

Effects of Self-Fed or Hand-Fed Protein Supplements on Cattle Grazing
Patterns, Low-Moisture Blocks Versus Range Cake

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Introduction

Protein supplements are used to improve forage digestibility of cows grazing dormant, low-quality forage in the fall and winter. Supplemental protein can be delivered to cows on rangeland in a variety of forms. Large cubes (range cake) can be hand-fed to cattle at various schedules (e.g., daily, every other day, 3 times per week, once a week). Protein supplements can also be self-fed using liquid, pressed block, chemical block and low-moisture block delivery systems. Self-fed systems allow cattle to have continuous access to the supplement. Intake of the supplement is controlled by a variety of methods, such as chemical agents or the hardness of the product. Low-moisture blocks (LMB) can be used to improve the uniformity of grazing on rugged rangeland (Bailey and Welling 1999, Bailey et al. 2001). Through strategic placement of LMB, cattle can be lured to underutilized areas. Hand-fed range cake also appears to change cattle grazing patterns. Cattle increase their visits to areas where range cake is fed (Ganskopp et al. 2002). Range cake is typically fed in accessible areas where vehicles can travel on a regular basis. In rough topography or in extensive pastures, the areas where range cake can be reasonably delivered are limited. In contrast, LMB can be placed in more remote and rugged areas, because it need only be delivered once every 2 weeks.

Objective

The objective of this study was to compare the grazing patterns of cows fed range cake using a typical feeding schedule of 3 times per week to the grazing patterns of cows fed low-moisture blocks. We hypothesized that cows would frequent the areas where supplements are placed.

Methods

Study area. The study was conducted at the Thackeray Ranch, which is part of Northern Agricultural Research Center (NARC) and is located approximately 17 miles south of Havre, MT. Two pastures (Anderson and Arches) were used in the study. The Arches pasture is 638 acres of rangeland composed primarily of Kentucky bluegrass, bluebunch wheatgrass and rough fescue. Bullhook Creek flows through the northeast corner of Arches pasture. The Anderson pasture is 815 acres of rangeland composed primarily of Kentucky bluegrass and rough fescue. Bullhook Creek bisects the Anderson pasture. Both pastures were grazed from mid October through December 2002. Forty cow-calf pairs grazed Anderson pasture for 2 weeks in late May 2002. Forty cow-calf pairs grazed Arches pastures during June 2002. Forage in these pastures regrew after grazing in early summer 2002 because of abundant rainfall (approximately 13.5 inches during the period between May and August 2002). The total standing crop at the beginning of the study was 1230 ± 170 lbs/acre in the Anderson pasture and 1300 ± 230 lbs/acre in the Arches pasture. Standing crop of grass was 1100 ± 140 lbs/acre in the Anderson pasture and 890 ± 150 lbs/acre in the Arches pasture. Standing crop of forbs was 130 ± 60 lbs/acre in the Anderson pasture and 410 ± 110 lbs/acre in the Arches pasture.

Cattle. A total of 160 crossbred cows of Hereford, Tarentaise, Angus, Charolais, Piedmontese and Salers breeding were used in the study. Cows were non-lactating (after weaning) and ranged in age from 3 to 10 years. Calves were weaned on October 1, 2002, and the study began on October 17, 2002. All cows had been exposed to LMB prior this study. None of the cows were exposed to range cake prior to the study. Cows were randomly assigned to 2 treatment groups, supplementation with LMB or supplementation with range cake (cubes). During the interim between weaning (Oct 1) and the beginning of the study (Oct 17), the 81 cows assigned to the LMB treatment grazed in the Horse pasture and were supplemented with LMB. The range cake group (79 cows) grazed in the Hay pasture during the interim. Cows in this group were fed range cake daily during the interim period to familiarize them with the supplement and to train them to come to a horn call. Cake was first fed in a small (1 acre) lot, and after a few days it was fed in the pasture.

Cows were weighed and body condition scored (1 emaciated – 9 obese) at weaning (Oct 1, 2002 - 2 weeks prior to the study) and on January 2, 2003 (2 weeks after the end of the study).

Feed. The range cake was 20% crude protein (CP) cube that used an all-natural protein source (no urea). This cube was produced in the local area (Chester, MT) and is typical of what is used by local producers. During initial training (interim period), cows were fed 2 lbs/head/day. During the study, cows were fed 3 times per week, and 4 lbs/cow were delivered at each feeding.

