STRATEGIC SUPPLEMENTATION OF CRUDE PROTEIN: AN ECONOMICAL MANAGEMENT STRATEGY FOR INTERMOUNTAIN COW/CALF PRODUCERS

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Summary

Cow/calf producers can use strategic supplementation to improve cow body condition scores (BCS), improve calf health, increase conception rates, and increase their operations' net income. Strategic supplementation of crude protein (CP) includes:

1) Determining the proper timing and amount of supplementation in relation to a cow's nutritional requirements and forage quality;
2) Choosing the most appropriate type and form of a CP supplement for a given situation and environment;
3) Grouping cows based on BCS to improve the efficiency of CP supplementation;
4) Using a CP supplement to alter cow distribution within a pasture to improve overall pasture utilization;
5) Reducing the frequency of CP supplementation to decrease associated labor and fuel costs.

Introduction

Supplemental CP is needed when the CP content of the forage base is insufficient for a cow to maintain a desired level of production. A review of forage quality research conducted at the Northern Great Basin Experimental Range west of Burns, Oregon indicates that forage CP can be expected to be below requirements for a cow/calf pair beginning in mid-June and for a non-lactating cow beginning in July (Fig. 1). Also, because the forage CP concentration drops with the digestibility of the grass, this results in lower intake and availability of nutrients for maintenance and production. This situation causes cows to lose weight and lower their BCS from mid-summer through weaning. However, intake and digestibility of nutrients can be increased if supplemental CP is provided, which means cows will be in better body condition entering the winter-feeding and/or calving season, will have stronger and healthier calves at calving, and will breed back faster than unsupplemented cows. Nevertheless, CP supplementation is expensive, and cow/calf producers should use a supplementation program that minimizes costs while allowing cows to meet an expected level of production.

The most efficient time to increase cow weight and BCS is the period from weaning to calving. Furthermore, providing adequate nutrition to the cow herd during this period is critical because approximately 80 percent of all fetal growth occurs during 3 months prior to calving (Anthony et al. 1986, Fig. 2). It is difficult, and cost prohibitive, to improve cow body condition following calving. This is because a cow's nutrient requirements are the greatest during lactation. Consequently, nutrition research at the Eastern Oregon Agricultural Research Center (EOARC) has focused on developing nutritional management strategies that reduce feed and supplementation costs while maintaining acceptable levels of performance during the pre-calving period. Strategic supplementation, specifically reducing frequency of CP supplementation, has yielded favorable results. I will discuss this and other relevant data pertaining to the ability of strategic supplementation to improve a cow/calf producer's profitability.

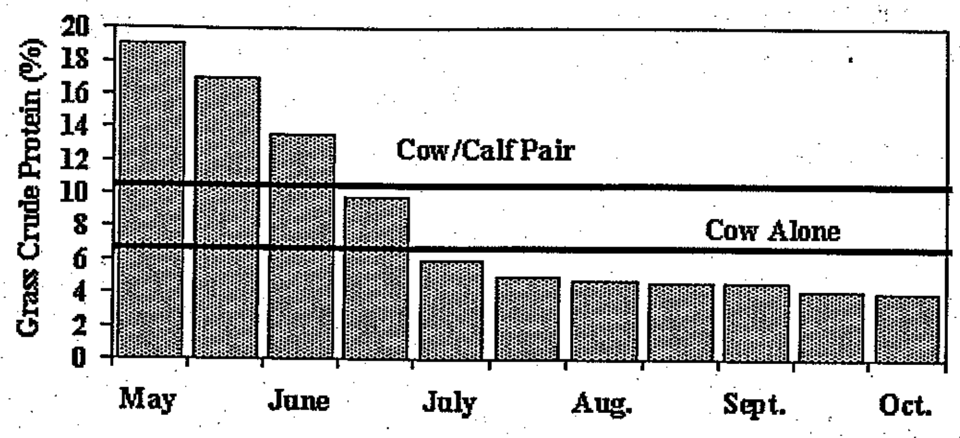

Figure 1. Estimated seasonal crude protein concentration of sagebrush-bunchgrass range and associated requirements of lactating and non-lactating cows adapted from Turner and DelCurto 1991.

