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Influence of Forage Resources on Beef Cow Production on Rangelands in the Northern Great Plains

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Introduction

The level of profitability of beef production is largely a function of the relationships between the capital investment in production resources, the amount of beef product produced, its market value, and the cost per unit of production in a ranch business. Operators typically have more control over production costs than any other factor which has lead to an emphasis on reducing unit cost of production to improve profitability. However, reductions in production costs must not come at the expense of lower animal productivity. Thin cows or cows in low body condition (BCS <4) at calving are more likely to breed late in the breeding season or not breed at all, which reduces net calf crop and subsequent profitability. Matching the nutrient requirements of the cow with the quality available in forages at seasonally specific intervals throughout the year has been suggested as a means of effectively reducing production costs while maintaining cow body condition. Adams et al. (1996) reported that extending the grazing season and matching the cow to the forages available on rangelands would likely result in lower production costs and greater net returns. When nutrient requirements for the animal are matched with available nutrients in forage, supplemental feed costs and labor can be reduced without reducing animal productivity.

Seasonal Variations in Forage Quality

The quantity and quality of forage produced on rangelands is highly variable across seasons and between years. Annual rainfall, plant species, and the proportion of cool-season and warm-season species are all factors that play a significant role in forage quality at any point in time. The seasonal changes in forage quality observed as the growing season progresses are primarily the result of plant maturation. Forage species will contain their highest concentrations (>10% crude protein) of nutrients before they reach maturity. Once plants have fully matured and begin to senesce in the dormant season, crude protein concentrations typically will range from 5 to 8% crude protein.

Cow Nutrient Requirements

Nutrient requirements of the cow increase as size, milk production, gestation length, and activity increase. Protein and energy needs by the cow are greater during lactation than any other time of the production cycle. As the cow reaches the last 1/3 of gestation, total digestible nutrients (TDN) and crude protein requirements can increase as much as 20 and 14%, respectively. These requirements also will increase with increasing milk production. Figure 1 illustrates the relationship between crude protein concentrations in a forage source and the amount of forage needed to meet crude protein needs of the cow during mid- and late-gestation at 2 different levels of milk production. As requirements for gestation and lactation increase, the amount of bulk forage needed increases at all concentrations of crude protein.

Interactions at the Forage – Animal Interface

As forages mature, the increase in structural fiber and associated decrease in crude protein concentration will limit the amount of forage a cow can consume. As cow nutrient requirements increase with increasing gestation length or lactation, the ability of the animal to consume adequate amounts of low quality forage to meet nutrient needs decreases. Figure 2 demonstrates the relationship between crude protein concentration in forage and the ability of the cow to consume adequate forage to meet crude protein requirements. Cows grazing forages that contain >10% crude protein, which would be similar to forages found throughout the growing season, can consume enough forage to meet nutrient requirements at all phases of production. Conversely, it is unlikely that a cow grazing forage that contains less than 5% crude protein, which may be similar to forages found on winter range, will be able to consume enough forage to meet protein requirements at any phase of the production cycle. Furthermore, it also is unlikely that forages from fall and winter range will support milk production during lactation and maintain cow body condition without adequate supplementation of crude protein.

Forages containing 55% or more TDN would meet cow requirements for all stages of the production cycle up to 20 pounds of milk production. Research has indicated that that digestibility of forages on rangeland will be over 50% for most of the calendar year. Rangeland forage with digestibility below 50% is most common in mid-winter and it would be unlikely that a cow could consume enough forage to meet nutrient requirements for late gestation or lactation. Therefore, in most instances, forages on rangelands are deficient in protein before they are limited in energy content.

Balancing Cow Requirements and Forage Availability

In traditional spring calving systems, the high nutrient requirements observed in late gestation and during lactation occur before spring grass growth when protein and energy concentrations of grazed forages are at their lowest. Typically, the disconnect between cow needs and forage availability is mitigated by feeding harvested forages or supplements. This problem is further exacerbated when the quality of forages at certain times of the year cannot support the amount of milk produced by the cow. Furthermore, late-fall weaning can often result in nutritional requirements of the cow exceeding that available in forages with low protein concentrations at this time of the year.

Balancing the cows nutritional needs during late gestation and lactation with peak forage quality in the early spring can effectively reduce the need for harvested forages and supplemental feeds and their associated costs. Similarly, weaning calves before late fall, when significant amounts of cow body condition is lost, can reduce the need to feed body condition back on before calving. Conversely, cows with low nutrient requirements can be matched with low nutrient concentration forages. Figure 3 shows the relationship between seasonal forage quality changes and physiological stage of reproduction in the cow.