The LMB contained 30% CP. Barrels (250 lbs/barrel) were at the rate of 1 barrel for every 20 to 25 cows (4 barrels).

Two 50 lb white salt blocks were available for each treatment group.

Feed placement. For the hand-fed range cake treatment, supplement was delivered 3 times per week (usually Monday, Wednesday and Friday) at approximately 11:00 am. The vehicle delivering the range cake used 2-track roads and reasonable terrain to travel to the area where most of the cows were observed or the closest area nearby that could be reasonably accessed by a vehicle. (The definition of reasonably accessible was an existing 2-track road or off-road locations that did not require 4-wheel drive during dry weather and did not contain abundant obstacles such as rocks or trees.) After driving to the location with the majority of cows, the vehicle horn was sounded and the cows called to the vehicle. When 3/4 of the herd arrived, feeding began. In cases when it was apparent that the herd was widely separated in 2 general locations, the 2 subgroups were fed separately using the same protocol. The location of range cake feeding sites were located with a GPS receiver (Trimble GeoExplorer™) capable of an accuracy of within 2 meters (m).

The LMB were placed in difficult terrain as defined in earlier studies (Bailey and Welling 1999 and Bailey et al. 2001). Placements of 4 barrels remained in the same

location for 2 weeks and then changed to a new site within difficult terrain. Barrels were placed in areas that were somewhat protected from the prevailing southwest winds (e.g., coulees, northeastern aspects, near trees and brush). Cows were herded to the LMB and nearby salt on the day that it was first placed there. In contrast, cows in range cake group were not herded to the salt placement areas. In contrast, they were called to the site where range cake was fed.

Cattle handling. The study was divided into 4 periods (2 weeks / period). During the first 2 periods, LMB were placed in the Anderson pasture and range cake was fed in Arches (randomly selected). Cows selected for the self-fed treatment grazed in the Anderson pasture and cows selected for the hand-fed cake treatment grazed in Arches pasture. During the third and fourth periods, LMB was placed in Arches and cake was fed in Anderson. Cows from each treatment group were switched to the other pasture at the end of the second period. Cows in self-fed treatment group grazed in Arches and cows in the hand-fed group grazed in Anderson.

Four to 8 randomly-selected cows from each group were tracked using Lotek GPS 2200 collars at 10-minute intervals for 2-week periods. Collars were placed on other set of randomly selected cows during the next period. In the 8 weeks of the study (4 periods), 23 cows in the LMB treatment and 22 cows from range cake treatment were tracked for full 2-week periods. Three other cows had complete data for over 7 days and were included in some of the analyses. Roughly 30% of the cows used in the study were tracked.

Behavioral measurements obtained from GPS collars. Geographic coordinates obtained from collared cows were differentially corrected so that the accuracy was within 10 m. The elevation, slope, distance to supplement, and minimum distance to water were calculated for each recorded location using an USGS digital elevation model in a geographic information system (ArcView™). Locations for each cow were averaged and used in the statistical models. Variables that were calculated were the mean elevation, slope and minimum distance to water. These were further divided into the mean elevation, slope and distance to water during daylight and night hours. The average time spent within 100 m of cake and LMB were also evaluated. The average distance traveled per day was calculated by summing the distances between successive recorded locations of each cow.

Other behavioral measurements. Two times per week (e.g., Wednesday and Thursday) observers, usually on horseback, recorded the locations of cows in each pasture. The purpose was to ensure that the grazing patterns of collared cows in each group were representative of the 2 herds. Over the study, timing of observations was coordinated so the locations of cows in the herds were recorded in both the morning and afternoon. Observations were collected during mid morning (9:00 to 10:00 AM) or mid afternoon (1:30 to 3:00 PM).

Vegetative measurements. At the end of second and fourth periods, forage utilization measurements were collected in each pasture. Height-weight relationships

based on stubble height measurements were used to determine forage utilization (Cook and Stubbendieck 1986). Approximately 100 transects were collected in each pasture. Each pasture was divided into 100 x 100 m grid cells and utilization measurements were collected in about 1 out of 3 cells. Selected cells were distributed across the pastures. Locations of transects within cells were randomly located.