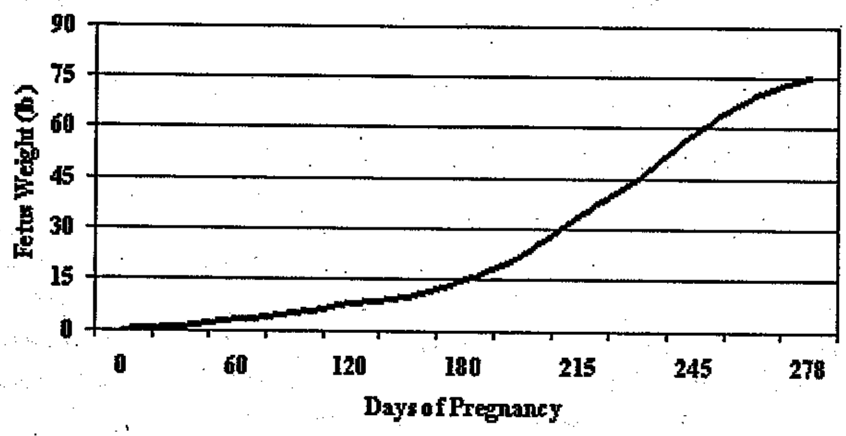

Figure 2. Fetus growth during gestation. Approximately 80 percent of all fetal growth occurs during the last 3 months of gestation adapted from Anthony et al. 1986.

Designing a Crude Protein Supplementation Program

Is CP supplementation necessary?

The first step in preparing a CP supplementation program is to determine if CP supplementation is necessary. This involves obtaining an estimate of forage CP concentration that can be obtained from historical records or, preferably, from analysis of a representative sample of the forage source to be used (pasture, meadow hay, grass seed straw, etc.). Once this information has been collected, along with cow CP requirements that can be obtained from NRC (1984) tables available at your local extension office, a cow/calf producer can determine if CP supplementation is necessary to meet an expected level of performance.

How do I choose a CP supplement?

Most sources of supplemental protein can be grouped into four broad categories. These are:

1) oilseeds and oilseed meals (cottonseed, soybean, canola, sunflower, etc.);
2) animal and grain byproducts (fishmeal, feather meal, brewers grain, distillers grain, etc.);
3) legume hays (primarily alfalfa);
4) non-protein nitrogen (urea and biuret).

In addition, most CP supplements are usually in one of two forms. These are dry feeds (meals, cubes, cakes, pellets, dry or pressed blocks, alfalfa hay, etc.) and liquid feeds (molasses-mixes, hardened molasses blocks or tubs, etc.). Consequently, cow/calf producers have many choices to consider when selecting a source and form of supplemental CP. However, there are a few considerations that beef producers should incorporate into their decision-making process when deciding on a form of supplemental CP. These include supplement delivery method and cost per pound of supplemental CP.

Supplement delivery method

Choosing a supplement delivery method determines if a CP supplement will be hand-fed or self-fed. Hand-feeding involves regularly providing a supplement to animals in a manner that allows rapid consumption (alfalfa, soybean meal, cottonseed cake, etc.), whereas self-feeding involves periodically providing large quantities of supplement with the assumption that animals will consume the supplement in consistent, controlled amounts over an extended period of time (salt mixes, molasses mixes, blocks, tubs, etc.). Self-fed supplements normally require less labor compared with hand-fed supplements; however, they are usually more expensive per pound of CP and normally have a greater variation in supplement intake per animal.

Cost per pound of crude protein

Calculating the cost per pound of CP allows a beef producer to determine which protein source/form is most economical to purchase for use as a protein supplement. For example, assume a beef producer has the option of purchasing alfalfa hay (17 percent CP, $85/ton) or soybean meal (54 percent CP, $250/ton) as a CP supplement and has the facilities and equipment to feed both properly. Which protein supplement is the most economical? Initially, the beef producer may assume alfalfa hay is the best choice; however, when the cost per pound of CP is calculated, it becomes clear that soybean meal (2,000 pounds * 54 percent CP = 1,080 pounds CP; $250/1,080 pounds CP = $0.23/pound CP) is actually cheaper than alfalfa hay (2,000 pounds * 17 percent CP = 340 pounds CP; $85/340 pounds CP = $0.25/pound CP) when expressed per pound of CP. Therefore, soybean meal would be the most economical CP supplement.

