The Effect of Pre-Calving Energy Level on Cow Performance

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ABSTRACT

Wintering cows is one of the most costly phases of beef cattle production. The cost of hay continues to increase as does the cost of fossil energy and labor to harvest and feed the hay. One way to reduce wintering costs would be to feed less hay, but not to the point of reducing the reproductive performance of the cow and the growth of her calf.

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Ralph L. Phillips and Martin Vavra

SUMMARY

During the first year of a four-year study, 60 pregnant Hereford cows, ranging in age from 4 to 10 years, were allotted by age and weight into 3 treatment groups of high, medium and low levels of hay which were to approximate 120 percent, 100 percent and 80 percent, respectively, of the National Research Council (NRC) energy recommendations for maintenance of a dry pregnant cow.

Each year during the test period, cows were fed alfalfa-grass hay to meet the desired treatment levels for an average of 84 days. The test period started each year about the first of November and continued until the beginning of the calving season. At the beginning of the calving season, all cows from each treatment group were fed 100 percent for maintenance of a dry cow until they calved. From calving until range turnout, cows were fed 100 percent of NRC energy recommendations for a lactating cow.

The average weight changes of cows during the test period were 47, -2 and -58 pounds, respectively, for the high, medium and low groups. Cows on the high level were the heaviest (1,075 pounds) after calving followed by the medium group (1,035 pounds) and the low group (1,026 pounds). At breeding time, weights for the three groups were similar (1,006 pounds, high; 1,010 pounds, medium, and low 992).

The four-year average for conception rate and days to first post-partum estrus were similar (84 percent, 81 percent, and 86 percent; 56 days, 55 days and 58 days for the high, medium and low groups, respectively). Calf data indicates that pre-calving energy intake did not influence subsequent calf performance.

INTRODUCTION

Wintering cows is one of the most costly phases of beef cattle production. The cost of hay continues to increase as does the cost of fossil energy and labor to harvest and feed the hay. One way to reduce wintering costs would be to feed less hay, but not to the point of reducing the reproductive performance of the cow and the growth of her calf.

This study was designed to evaluate the effects of pre-calving, post-calving weight change, days to first post-partum estrus and conception rate of the cow as well as birth weights and weaning weights of calves.

PROCEDURE

The information presented is a summary of four years of data. Cows were under spring-calving management, typical of northeastern Oregon.

Hay was fed from November to June to meet the cow's productive needs except during the test feeding period. The calving season was 60 days starting in early February. A 60 day breeding season started in late April with the first 42 days being artificial insemination and the last 18 days natural service. Cows and their calves grazed a mixed conifer forest range from early June until mid-September. Calves were weaned in mid-September and cows were pregnancy tested at that time. Cows that were open or had raised inferior calves were culled. The rest of the cows remained on range until early October.

The first year 60 pregnant Hereford cows, ranging in age from 4 to 10 years, were allotted by age and weight into 3 treatment groups of 20 cows each. The treatments were high, medium and low levels of hay, which were to approximate 120 percent, 100 percent and 80 percent, respectively, of the National Research Council (NRC) energy recommendations for maintenance of a dry pregnant cow. Each year, cows that were culled or died in each treatment were replaced by cows of similar age and size to maintain the same average age and size for the 3 groups.

Cows were fed alfalfa-grass hay to meet the desired treatment levels for an average of 84 days. Adjustments were made each year for hay quality and weather conditions. These adjustments were based on the performance of the 100 percent group. At the end of each weighing period, necessary adjustments in feed intake were made so the 100 percent group maintained their weight. Corresponding adjustments were made in intake for the 120 percent and 80 percent groups. Table 1 lists the nutrient composition and recommended level (NRC) to feed alfalfa, alfalfa-grass and meadow hays. The test period started each year about the first of November and continued until the beginning of the calving season in late January.

During the first 2 years (1975-76 and 1976-77), all cows from the treatment groups were placed in one herd and fed at 100 percent of NRC for a dry cow from the beginning of the calving season until they calved. From calving to range turnout, all cows were fed 100 percent of NRC for a lactating cow. Because of the shortage of hay druing the 1976-77 years, cows were fed 20 pounds of alfalfa-grass hay plus barley straw free choice. This amount of feed should have met the cow's requirements for lactation.

