ALFALFA SUPPLEMENTATION OF BEEF CATTLE GRAZING WINTER SAGEBRUSH-STEPPE RANGE FORAGE

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INTRODUCTION

Several studies have been conducted or are planned in the near future to evaluate the efficacy of wintering beef cattle on rangelands in the Northern Great Basin. This research directive is designed to evaluate alternatives to traditional winter management of beef cattle, as well as, alternatives to managing private and public sagebrush-steppe rangelands. The overall objectives are: 1) to determine if grazing cattle during the winter months represents a viable alternative to traditional hay feeding management systems; 2) to evaluate winter grazing as an alternative use of public rangelands within multiple use goals and 3) to define supplementation strategies optimizing cattle performance with efficient use of dormant range forage resources. For all supplementation studies, minimizing supplement inputs (costs and labor) and maximizing the use of the range forage with an acceptable level of beef cattle performance will be the research goals.

EXPERIMENTAL DESIGN

Our research is currently in the second year of a two-year study evaluating graded levels of supplemental alfalfa on beef cattle performance and utilization of the dormant range forage resource. In year 1 (winter of 1989-90), 48 mature gestating Hereford x Angus cows were stratified by age and body condition and allotted randomly within stratification to one of the following treatments: 1) control, no supplement; 2) 1.5 kg supplemental alfalfa pellets (3.31 lbs); 3) 3.0 kg supplemental alfalfa pellets (6.61 lbs) and 4) 4.5 kg supplemental alfalfa pellets (9.92 lbs). In year two (winter of 1990-91), 72 mature gestating Hereford x Angus cows were allotted in the same manner and to the same treatments as year 1. For both years, cows were gathered daily at 0900 to 1200 hours and individually fed their corresponding treatment supplements. Chemical composition of the alfalfa pellet supplement is listed in Table 1. Individual feeding of the cows began in early November and continued through February 21 (year 1) and January 15 (year 2). The second years study was shortened due to a lack of available forage and concern over the health of the unsupplemented control cows. A free-choice trace mineralized salt with vitamin A was provided during both years.

Cow body weights were monitored on a 28-day basis throughout the winter grazing period. Likewise, cow body condition was monitored on a 28-day basis using a one to nine scale (1 = extremely thin, 9 = extremely fat; Neumann and Lusby, 1986). Additional cow weight, body condition and calf weights were (year 1) and will be (year 2) obtained at calving, just prior to breeding and mid-summer.

In addition to cow performance measures, esophageal steers were used to monitor diet quality throughout the winter grazing periods. Four consecutive days of collections were made at the beginning of December, January (for year 1 and 2) and February (year 1, only). Forage intake is being estimated by dosing chromic oxide sustained release boluses to determine fecal output and an internal marker estimate of digestibility. Intake estimates correspond to the same time periods as the esophageal collections during both years. In addition, vibracorders and digital pedometers were used to estimate the influence of graded levels of alfalfa on time spent grazing, pattern of grazing and distance traveled. Results corresponding to forage intake and beef cattle behavior have not been analyzed and, as a result, will be presented at a later date.

Table 1. Chemical composition of supplement and diet selected by beef steers during the winter supplementation period (Year 1).

Item[a]	Alfalfa Supplement	Quality of diet selected			
		December	January	February	SE[b]
Organic matter, %	91.5	73.9	77.7	77.5	1.7
Acid detergent insoluble nitrogen, %	18.9	48.9	50.5	55.3	2.7
		-----% of forage organic matter-----			
Crude protein, %	19.0	6.82	6.28	5.43	.24
Neutral detergent fiber, %	41.3	81.5	79.1	79.0	.84
Acid detergent fiber, %	32.0	72.2	67.1	70.5	.91
Acid detergent lignin, %	6.11	7.81	7.29	9.09	.16

[a]Acid detergent insoluble nitrogen is expressed as percent of the total nitrogen.

[b]SE = standard error of the means (n = 6).

RESULTS

Year 1. Protein concentration and potentially digestible protein declined throughout the winter grazing period (Table 1). Crude protein decreased 20 percent from early December to early February. In addition, acid detergent insoluble nitrogen (ADIN; an estimate of nondigestible nitrogen) tended to increase throughout the winter grazing period and represented as much as 50 percent of the total nitrogen in the selected forage. In contrast, fibrous components of the diet remained relatively stable during the winter grazing

period with the exception of an elevated lignin component during the February sampling period.