Crude Protein Supplementation Strategies

Split the cow herd into low and adequate BCS groups

One of the most cost effective CP supplementation strategies is to split the cow herd into groups based on BCS (1-to-9 scale; 1 being thin and emaciated and 9 being overly fat or obese). This can be a hassle depending on resource (pasture and labor) availability; however, it is worthwhile if planned properly. It is recommended that the cow herd be split into at least two groups, one containing cows with adequate BCS (5 and above) and one containing cows with low BCS (4 and less). This is because research from Texas A&M University (Lamp 1995) has shown cows with a BCS of 4 or less at calving and breeding will not breed back fast enough to maintain a 365-day (one calf per year) calving interval (Fig. 3). Also, compared with thin cows, cows with a BCS of 5 or greater have improved calf health, survivability, and weaning weights. The bottom line is that thin cows cost cow/calf producers money (Table 1). A reduced pregnancy rate, resulting in fewer calves at weaning, is responsible for the largest reduction in net income.

By grouping cows based on their BCS, a cow/calf producer can strategically provide supplemental CP to the thin cows that require additional nutrients. In contrast, if all cows are fed together in one group, cows with an adequate BCS consume supplemental CP that would be better utilized by thin cows. This means that the cows with an adequate BCS are being overfed while the thin cows are being underfed, which is inefficient and results in a more expensive supplementation program, not to mention a decreased number of calves at weaning.

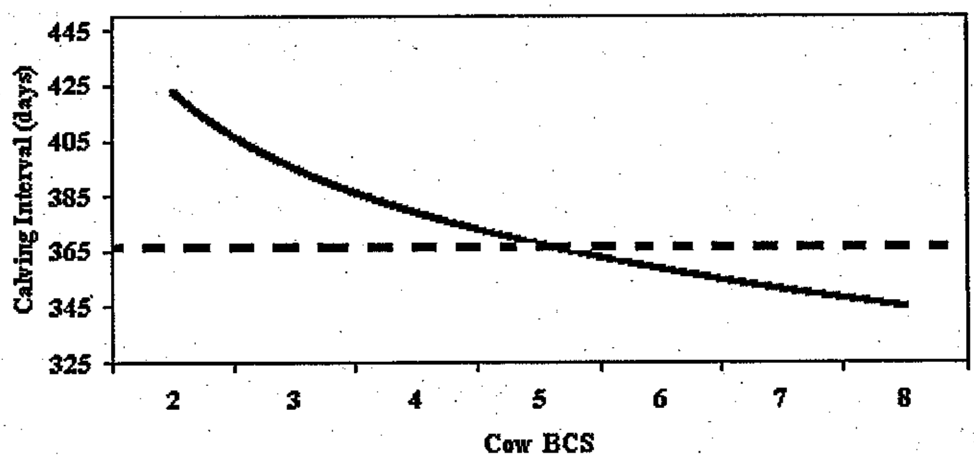

Figure 3. The effect of cow body condition score at breeding on calving interval. The dotted line indicates a 365-day calving interval (one calf per year; adapted from Herd and Sprott 1986).

Table 1. Lost net income per thin cow (BCS 3 or 4) compared to a cow with a BCS of 5 (adapted from Lamp 1995).

	Calf price per hundredweight				
	$60	$70	$80	$90	$100
Cow BCS	Lost net income per thin cow				
BCS 4	$27.82	$39.84	$51.85	$63.86	$75.88
BCS 3	$51.51	$75.53	$99.56	$123.58	$147.60

Supplement placement can affect cow grazing distribution

Strategic placement of a CP supplement can lure cattle to areas of a pasture infrequently grazed, thus potentially improving grazing distribution. A Montana study evaluated the ability of strategically placed dehydrated molasses blocks (30 percent CP) to attract cows to underutilized rangeland and improve grazing distribution (Bailey and Welling 1999). Molasses blocks were moved every 7 to 10 days to areas normally not grazed because of rough terrain and/or distance from water. Grass utilization within 200 yards of supplements was increased from 15 to 20 percent compared with the same area before supplement placement. In contrast, areas of similar terrain and distance from water, with no molasses block present, were found to have no evidence of grazing following a similar period of time. This suggests that strategic placement of CP supplements can increase the total usable area of rangeland pastures, potentially increasing AUM's available to the cow/calf producer.