The third year (1977-78), cows remained in their treatment groups until the breeding season. The groups were fed their respective treatment level of feed until calving. After calving, they were fed 100 percent of NRC for a lactating cow based on their calving weight. This change in management was made because during the first two years the 80 percent cows' weight losses were less from calving to range turnout than the other two groups. Thinner cows in the 80 percent group may have been eating more than the cows from the 100 and 120 percent groups.

The winter of 1978-79 was extremely cold and windy and mean daily chill factors as low as -20° F. The cows did not have access to protection from the wind and water intake may have been limited because of frozen ditches. The study was terminated after 71 days. All 3 groups were placed together and were moved to a protected area. They were fed at 120 percent

of NRC for a dry cow until the beginning of the calving season to makeup for the excessive loss in condition. From the beginning of the calving season to range turnout, they were fed at 100 percent of NRC to meet the productive needs of maintenance and lactation.

Each year, cows were weighed initially, at the termination of the feeding trial, within 24 hours after calving, at the beginning of breeding season (1977-78 and 1978-79 only), as they went on range and at weaning time. Calves were weighed at birth, at range turnout and at weaning. All weights were taken without a shrink off feed and water.

During the winters of 1975-76 and 1976-77, cows were fed in dry lot until just before the beginning of the calving season when they were turned out and were fed on the ground. The 1977-78 and 1978-79 trials were conducted in open fields without any protection from the wind and cows were fed on the ground.

Vasectomized bulls, equipped with chin-ball markers, were used to identify cows in heat after calving. The bulls were turned in with the cows two weeks after the beginning of calving. Estrus was checked daily, by recording cows that were marked, until the beginning of the breeding season.

Cows had access to fresh water from electric water fountains while in dry lot and from open ditches while they were in fields. Cows had access to a 1:4 bonemeal-salt mineral mix at all times.

RESULTS AND DISCUSSION

Table 1 shows recommended daily feeding rates for cows under the management of this study. The hay intake, crude protein and TDN values for the 3 types of hay are given as guidelines. Intake should be adjusted according to hay quality, local climatic conditions and changes in cattle condition. Severity of the winter can influence cattle performance.

Cow weights and weight changes are given in Table 2. The average weight changes of cows for the four years during the test period were 47, -2 and -58 pounds, respectively, for the high, medium and low groups. Annual weight changes were relatively consistant within the first 2 years of the study but the last 2 years varied from the 4 year mean. The 1977-78 winter was relatively mild. The 1978-79 winter was cold and windy and water intake may have been limited during the pre-calving test period.

As would be expected, cows in the 3 groups lost weight from the end of the test feeding period until after calving. This weight loss included that from calf and placenta, which could amount to about 150 pounds. Cows in the high energy level group lost the most weight during this time and cows on the low energy level lost the least because of the change in the feed level from the previous period. Cows on the high level were the heaviest (1,075 pounds) after calving followed by the medium group (1,035 pounds) and the low groups (1,026 pounds), a reflection of the test period feeding levels. The weight changes from calving to range turnout are given

in Table 2. During the first year (1975-76), all 3 groups lost weight. The 120 percent group lost 48 pounds followed by the 100 percent group at -29 pounds and the 80 percent at -15 pounds. These weight losses were probably caused by an under estimation of the feed quality under conditions of the study. Cows of this size and condition should have maintained or gained a small amount of weight while consuming 23 pounds of a medium quality alfalfa-grass hay. In the second year (1976-77), cows from all groups lost more weight than cows during the following 2 years (120 percent, -126 pounds; 100 percent, -86 pounds and 80 percent, -89 pounds). These results would indicate that the 20 pounds of hay plus barley straw free choice were not adequate to maintain weight for cows in this stage of production. Perhaps the straw was too bulky and the straw intake was not adequate when fed with the quality of hay used in this study. Under typical management, the barley straw should have been fed during the pre-calving period. During the last 2 years of the study (1977-78 and 1978-79), all groups of cows were able to maintain or gain weight during the lactating period. In 1977-78, the 120 percent group had an average gain of 9 pounds followed by 43 pounds for the 100 percent group and 44 pounds for the 80 percent group. During the 1978-79 year, the 120 percent group averaged a -9 pounds; 100 percent group, -6 pounds and the 80 percent group, 24 pounds from calving to on range.