Range cake waste estimates. Two protocols were used to estimate amount of range cake that was not consumed or wasted. When there was no snow cover, 3 plots (4 x 40 m) in the area where cake was fed were carefully observed and raked. The number and size of range cake cubes in this area were recorded so the total weight of unconsumed cake could be estimated from each feeding. This approach was used to revisit locations where cake was fed 2 to 4 days earlier. However, this approach did not work when there was snow cover.

When cake was fed on snow, our approach was to revisit feeding sites after the snow melted (e.g., after chinook winds or warm weather). Evidence of the range cake cubes was visible even when there was deterioration of the cube itself. The weight of the wasted cake was calculated from the number of observed cubes times the average weight of a cube.

Statistical analyses. For changes in cow weight and body condition score, the statistical model included treatment (LMB and range cake), age (3, 4, 5 and 6+ years), and cow breed. The residual (variation among cows) was used as the error term. For terrain use (observations and GPS collars), the statistical model included treatment, block, and the block x terrain interaction. Blocks were considered as the general site where LMB and salt was placed. There were 2 locations in each pasture where LMB and salt (both treatments) was placed. Thus, these general placement areas (blocks) were used in a latin-square design. The block x treatment interaction (3 df) was used as the error term.

For utilization data, the dependent variable was the change in forage utilization between measurements. The terms used in the model are listed in Table 6. Interactions between treatment and terrain attributes were used to evaluate if the treatment affected how cows used the terrain. A paired t-test was used to compare grazing use (change in forage utilization) of the 10 highest utilization transects in each pasture when LMB or range cake was fed.

Economic analyses. Simple economic analyses were also completed. Required labor, travel, and other data needed for economic evaluations were recorded and evaluated so the costs for each treatment could be determined. The objective of this economic analysis was to calculate costs for each treatment so producers can readily compare treatments on an expenditure basis.

Results

Supplement and salt intake. Intake of LMB was 0.70 lbs/head/day. Range cake was fed at a rate of approximately 12 lbs/head/week. Actual feeding rates are listed in Table 1. Cows that were self-fed LMB consumed more ($P = 0.04$) salt than cows that were hand fed range cake (Table 1).

Table 1. Mean estimated intake of supplemental feeds during the study. Estimated intakes reflect disappearance of low-moisture blocks (LMB) and salt. Intake of range cake is based on the amount fed to the cows.

Treatment	n	Intake (lbs/head/day)		Intake (oz/head/day)	
		Supplement	SE	Salt	SE
LMB	4	0.70	0.11	0.46	0.07
Range cake	4	1.69	-	0.13	0.07
P-value		-		0.04	

Cow weights and body condition scores. At weaning (October 1, 2002) about 2 weeks before the study, mean cow weight in the self-fed LMB treatment and hand-fed range cake treatment was similar ($P = 0.8$). About 2 weeks after the end of the study (January 2, 2003), mean cow weight in both treatment groups was similar (Table 2). Cows gained roughly 80 lbs during this 3 month period. Average daily gain (ADG) was similar ($P = 0.7$) for both treatments, and the overall ADG was 0.89 lbs/head/day. Body condition scores (BCS) followed the same trend as live weight (Table 2). Body condition scores before and after the study were similar ($P \geq 0.3$). Overall, BCS of cows in both treatments increased by an average of 0.5 units. Younger cows tended to gain more weight during the study than older cows ($P = 0.08$). The 3 year-old cows gained 106 lbs during the study (1.14 ADG) while the 6 year-old or older cows gained 67 lbs (0.72 ADG). The 4 and 5 year-old cows were intermediate with average gains of 84 (0.90 ADG) and 81 lbs (0.87 lbs), respectively. Cow age was not an important factor for explaining differences in BCS ($P = 0.4$). Cow breed was an important factor for explaining variation in weight gain and BCS ($P < 0.05$).

Table 2. Changes in weight and body condition scores for cows fed low moisture blocks (LMB) and range cake during the study.

Trait	LMB	SE	Range cake	SE	P-value
October wt (lbs)	1346	15	1364	15	0.8
January wt (lbs)	1431	16	1423	16	0.9
ADG (lbs/head/day)	0.91	0.06	0.86	0.06	0.7
October BCS	5.8	0.06	5.8	0.06	0.6
January BCS	6.2	0.07	6.3	0.07	0.3
Change in BCS	0.4	0.05	0.5	0.07	0.6

Terrain use. Low-moisture blocks were placed at higher elevations and on steeper slopes than the locations where range cake was fed (Table 3). Low moisture blocks were placed at higher elevations than the pasture averages. These areas typically received less grazing use than lower elevations. For both treatments, salt was placed in the same general area as the LMB was placed, higher elevations and generally steeper slopes.

