NGP is often prescribed to accomplish this period of nonuse. In spring, livestock are often grazed on a pasture which has been seeded with an introduced grass such as crested wheatgrass (*Agropyron cristatum* (L.)) and to a lesser extent, Russian wildrye (*Elymus junceus* Fisch). The original focus of specialized grazing systems was to improve depleted range while allowing some level of grazing. Limited emphasis has been placed on individual livestock performance.

A grazing study was initiated in 1989 in an attempt to evaluate the use of the grasslands of western South Dakota so as to benefit both vegetation and livestock. The overall objective of this study was to identify, through the examination of vegetation and cattle diet characteristics, criteria for determining when to move livestock in a grazing system on native and introduced pastures during the spring through summer grazing season. This paper addresses a portion of the larger study and looks at the percentage of crude protein available in diets harvested by steers grazing introduced pastures and native grass pastures in either high or low range condition.

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## Materials and Methods

The study was conducted at the Cottonwood Range and Livestock Research Station in west central South Dakota from 1990 through 1992. The Station is located approximately 75 miles east of Rapid City, South Dakota. Climate is continental and semi-arid with hot summers and cold winters. Long-term average annual precipitation is 15.5 in., the majority of which occurs between April and September.

### Experimental Pastures

Twenty pastures were used in this study. Twelve pastures were of native range and eight of introduced grasses. Six of the native pastures were in high range condition (Hi) which had dominant vegetation of western wheatgrass with an understory of blue grama (*Bouteloua gracilis* [H.B.K] Lag. ex Steud) and buffalograss (*Buchloe dactyloides* [Nutt.] Engelm). The other six native pastures were in low range condition (Lo) which is dominated by warm season shortgrasses, blue grama and buffalograss, with western wheatgrass making up a lesser component of the vegetation. All native pastures were 17 acres in size. Four of the eight introduced grass pastures had been seeded to crested wheatgrass (Ag) in 1975, and the remaining four were seeded to Russian wildrye (El) in 1979. The introduced pastures ranged in size from 25 to 42 acres. The El pastures were used in this study during 1990 only.

### Grazing Treatments

Half of the native pastures of each condition (Hi and Lo) received the season-long (SL) grazing treatment and half received the spring-deferred (DF) grazing treatment. Season-long treatments occurred from early May to late August and spring-deferred treatments occurred from early June to late August in 1990, 1991, and 1992. Half of the introduced pastures of each species (Ag and El) received the same SL treatment as the native pastures. The remaining introduced pastures received a spring-only (SO) treatment which required grazing only during early May to early June, which was the spring deferment period of the native DF pastures.

### Stocking Rate

Pastures were stocked with yearling steers of mixed breed, local origin, and uniform size (Table 1). Stocking rate on native pastures was 0.5 AUM/acre for both the SL and DF treatments. Stocking rate for introduced pastures (both Ag and El) was 0.5 AUM/acre in 1990, 0.7 AUM/acre in 1991, and 1.0 AUM/acre in 1992.

### Diet Quality Samples

Diet quality samples were collected using esophageally fistulated steers. Samples were collected throughout the grazing season in each year on native Hi and Lo and introduced Ag and El pastures for the SL, DF, and SO grazing treatments. Samples were collected by removing the cannula from the neck of the animal, strapping a collection bag beneath the esophageal opening, and allowing the animal to graze freely for approximately 30 minutes. Bags were then removed from the animal, the cannula reinstalled, and the samples immediately bagged and frozen. Samples were later freeze-dried and analyzed for percent crude protein.

## Results and Discussion

For each of the three years of the study, percent crude protein was generally not limiting in diets of steers grazing native and introduced pastures until late in the summer when it approached 6% for the native pastures (Figures 1-3). Contrary to what was expected, percent crude protein in the diet was typically higher throughout the season on introduced compared to native pastures. Overall quality of cool season plant species (e.g., crested wheatgrass and Russian wildrye in the introduced pastures and western wheatgrass in the native pastures) is known to decline markedly during summer, while warm season species (e.g., buffalograss and blue grama in the native pastures) should offer the highest quality forage at that time. Even in a hot summer (1990) steers grazing Russian wildrye, a cool season introduced grass, had diets with the highest percent crude protein (greater than 10% all season) when compared to steers on crested wheatgrass and native pastures. Both crested wheatgrass and Russian wildrye are

Table 1. Average weight (lb) of steers on turn-in date for 1990, 1991, and 1992

| | Season-long[1] | | | | Spring-only | | Deferred | |
|---|---|---|---|---|---|---|---|---|
| Year[2] | Hi | Lo | Ag | El | Ag | El | Hi | Lo |
| 1990 | 595 | 584 | 624 | 593 | 594 | 602 | 675 | 684 |
| 1991 | 626 | 631 | 611 | NG[3] | 609 | NG | 710 | 712 |
| 1992 | 699 | 687 | 688 | NG | 673 | NG | 737 | 753 |

[1]Hi = high condition native range pastures, Lo = low condition native range pastures, Ag = crested wheatgrass pastures, El = Russian wildrye pastures.
[2]Turn-in dates for 1990: season-long and spring-only = May 7; deferred = June 8. 1991: season-long and spring-only = May 2; deferred = June 7. 1992: season-long and spring-only = May 11; deferred = June 9.
[3]Russian wildrye pastures were grazed in 1990 only.