Cow weight changes responded in a curvilinear fashion with nonsupplemented cows losing over 60 lbs of body weight during the 112-day supplementation period (Figure 1). In contrast, cows receiving supplemental alfalfa pellets gained weight during the supplementation period with increasing gain with increasing quantities of supplemental alfalfa pellets. The magnitude of gain, however, decreased with increased quantities of supplement above 1.5 kg (3.31 lbs). Cow body condition changes also responded in a curvilinear fashion. Nonsupplemented control cows lost over 1.2 units of body condition, whereas, supplemented cows maintained body condition throughout the winter grazing period (Figure 2).

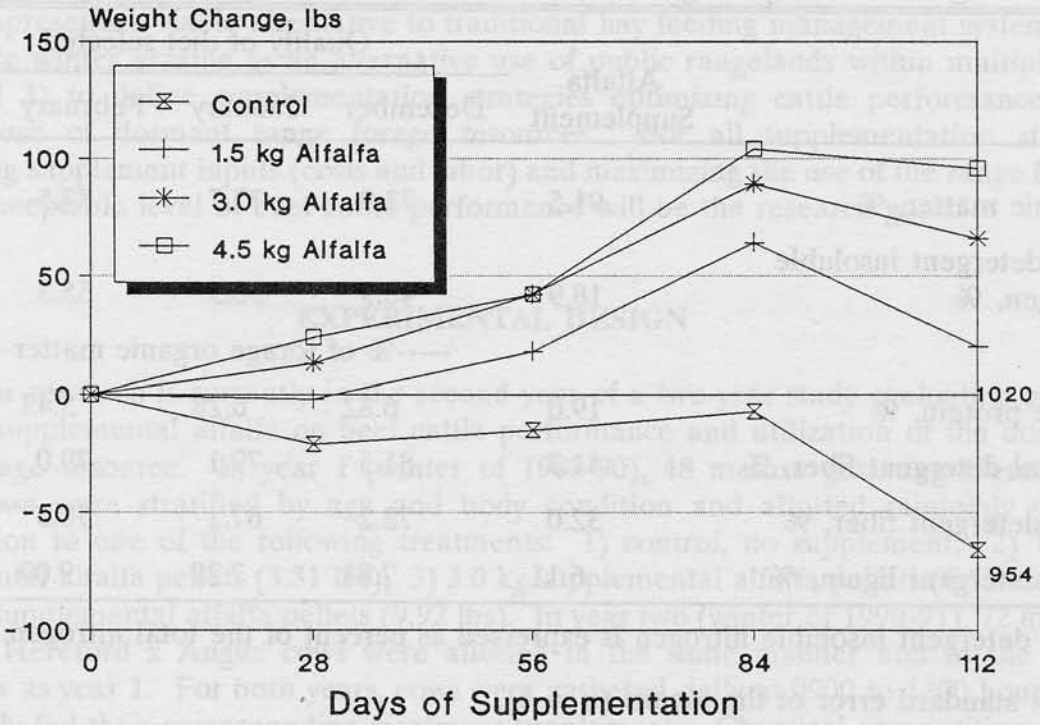

Figure 1. Influence of graded levels of supplemental alfalfa pellets on beef cattle body weight changes during the winter grazing period (Year 1).

The nutritional status during the supplementation period did impact subsequent cow and calf performance. From the end of the supplementation period (day 112, February 21) to calving (avg calving date = April 8), previously unsupplemented cows displayed a compensatory gain in body weight and maintenance of body condition. Cows who had previously received supplemental protein continued to lose weight and body condition. At calving, calf birth weights tended to increase with dams who received increasing levels of supplemental alfalfa pellets (82, 87, 89 and 91 lbs for control, 1.5, 3.0 and 4.5 kg alfalfa

supplement treatments, respectively). In addition, calf average daily gain (first 68 days postpartum) tended to increase linearly with dams who received increasing levels of alfalfa pellets (1.97, 2.07, 2.20 and 2.23 lbs/head/day, respectively).