The results of the 1977-78 year, when the groups remained separated until breeding, indicate the thinner cows in the 80 percent group did not eat more feed than the 100 percent and 120 percent groups during the 2 previous years when the 3 groups were fed together. The 80 percent group gained more than the 120 percent group (44 pounds vs 9 pounds) but gained about the same as the 100 percent group. Although in the 2 previous years all 3 groups lost weight, the trends in weight change were the same for all 4 years. Cows fed at an 80 or 100 percent level during pre-calving possibly were more efficient from calving to breeding when compared to the cows fed at the 120 percent levels during the pre-calving period.

Average cow weights at breeding during the last two years (1977-78 and 1978-79) were similar (1,006 pounds, 1,010 pounds and 992 pounds for treatments 120 percent, 100 percent and 80 percent, respectively). These results indicate there is little or no advantage to feeding cows at the 100 percent or 120 percent level of NRC for maintenance during the pre-calving period providing the cows are in as good or better condition as cows used in this study.

The 4-year average for conception rate and days to first post-partum estrum (Table 3) were similar (85 percent, 81 percent and 86 percent; 56 days, 55 days and 58 days for the high, medium and low groups, respectively). These results indicate that pre-calving energy level did not influence conception rate or calving interval (as indicated by days to first estrus), under the conditions of this study. Cow weight gains on range also were similar for all 3 groups (high, 99 pounds; medium, 102 pounds; and low, 105 pounds).

Calf data (Table 4) indicates that pre-calving energy intake of the cow did not influence subsequent calf performance. There were no differ-

ences in calf birth weight, average daily gains from birth to range turnout, average daily gains on range or average daily suckling gains. Over the 4 years, there was no difference in calf death loss or disease between the treatments.

The culling rate and death rate of cows were the same for the 3 groups. At the end of the 4 years, each group had the same number of cows that originally started the study.

From the 4 years of data presented, it appears feed intake can be reduced by 20 percent before calving without reducing reproductive performance of cows or the growth rate of the calf. However, the key to the success of this type of feeding program is the condition of the cow.

To compare, the cows used in this study rated 2 on a scale of 1 to 5. One is a cow in over condition (very fat), and 5 is a cow in poor condition (very thin). Cows in the study were medium to large frame Herefords weighing 1,100 to 1,150 pounds in the fall as they came off range.

Cows carrying excess weight (rating 1 or 2) before winter can lose more weight before calving than cows carrying less (rating 3 or 4) and still not influence reproductive performance. Under poor range conditions, where cows are thin (rating 5), this feeding practice should not be considered. Other researchers have shown that short feeding thin cows may reduce reproductive performance. Also, it is generally recommended that cows should maintain or gain weight during the breeding season to achieve a high level of conception. Again, this depends on the condition of the cow. Cows rating 5 generally will have poor conception when compared to cows rating 3. The best time to reduce excess weight in cows is before calving. Some authorities recommend that cows be fed to maintain their weight during the last one-third of pregnancy because the calf if growing rapidly during this time and if the cow maintains her weight, she is actually losing body condition. Under conditions of this study and the condition of the cows used, feeding at 80 percent of NRC for a dry cow up to calving did not influence reproductive performance of calf weight gain.

The feed values given in Table 1 are recommendations. Hay should be analyzed each year to make adjustments in feeding rate and meet the desired production level. Poor quality roughages should be used in the precalving feeding program rather than during lactating and breeding period. Good quality hay and good quality barley or oat straw could be fed in a 1:1 ratio. Poor quality cereal straws could be fed at 1 part straw to 3 parts hay, providing the hay is of good quality. Excellent quality bluegrass straw meets the requirements for a dry cow, prodiving intake is adequate. Adjustments in feeding rate should be made for weather conditions. Feed requirements could increase by as much as 10 percent under extended periods of chill factor below 0°F. Excessively muddy conditions can also increase animal requirements by as much as 15 percent.

Depending on individual ranches and weather condition, most ranchers in northeastern Oregon have to feed dry cows about 100 days. Most ranchers have a late range forage and hay aftermath for the cows to graze until

about the middle of November unless early snow covers it. The calving season starts mid-February to early March. A 20 percent reduction in alfalfa-grass hay would amount to a daily savings of 3 pounds of hay per cow over the 100 days. For 100 cows, the hay savings would be 15 tons.