Decrease supplementation frequency to reduce labor and fuel costs

Providing a CP supplement is expensive. Costs include the supplement and labor, fuel, and equipment associated with supplement delivery. Other than determining the type and quantity of a CP supplement to purchase, a beef producer has little control over supplement cost. However, a beef producer does have significant control over labor and associated supplement delivery costs. Therefore, recent research has attempted to develop CP supplementation strategies that decrease the costs associated with supplement delivery while maintaining acceptable levels of performance.

Research at EOARC has demonstrated that cattle consuming low-quality forage can be provided a natural, high-protein source of supplemental CP (soybean meal, cottonseed meal, etc.) as infrequently as once every 6 days without adverse effects on nutrient intake and digestibility, grazing behavior, or cow performance (Fig. 4) compared with providing a supplement daily (Bohnert et al. 2002, Schauer et al. 2003). In addition, with proper planning and management, CP supplements containing sources of non-protein nitrogen, such as urea and biuret, can be provided every other day with no difference in performance compared to daily supplementation. Likewise, alfalfa can be provided two or three times a week with results similar to daily supplementation.

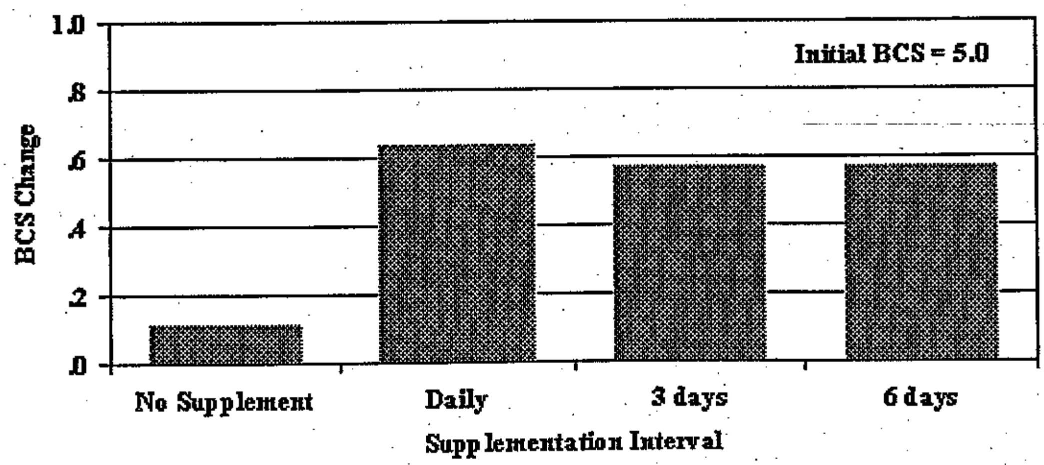

Figure 4. The effect of CP supplementation interval on body condition score (BCS) change of cows consuming low-quality forage during the 3 months prior to calving (adapted from Bohnert et al. 2002).

The primary advantage of infrequent over daily supplementation is the decreased costs associated with supplement delivery. The potential savings in time and labor of infrequent supplementation are provided in Table 2. Assuming that a cow/calf producer will require 3 gallons of fuel ($1.70/gallon) and 2.5 hours of labor ($7.05/hour) for each day supplemental CP is provided, total labor and fuel costs over a 30-day period are approximately $680, $340, $230, and $115 for supplementation every day, once every 2 days, once every 3 days, and once every 6 days, respectively. Based on these figures, infrequent supplementation can reduce total costs associated with supplement delivery from 50 to 80 percent compared with providing a supplement daily. Another way of evaluating the benefits of infrequent supplementation is to look at the time that is available to do something other than providing supplemental CP every day. Using the scenario above, a cow/calf producer would have an additional 37.5, 50, or 62.5 hours available each month for other projects if supplementation occurred every other day, every 3 days, or every 6 days, respectively, compared with daily supplementation (Table 2).

Table 2. Decreased labor and fuel costs associated with infrequent supplementation over a 30-day period.

Item	Supplementation interval			
	Daily	2 days	3 days	6 days
Fuel cost ($)[a]	153.00	76.50	51.00	25.50
Labor cost ($)[b]	528.75	264.38	176.25	88.12
Total costs	681.76	340.88	227.25	113.62
Benefit (hours)	0	37.5	50.0	62.5
Benefit ($)	0	340.88	454.51	568.14

[a] Fuel cost calculated as 3 gallons/supplementation day at $1.70/gallon.
[b] Labor cost calculated as 2.5 hours/supplementation day at $7.05/hour.