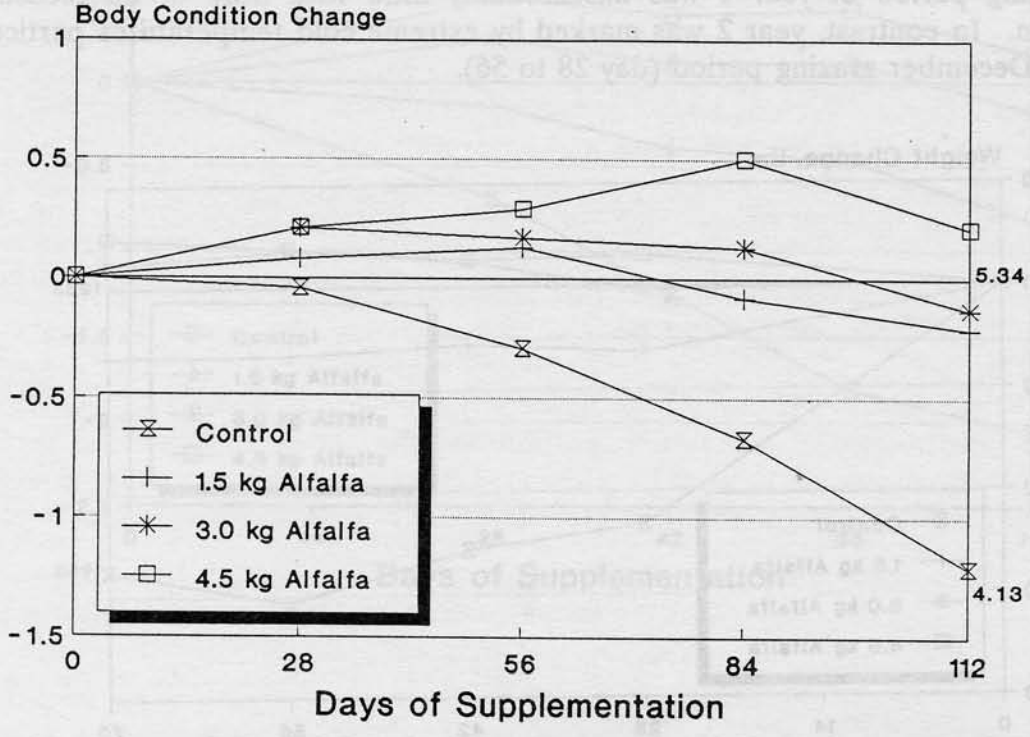

Figure 2. Influence of Graded Levels of Supplemental Alfalfa Pellets on Beef Cattle Body Weight Changes During the Winter Grazing Period (year 1).

Year 2. Similar to year 1, cow body weight changes responded in a curvilinear fashion, however, the magnitude of weight loss was greater than year 1 (Figure 3). Nonsupplemented cows lost 138 lbs, whereas supplemented cows were more able to maintain body weight during the 70-day supplementation period (-34, 12 and 26 lbs gain for 1.5, 3.0 and 5.0 kg supplemental alfalfa treatments, respectively). Body condition changes also responded in a curvilinear fashion with control cows losing over 2 units of body condition during the 70-day supplementation period (Figure 4). In addition, cows receiving 1.5 kg of alfalfa supplement lost .8 units of body condition, whereas, cows receiving 3.0 and 4.5 kg of supplemental alfalfa were able to maintain body condition within .2 units of their initial body condition.

Data pertaining to subsequent beef cow performance and calf performance are currently being collected and will be presented at a latter date.

Difference between beef cattle performance in year 1 versus year 2 may be due to a number of factors. In year 1, a greater amount of forage was available and substantial fall regrowth occurred prior to the winter grazing period. Therefore, the forage may have been more readily available and of higher nutritional quality than year 2. In addition, the winter grazing period of year 1 was unseasonably mild with little or no measurable precipitation. In contrast, year 2 was marked by extreme cold temperatures particularly during the December grazing period (day 28 to 56).