Table 3. Terrain attributes for the Anderson and Arches pastures and the average terrain attributes for low-moisture blocks (LMB), range cake, and salt placement sites. For each pasture, the average, minimum, and maximum values for elevation (feet), horizontal distance to water (miles), and slope (%) are presented. Only averages of these terrain attributes are presented for the supplement placement sites.

Pasture	Pasture terrain			Supplement Placement			
	Elevation	Distance to H2O	Slope	Type	Elevation	Distance to H2O	Slope
Anderson				LMB	3876	0.34	26.2
Average	3678	0.33	20.7	Salt - LMB	3872	0.33	29.6
Minimum	3464	0.00	0.1	Range cake	3678	0.21	14.8
Maximum	4030	0.79	82.0	Salt - cake	3821	0.34	19.8
Arches				LMB	4100	0.33	18.7
Average	3990	0.33	23.3	Salt - LMB	4085	0.32	21.1
Minimum	3679	0.00	0.1	Range cake	3952	0.38	11.3
Maximum	4383	0.76	86.2	Salt - cake	4089	0.26	18.4

Collared cows that were self-fed LMB used higher elevations ($P = 0.06$) than collared cows that were hand-fed range cake (Table 4). There were no significant differences between cows fed LMB and range cake for mean slope use ($P = 0.16$) or horizontal distance traveled to water ($P = 0.18$). Results were similar for the day and night periods (Table 5). Cows fed LMB used higher elevations during the day ($P = 0.08$) and at night ($P = 0.09$) than cows fed range cake. At night, cows fed LMB tended to use steeper slopes than cows fed cake ($P = 0.10$). Daylight slope use and the average distance to water during the day and night periods were similar for both treatments ($P > 0.1$).

Table 4. Mean terrain use by cows self-fed low-moisture blocks (LMB) and hand-fed range cake based on GPS tracking collar data (24 hour basis).

Terrain attribute	LMB	SE		Range cake	SE	P-value
Elevation (m)	1177	3		1164	3	0.06
Distance to water (m)	646	16		691	16	0.18
Slope (degrees)	8.04	0.39		6.90	0.40	0.16
Elevation (feet)	3862	10		3819	10	0.06
Distance to water (miles)	0.40	0.01		0.43	0.01	0.18
Slope (%)	17.9	0.9		15.3	0.9	0.16

Table 5. Mean terrain use by cows self-fed low-moisture blocks (LMB) and hand-fed range cake based on GPS tracking collar data during daylight and night.

Terrain attribute	LMB	SE		Range cake	SE	P-value
Daylight						
Elevation (feet)	3857	11		3817	12	0.08
Distance to water (miles)	0.37	0.01		0.41	0.02	0.17
Slope (%)	17.3	0.7		14.7	0.7	0.11
Night						
Elevation (feet)	3880	13		3835	15	0.09
Distance to water (miles)	0.39	0.02		0.44	0.02	0.18
Slope (%)	16.0	0.5		13.7	0.6	0.10

To evaluate the degree that cows remained near supplement, we compared the time that collared cows spent within 100 m of supplement placement sites (Figure 1). Cows spent more time ($P = 0.03$) within 100 m of LMB than range cake placement sites. Cows spent an average of 283 minutes (4 hours and 43 minutes) within 100 m of LMB and an average of 53 minutes within 100 m of range cake feeding sites. The acreage within 100 m of LMB was somewhat larger than acreage within 100 m of range cake. Another analysis that accounted for these differences resulted in a nearly identical finding; cows spent more time ($P = 0.04$) within 100 m of LMB than within 100 m of range cake feeding sites. When cows were initially fed range cake, they spent an average of 70 minutes within 100 m of the feeding site. Most of the time (64%) cows went to another location to graze after traveling away from the site where cake was fed, and 36% of the time cows went to water after being fed cake. Cows sometimes returned the location where cake was fed. During the first 24 hours after cake was fed, cows spent an average of 94 minutes (1 hour and 34 minutes) within 100 m of the site where cake was fed. This value includes the time spent near the site during the initial feeding period (70 minutes). During the next 24 hours after feeding (24 to 48 hours after feeding), cows spent an average of 22 minutes within 100 m of the feeding site.