Adjusting Forage Availability to Cow Requirements

Planted forage species can provide some grazing alternatives at times when native vegetation on rangelands is in low supply. Grass species such as crested wheatgrass and Russian wildrye have the potential to provide adequate forage 2 to 3 weeks earlier in the spring than native rangeland. Having these forages available when cow nutrient requirements are high can help displace the need to feed hay.

Other opportunities for extending the grazing season in the spring or fall with complementary forages include the use of cereal grains such as oats, wheat, and rye, and crops residues such as corn or sorghum stalks. However, crop residues are not always located within close proximity to rangelands or pastures. Therefore, trucking costs will have to be considered when evaluating the feasibility of using crop residues rather than harvested forages.

Supplementing cows grazing low quality forages is generally more cost effective than putting cows on full feed. Generally, protein supplements are far more effective for utilizing low quality forages than energy from grain supplements. Research has indicated that protein supplements have maintained body condition of lactating cows in the fall and dry cows on winter range. Furthermore, grain supplements generally will not maintain body weight of cows grazing winter range.

Adjusting Cow Requirements to Forage Availability

The amount of supplemental harvested and purchased feeds needed to maintain a cow herd is closely associated with dates of calving and weaning. Changing these critical production dates to balance cow nutrient requirements with the nutrient concentration of available forages can help reduce the need for supplemental feeds and their associated costs. Peak lactation generally occurs 30 – 60 days post partum, if range is ready for grazing in mid-May, calving in mid-April would put cows out on range when their nutrient requirements for lactation are the highest. Changing calving date however, affects the operation of the entire ranch. The profitability of a change in calving is date is going to depend on production levels, marketing opportunities, additional input needs including labor, and the ability to retain ownership and feed calves following weaning.

Adjusting weaning date also can reduce nutrient requirements for cows. Weaning in August compared to October will remove the nutrient demand for lactation and can save as much as 25% forage. Early weaning also is a useful tool to reduce the need for supplemental feeds when nutrient concentration of forages is too low to support the nutritional needs a lactating cow.

Conclusions

Reducing the need for supplemental feeds can improve the profitability of ranching operations. Synchronizing peak nutrient requirements of the cow with peak nutrient availability in forages can at least partially displace some harvested feedstuffs. Grazing

alternative forages and available crop residues also is a cost effective method of keeping cows off winter feed. Adjustments to calving and weaning dates are effective tools to match forage supply and cow demand.

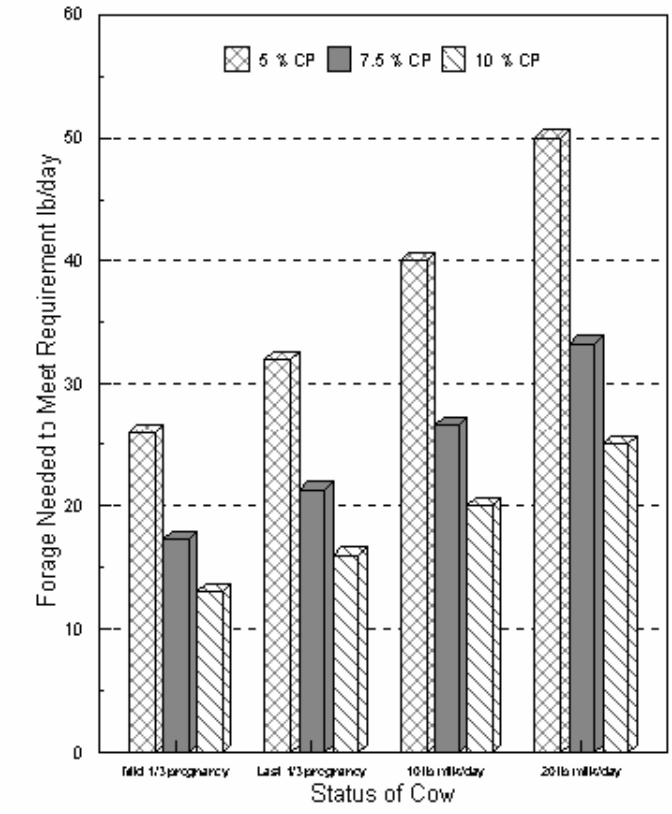

Figure 1. Relationship between forage crude protein concentration and the amount of forage required to meet nutrient needs of cows during mid- and late-gestation, at 2 levels of milk production (Adams et al. 1996).