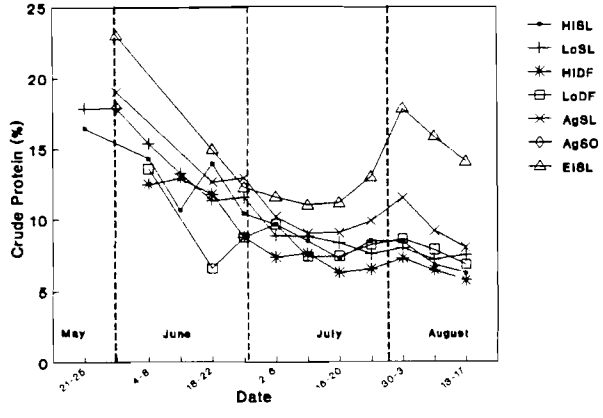


Figure 1. Crude protein content (%) of steer diets during 1990.

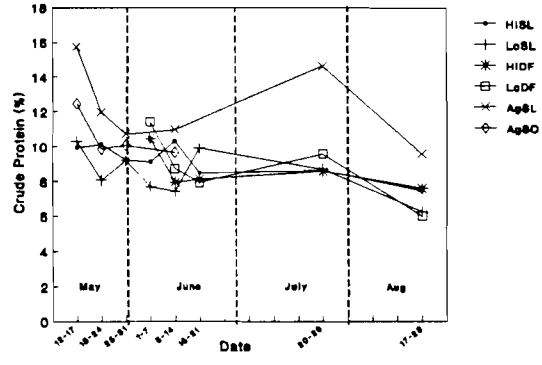


Figure 3. Crude protein content (%) of steer diets during 1992.

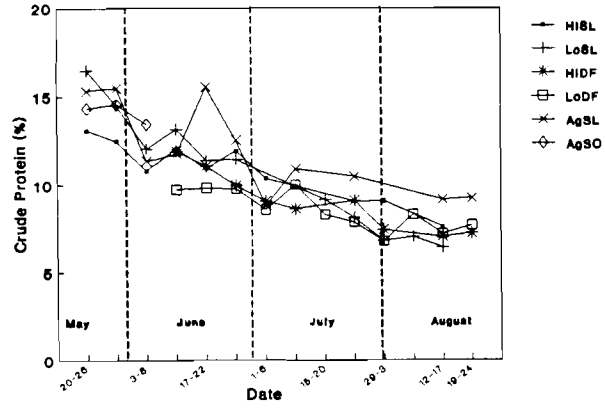


Figure 2. Crude protein content (%) of steer diets during 1991.

Grazing treatments were HiSL = season-long on native high condition pastures, LoSL = season-long on native low condition pastures, HiDF = spring-deferment on native high condition pastures, LoDF = spring-deferment on native low condition pastures, AgSL = season-long on crested wheatgrass pastures, AgSO = spring-only grazing on crested wheatgrass pastures, and ElSL = season-long on Russian wildrye pastures.

bunchgrasses that maintain a substantial mass of leaf material on the periphery of the bunch. These leaves would provide higher quality forage to grazing livestock than the stems and are readily available to grazing animals. Native grasses, both cool and warm season, typically maintain a higher stem to leaf ratio and leaves are not easily separated by a grazer from the stems. Thus, it is likely that the steers consumed a greater percentage of the lower quality stems while grazing the native pastures than did steers on introduced pastures, leading to generally lower quality diets from the native pastures.

Average daily gains (ADG, Table 2) were similar for all pastures within each year. ADG was as high on cool season, introduced pastures as on native pastures for all years even with the higher stocking rates on the introduced pastures in 1991 and 1992 (1.0 AUM/acre for introduced vs 0.5 AUM/acre for native in 1992). This is another indication that the steers grazing the introduced pastures during the entire grazing season were obtaining a diet of adequate quality and quantity for reasonable growth.

## Conclusions

As long as forage quantity is not limiting, livestock can obtain forage of adequate nutritional value throughout the grazing season on cool season introduced grass pastures. Thus, it is possible to allow cattle to remain on introduced pastures much later in the season than is traditionally done without sacrificing animal weight gains. This longer deferment of use of native pastures in spring will reduce grazing pressure on important cool season grass species and would add flexibility to an operation, which is very crucial in dry years.

## Acknowledgements

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Table 2. Average daily gain (lb) for 1990, 1991, and 1992

| | Season-long[1] | | | | Deferred | |
|---|---|---|---|---|---|---|
| Year[2] | Hi | Lo | Ag | El | Hi | Lo |
| 1990 | 1.9 | 2.0 | 1.9 | 2.1 | 1.7 | 1.9 |
| 1991 | 1.8 | 1.8 | 1.8 | NG[3] | 1.4 | 1.8 |
| 1992 | 1.5 | 1.6 | 1.9 | NG | 1.4 | 1.2 |

[1]Hi = high condition native range pastures, Lo = low condition native range pastures, Ag = crested wheatgrass pastures, El = Russian wildrye pastures.
[2]Grazing season ended on August 21, 1990, August 22, 1991, and August 25, 1992.
[3]Russian wildrye pastures were grazed in 1990 only.