Cows visited LMB (collar location within 10 m of barrel) on an average of 38 percent of the days evaluated, or about once every 2.6 days. Cows spent an average of 48 minutes per day within 10 m of LMB. Thus, cows spent about 127 minutes at LMB during a visit. Only 2 out of 24 collared cows (8%) did not visit LMB during the study. In the range cake treatment, 4 of the 79 cows (5%) consistently came to where the cake was fed, but they were never observed consuming cake. They stood about 10 to 20 m from the line of cake placement while the other cows searched and consumed the cubes.

Activity. Data collected from the vertical movement sensor can reflect the overall activity of collared cows. Cows that are active have vertical sensor movements of 25 or more movements per minute while cows that are inactive (resting) have readings of less than 25 per minute. In this study, the proportion of time that cows were active was similar ($P = 0.8$) for both treatments. Cows that were supplemented with LMB were active 54.8 ± 3.2 % of the time, while cows supplemented with cake were active $56.3 \pm$

3.6 % of the time. The type of supplement did not affect the activity of the collared cows. Cows were active slightly more than half the time.

Time spent near water. Although the means were numerically less for LMB than the cake treatments (Figure 2), differences in the time that cows spent within 10, 50 and 100 m of water were not statistically significant ($P > 0.1$). Overall, collared cows spent just over an hour each day within 10 m of water and just over 2 hours each day within 50 m of water. Cows spent about 2.5 hours each day within 100 m of water. Bullhook creek was a primary water source in both the Anderson and Arches pastures. The topography and woody vegetation near the creek provides excellent protection from strong winds.

Distance traveled. The distance traveled each day was similar ($P = 0.2$) for each treatment group. Mean distance traveled for cows fed LMB and range cake was 2.6 ± 0.2 and 3.2 ± 0.2 miles / day, respectively.

Forage utilization. During the study, forage utilization increased by an average of 5 percentage points during 2 periods (1 month). Differences in elevation within a pasture did not affect forage use ($P = 0.17$). Forage utilization was also not affected by distance to water ($P = 0.7$). However, forage use decreased ($P < 0.001$) with steeper slopes (Table 6). Steep slopes affected forage utilization to a lesser degree when LMB was used as a supplement, as compared to range cake. The slope by treatment interaction was important ($P < 0.001$).

Table 6. Least squares constants (regression coefficients) for factors affecting changes in forage utilization during 2 periods (1 month).

Parameter		Estimate	SE	P-value
Intercept	-	15.4	3.9	0.001
Treatment	LMB	3.3	4.8	0.5
	Range cake	0.0		
Pasture	Anderson	-5.6	1.8	0.002
	Arches	0.0		
Elevation		-0.01	0.04	0.9
Elevation x treatment	LMB	-0.06	0.05	0.19
	Range cake	0.0		
Distance to water		0.01	0.01	0.3
Distance to water x treatment	LMB	-0.01	0.01	0.07
	Range cake	0.0		
Slope		-1.07	0.20	0.001
Slope x treatment	LMB	0.96	0.27	0.001
	Range cake	0.0		

Forage utilization was measured at 20 locations that were located in some of the highest areas of each pasture (10 per pasture). Specifically these were locations that were 1 standard deviation above the average pasture elevation based on grid cells (10 x

10 m) in the digital elevation model (DEM) of each pasture. Using a paired t-test, change in forage utilization was evaluated at these 20 sites. The change in forage utilization was greater ($P = 0.004$) when self-fed LMB was provided than when range cake was hand fed. Forage utilization increased by 17 ± 4 percentage points when LMB was supplemented and decreased by 2 ± 4 percentage points when range cake was fed. (Note: that negative change in forage utilization is impossible during the dormant seasons, fall and winter. A negative change in forage utilization reflects sampling errors.).

Cattle herd observations. Least squares means of the elevation of cows when they were observed during the mid-morning and early afternoon were not different ($P = 0.2$), but these means followed the same trends as those recorded by the GPS tracking collars (Table 7). The observed cows in the LMB and range cake treatments were observed at similar distances from water ($P = 0.7$) and slopes ($P = 0.8$).

Table 7. Average terrain use of cows observed during mid morning and mid afternoon. Values reflect locations of the cow herd recorded by human observers.