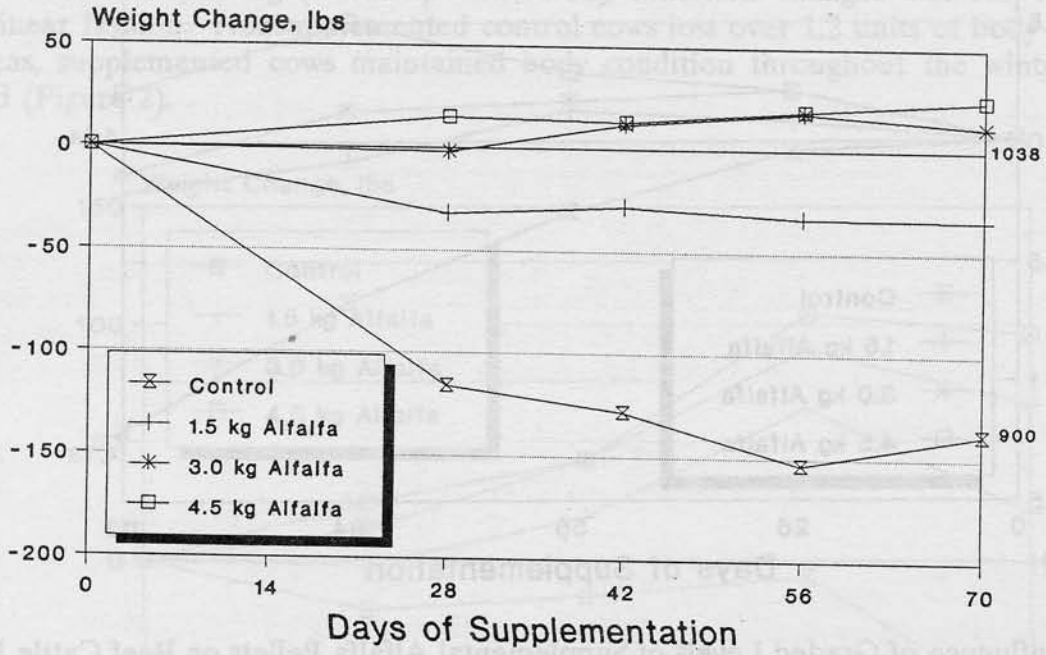

Figure 3. Influence of Graded Levels of Supplemental Alfalfa Pellets on Beef Cattle Body Weight Changes During the Winter Grazing Period (year 2).

DISCUSSION

Responses to supplemental protein are usually observed when the crude protein content of the forage are less than 6 to 8 percent (Campling, 1970; Kartchner, 1981). In addition, the digestibility of the forage and, specifically, availability of the crude protein *modify this estimate (Allden, 1981). Results from this study suggest that beef cattle grazing* winter sagebrush-steppe range forage are deficient in protein. Crude protein concentrations of the selected diets were less than 7 percent and declined throughout the winter grazing period. In addition, approximately 50 percent of the crude protein was found in the nondigestible ADIN fraction.