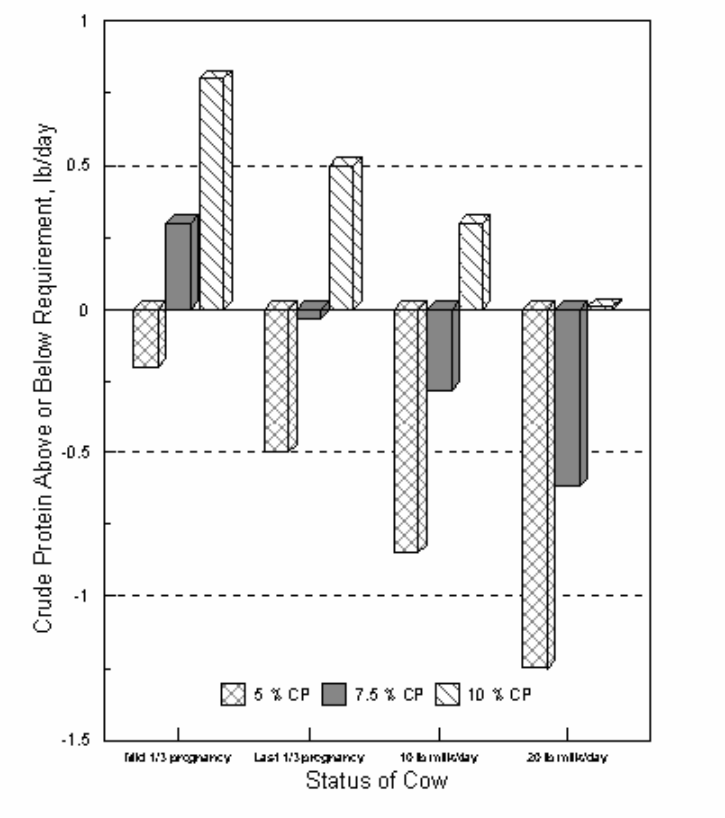

Figure 2. Relationship between forage crude protein concentration and the ability of a cow to consume adequate forage to meet crude protein requirements (Adams et al. 1996).

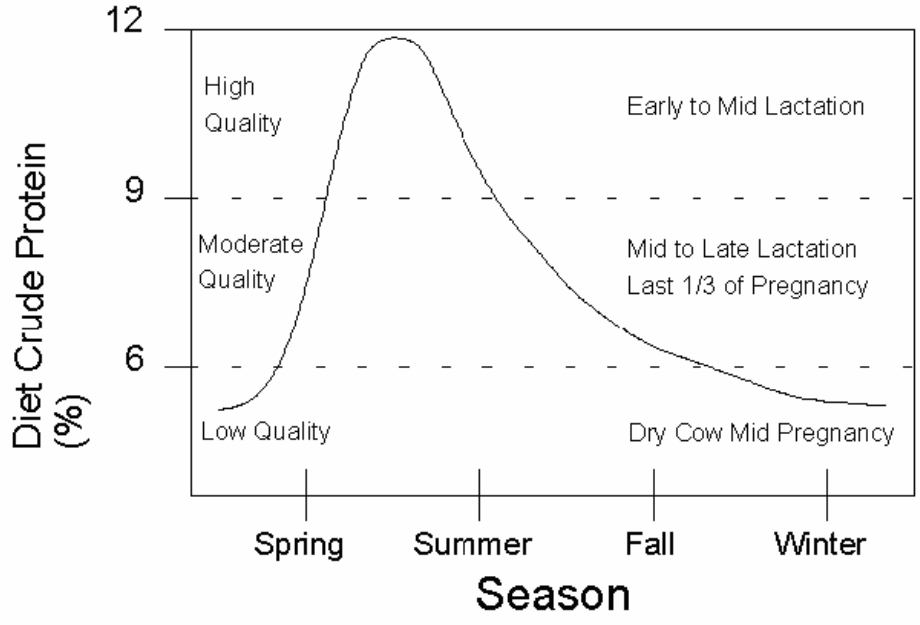

Figure 3. Relationship between seasonal variations in forage quality and cow reproductive status (Adams et al. 1996).