Terrain attribute	LMB	SE		Range cake	SE	P-value
Elevation (m)	1160	5		1148	5	0.2
Distance to water (m)	313	63		336	63	0.7
Slope (degrees)	11.3	0.8		11.8	0.8	0.8
Elevation (ft)	3805	16		3766	16	0.2
Distance to water (miles)	0.19	0.04		0.21	0.04	0.7
Slope (%)	25.1	1.8		26.2	1.8	0.8

Wastage of range cake cubes. A total of 7 range cake feeding sites were evaluated to estimate the amount of cubes that were unused and wasted. The mean total estimate of wasted cubes was less than 0.1 lb (29 ± 13 g) per feeding. At 3 feeding sites, no evidence of unused range cake cubes were observed.

Economic analyses. This economic analysis is based on the following assumptions. Each trip to place LMB or range cake required a total of 50 miles of travel. Over the study, distance traveled during each trip varied by less than 3 miles of this value. The federal mileage value of \$0.36 / mile was used to estimate the cost for fuel, maintenance and depreciation. Our cost estimates for the use of the 4-wheeler used in LMB supplement placement are low so we used the federal mileage rate for the 4-wheeler. The value for labor was \$10 / hour. For the self-fed supplement treatment, 1 trip was required each week. LMB was placed once every 2 weeks and the cows were checked once during interim between LMB placements. For the hand-fed treatment, range cake was fed 3 times per week. See Appendix 1.

Overall, LMB was less expensive to feed than range cake. The total cost per head per day for LMB was \$0.29 per day. For range cake, total cost was \$0.40 per head per

day. The required labor and travel (mileage) were less for the self fed LMB than for the hand-fed range cake (Appendix 1).

Discussion

Cow performance. During the study, cows from both treatments gained weight and performed well. Above average summer precipitation resulted in abundant forage for the study (over 900 lbs / acre of grass). There were no differences in live weight gain or body condition score between treatments. On average, cows fed range cake consumed 0.13 lbs / head / day more crude protein than cows fed LMB. However, this difference in average crude protein intake did not affect cow performance.

Terrain use. Low moisture blocks were placed in higher and generally steeper terrain than where range cake was fed. This was a planned part of the study. Low moisture blocks can be placed in rougher terrain than range cake because LMB only need to be set in the pasture once every 2 weeks. Producers typically feed range cake near 2 track roads or in easy or moderate terrain because of additional vehicle wear and tear required to haul supplement in rugged topography.

Collared cows fed LMB used higher elevations than cows fed range cake. Although the p-value for this comparison is 0.06, it was based on an F-test using the block x treatment interaction as the error term (1, 3 degrees of freedom). Essentially, thousands of locations recorded from 48 collared cows were reduced to 8 numbers. This type of study is difficult to replicate because of the need for management scale herd and pasture size. Thus, a p-value of 0.06 should be considered significant in this experimental design. Differences in slope use between treatments were not significant, except at night when slope use by cows fed LMB tended to be greater than cows fed cake. Cows often loafed near LMB sites which were located on or near steeper slopes. Cows fed range cake sometimes traveled further from water than cows fed LMB, but the differences were not significant. Although LMB was placed in high terrain, these LMB placements were not relatively far from water.

Terrain of the two treatment groups recorded by observers followed the same trend as those recorded by the GPS collars, but the differences between treatments were not statistically significant. Cows were observed during mid morning and mid afternoon. Cows often are traveling to or from water during these periods. Unfortunately because of distance, labor and climatic restraints, these were the only times that observations could be practically obtained. As in the GPS collar data, all the observed data were reduced to a total of 8 numbers (same statistical model). The mean observed elevation for cows fed LMB was numerically greater than the mean observed elevation for cows fed range cake.

As in other published studies (e.g., Mueggler 1965), the analysis of forage utilization data shows that forage use declines rapidly with steeper slopes. For cows fed range cake, forage utilization declined roughly 1.07 percentage points for every 1 degree (2.22%) increase in slope. For the LMB treatment, forage utilization declined roughly 0.11 percentage points for 1 degree increase in slope. This data suggests that the strategic

placement of LMB supplement increased forage utilization on steep slopes that typically receive less use. The forage utilization measurements collected in the higher elevations in each pasture supports the data recorded by the GPS collars. Forage use in higher elevations was greater when LMB fed as opposed to periods when range cake was used.