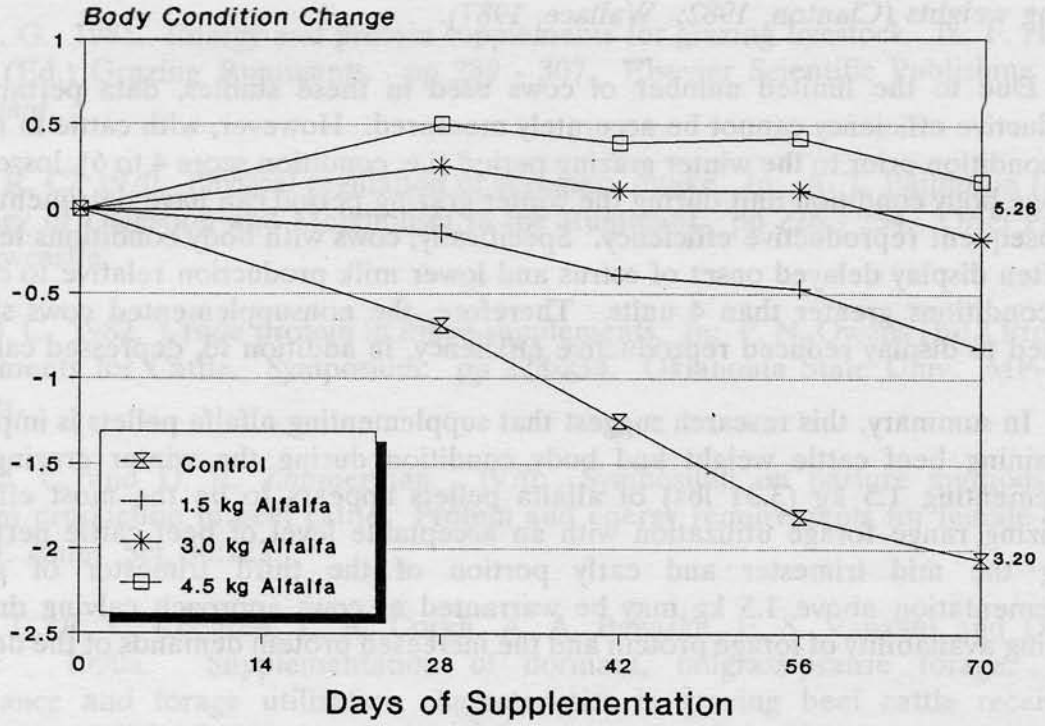

Figure 4. Influence of Graded Levels of Supplemental Alfalfa Pellets on Beef Cattle Body Weight Changes During the Winter Grazing Period (year 2).

Beef cow body weight and condition changes displayed a dramatic response to alfalfa supplementation during both years 1 and 2. The largest improvements in body weight and condition were noted for the 1.5 kg (3.31 lbs) supplementation level relative to nonsupplemented control cows. Cows supplemented 3.0 or 4.5 kg of alfalfa displayed smaller benefits relative to body weight and condition changes during the winter feeding period. This curvilinear nature of the cow performance data suggest that forage intake and digestion is optimized at the lower levels of alfalfa supplementation. High levels of alfalfa supplementation may have actually reduced the quantity of forage consumed. Data corresponding to this hypothesis will be available at a latter date.

Numerous researchers have observed increases in beef cattle performance with the addition of supplemental protein to high fiber, low-quality roughage diets. With mature cows, the benefits are often observed as decreased loss in body weight and condition during the winter feeding or grazing period (Clanton and Zimmerman, 1970; Lusby and Wetteman, 1988; DelCurto et al., 1990a and b). Adequate maintenance of cow body

weight and condition, in turn, tends to promote greater reproductive efficiency and calf weaning weights (Clanton, 1982; Wallace, 1987).

Due to the limited number of cows used in these studies, data pertaining the reproductive efficiency cannot be accurately measured. However, with cattle in moderate body condition prior to the winter grazing period (i.e. condition score 4 to 6), losses greater than one body condition unit during the winter grazing period can have detrimental effects on subsequent reproductive efficiency. Specifically, cows with body conditions less than 4 will often display delayed onset of estrus and lower milk production relative to cows with body conditions greater than 4 units. Therefore, the nonsupplemented cows should be expected to display reduced reproductive efficiency, in addition to, depressed calf ADG.

In summary, this research suggest that supplementing alfalfa pellets is important in maintaining beef cattle weight and body condition during the winter grazing period. Supplementing 1.5 kg (3.31 lbs) of alfalfa pellets appears to be the most effective in optimizing range forage utilization with an acceptable level of beef cattle performance during the mid trimester and early portion of the third trimester of gestation. Supplementation above 1.5 kg may be warranted as cows approach calving due to the declining availability of forage protein and the increased protein demands of the developing fetus.

FUTURE RESEARCH

Research tentatively planned for the winter of 1991-92 will evaluate both long stem alfalfa hay verses sun-cured alfalfa pellets and feeding daily verses alternate days. The treatment structure will be a 2x2 factorial contrasting the following treatments:

1) Long stem alfalfa hay fed on a daily basis
2) Long stem alfalfa hay fed on a alternate day basis
3) Sun-cured alfalfa pellets fed on a daily basis
4) Sun-cured alfalfa pellets fed on a alternate day basis

The alfalfa supplements will be derived from the same cutting of alfalfa and, on a alternate windrow basis, harvested as sun-cured pellets or long stem alfalfa hay. All cows will be fed the equivalent of 5 pounds of supplement per day. Cows will be gathered daily and individually fed their corresponding treatment supplements. Measures of interest will be the same as those described in the previous studies.

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