Conclusion and Management Implications

The most appropriate method of CP supplementation for one cow/calf producer may not work for all producers. Once CP supplementation is deemed necessary, producers should use economics, the value of convenience, and potential effects on cattle distribution within pasture to determine their most appropriate form of CP supplementation. For example, alfalfa hay may be more economical per pound of CP than a molasses-based block; however, blocks are continuously accessible and do not have to be provided as frequently as alfalfa hay. The difference in cost of alfalfa hay and the molasses block (per pound of CP) is considered the cost of convenience. In addition, continuously available supplements, such as blocks, tubs, liquid mixes, etc., may be more appropriate if altering cattle distribution within a pasture is a consideration. However, infrequently providing a more traditional source of CP (alfalfa hay, soybean meal, cottonseed meal, etc.) can decrease the time and labor associated with supplementation, thereby decreasing the cost of convenience between more expensive sources of CP. Also, infrequent supplementation of traditional sources of CP allows for strategic placement of supplement within a pasture, which may alter cattle distribution.

Infrequent supplementation of CP to cattle consuming low-quality forage can reduce labor and fuel costs by as much as 83 percent compared to daily supplementation without affecting nutrient utilization and performance. However, producers should consider the use of an extension agent or nutritional consultant when designing an infrequent supplementation regime because certain sources of supplemental CP (i.e., urea-containing supplements) can cause toxicity concerns, potentially resulting in death of livestock, if not managed properly.

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INTERANNUAL PRODUCTIVITY IN BURNED AND UNBURNED WYOMING BIG SAGEBRUSH-GRASSLAND

Jon Bates

Summary

Interannual climate variability has a huge impact on forage production in the sagebrush steppe. Forage production tends to be positively correlated with higher crop year (Sept–May) precipitation, but other factors are also important. Temperature, timing of precipitation, and soil nutrient availability also influence forage production. In this study, herbaceous production was evaluated in burned and unburned sagebrush steppe over a 6-year period. Herbaceous production was estimated every 2 weeks by clipping. By clipping frequently we have been able to track current years' production trends and develop a better understanding of how peak production fluctuates at the community and functional group (e.g., perennial grasses, perennial forbs) level.

As expected, dry years generally produce less forage than wet years. However, we also recorded higher productivity in a drought year than in a preceding year when precipitation was higher. Clearly, other environmental factors are interacting with precipitation to affect sagebrush steppe productivity. In dry years, peak production tended to occur earlier in the growing season than in years when precipitation was above or near average. The burn increased herbaceous production when compared to the unburned treatment in the second and third year after fire. During the drought years (fourth–sixth after fire) differences in productivity were minimal between the burned and unburned plant communities.

Introduction

Herbaceous production in the sagebrush steppe is highly variable across years. The variability is linked to the amount and timing of precipitation received over the winter and early spring (Sneva 1982). Past work has focused on the relationship of total peak production and crop year (Sept–May) precipitation. Total peak production is assumed to occur when perennial bunchgrasses are in flower. Because of the focus on bunchgrass productivity, relationships between precipitation and other species and functional groups are not as well quantified. Because of differing phenological development, peak production of other plants in the community may be undervalued.

In this study, we monitored herbaceous productivity every 2 weeks during the course of 6 growing seasons (Apr–Aug). Determining productivity through the growing season provided an index of not only peak community production but peak production for other plant functional groups as well. We placed plants into functional groups based on plant type and growth cycles. We separated current year's growth from total standing crop to quantify year effects to annual productivity. We also compared productivity between burned and unburned treatments.

Methods

The study was located at the Northern Great Basin Experimental Range (NGBER), 35 miles west of Burns, Oregon. The plant community was dominated by Wyoming big sagebrush and native bunchgrasses. Bunchgrasses included Thurber's needlegrass, Idaho fescue, bluebunch wheatgrass, and Junegrass.

Treatments consisted of a burned and unburned community. The burn was conducted in late summer 1997. The burn area was approximately 5.8 acres in size; the unburned community was 7.5 acres. These fields have not been grazed since 1994.