Use of supplements. Cattle use of LMB in this study was similar to the levels observed in earlier studies conducted at NARC. Twenty-two of 24 collared cows visited LMB at least once. Cows visited LMB about once every 2.5 days. Cows were fed range cake once every 2.3 days per week (3 times per week). Even though cows were hand fed and almost every cow came to the truck when called, 4 cows consistently did not consume any of the range cake cubes. Visual observations noted during feeding suggest that there is significant individual animal variation in intake of range cake. Some cows appear very adept at locating and consuming range cake cubes, while others consistently follow the truck or the person feeding the cake. This behavior appears to limit intake rate. A formal study measuring individual variation in intake of hand-fed supplements under range conditions appears warranted. Cows wasted very little of the range cake. Of the 7 feeding sites measured, the maximum estimate of wastage was a total of 86 g or 0.06%. On 3 of the 7 feeding sites, we could not find any evidence of any cubes. The primary source of waste was cubes that touched fecal material.

Cows spent much more time within 100 m of LMB than within 100 m of range cake feeding sites (Fig. 1). After consuming the cake, cows usually began grazing or traveled to water. As opposed to LMB, cows spent little time in the area where range cake was fed after they first left. There was little incentive to return to the area where range cake was fed, because it was rarely fed in the same general location on consecutive feedings. Cows were more sensitive to the presence of the feeding truck than to a specific location. Anecdotal observations noted that cows began to travel to the feed truck when they first saw it enter the pasture. As soon as cows heard the horn sound, they began to travel rapidly to the truck, often trotting or running. Minimal changes in behavior of cows supplemented with LMB were noted when the truck horn sounded.

Our cost estimates for supplementing cows with LMB was 29 cents per head per day and 40 cents per head per day for range cake. Although feed costs was less for range cake (16 cents per head per day) than for LMB (20 cents per head per day), the higher costs for labor and travel required for the range cake made it more expensive to feed.

Conclusions

Performance of cows supplemented with LMB was the same as cows fed range cake. The increased labor and travel requirements required for hand-feeding range cake made it more expensive to feed than LMB. Because LMB only has to be placed biweekly, strategic placement can be more readily applied than hand feeding range cake. Cows spent more time near LMB and used higher terrain than cows that were hand fed range cake. Strategic supplement placement of LMB is a more practical and effective approach than hand feeding range cake to lure cattle to graze high and rough terrain that typically receives little use.

Literature Cited

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Appendix 1

Cake – LMB Study 2002

Cost Analysis

Cake – 20% CP Beef Cubes

Study Length 63 days

Cattle No. 79

Criteria:

Cake Cost - \$187.20 per ton includes \$12.00 per ton freight.

Feed schedule - 3.79 lbs. per head per feeding, 3 times per week.

Total cake fed – 8400 lbs.

Labor - \$10.00 per hour.

Feeding – 2.5 hours, 3 times per week.

28 feedings (9.3 weeks).

Travel - 0.36 cents per mile 50 miles per feeding.

Total Costs:

Cake	8400 lbs	\$786.24
Travel	1400 miles @ 0.36	\$504.00
Labor	70 hours @ \$10.00	<u>\$700.00</u>
		\$1990.24

Cost per head per day – 0.40 cents

Cost of cake per head per day – 0.16 cents

Cost of travel per head per day – 0.10 cents

Cost of labor per head per day – 0.14 cents

Cake – LMB Study 2002

Cost Analysis

LMB – BFG 30 % CP Low Moisture Block

Study Length 63 days

Cattle No. 81

Criteria:

LMB Cost - \$578.00 per ton.

Fed free choice, barrels moved to a new site every two weeks/and or replaced if empty.

Labor - \$10.00 per hour to place barrels and check cattle.

5 hours to set up barrels or replace – 5 times.

5 hours (twice) to check cattle every other week.

Travel – 0.36 cents per miles 50 miles per trip.

Place barrels in pastures and check cattle weekly.

Total Costs:

LMB 3572 lbs.	\$1032.33
Travel 400 miles	\$144.00
Labor 30 hours	<u>\$300.00</u>
	\$1476.33

Cost per head per day – 0.29 cents

Cost of LMB per head per day – 0.20 cents

Cost of travel per head per day – 0.03 cents

Cost of labor per head per day – 0.06 cents