In southeastern Oregon, most ranchers have used up the rake-bunch hay and hay aftermath by November and start calving in earch March. This entails feeding hay for 120 days during the pre-calving period. Meadow hay is typically fed in this area. A 20 percent reduction would amount to a daily savings of 3.5 pounds per cow or 420 pounds per cow over the 120 day pre-calving period. For 100 cows, the savings would be 21 tons of hay. These savings can be substantial in terms of hay saved or dollars saved.

Table 1. Recommended feed intake for an 1,100 pound cow during the pre-calving and post-calving periods

	Pre-calving treatments % of NRC			Post-calving % of NRC	Feed Composition	
	120	100	80	100	Crude Protein	TDN
	---------(lb)---------			------	---(%)---	
Alfalfa Hay	17.5	14.5	11.5	21.5	17.0	57
Alfalfa-Grass Hay	18.5	15.5	12.5	23.0	9.5	54
Meadow Hay	20.5	17.0	13.5	26.0	7.5	49

Table 2. Periodic average weights and changes for cows fed at 3 levels of energy before calving

Year/ Treatment	Test period			Test period to calving		Calving to breeding		Breeding to range turnout		Calving to range turnout	Summer grazing	
	Initial weight	Final weight	Weight change	Calving weight	Weight change	Breeding weight	Weight change	On range weight	Weight change	Weight change	Off range weight	weight change
	(lb)											
1975-1976												
120	1,129	1,236	107	1,104	-130			1,058		- 48	1,230	172
100	1,118	1,156	38	1,063	- 93			1,034		- 29	1,205	171
80	1,139	1,108	- 31	1,052	- 56			1,037		- 15	1,207	170
1976-1977												
120	1,130	1,199	69	1,100	- 99			974		-126	1,077	103
100	1,119	1,134	15	1,041	- 93			955		- 86	1,053	98
80	1,128	1,077	- 51	1,040	- 37			951		- 89	1,067	116
1977-1978												
120	1,090	1,168	78	1,036	-132	988	-48	1,045	57	9	1,102	57
100	1,051	1,096	45	997	- 99	985	-12	1,031	46	43	1,108	77
80	1,038	1,048	10	984	- 64	958	-26	1,028	70	44	1,100	72
1978-1979												
120	1,180	1,112	- 68	1,055	- 57	1,023	-32	1,046	23	- 9	1,110	64
100	1,181	1,072	-109	1,040	- 32	1,035	- 5	1,046	11	- 6	1,110	64
80	1,187	1,025	-162	1,028	- 3	1,025	- 3	1,052	27	24	1,113	61
Average												
120	1,132	1,179	47	1,075	-104	1,006	-40	1,031	40	- 44	1,130	99
100	1,117	1,115	- 2	1,035	- 80	1,010	- 9	1,017	29	- 18	1,119	102
80	1,123	1,065	- 58	1,026	- 39	992	-15	1,017	49	- 9	1,122	105

Table 3. Conception rate and days to first post-partum estrus for cows fed 3 levels of energy before calving

Year/ Treatment	Conception rate (%)	Days to first post-partum estrus
1975-1976		
120	85	43
100	60	53
80	94	50
1976-1977		
120	89	46
100	89	51
80	84	49
1977-1978		
120	94	70
100	94	60
80	88	68
1978-1979		
120	70	66
100	67	54
80	74	64
Average[1/]		
120	84	56
100	81	55
80	86	58

1/ The overall average was calculated using the total numbers of the cows over the 4 years and not averaging yearly averages.

Table 4. The average performance of calves from cows fed at the 3 levels of energy before calving

Year/ Treatment	Birth weight	Weight on range	ADG on station	Weaning or weight off range	ADG on range	ADSG[1/]
	- - - - - - - - - - - - - (lb) - - - - - - - - - - - - - - - - -					
1975-1976						
120	95	183	1.54	478	2.42	2.08
100	93	196	1.56	449	2.32	2.10
80	89	179	1.41	457	2.41	1.99
1976-1977						
120	94	208	1.34	416	1.89	1.65
100	97	228	1.33	446	1.99	1.68
80	96	223	1.39	447	2.00	1.72
1977-1978						
120	90	228	1.39	416	1.68	1.53
100	88	226	1.42	410	1.66	1.54
80	88	233	1.43	418	1.65	1.54
1978-1979						
120	89	204	1.31	388	1.78	1.56
100	86	207	1.25	385	1.70	1.48
80	84	201	1.29	378	1.70	1.51
Average						
120	92	206	1.40	425	1.94	1.71
100	91	209	1.39	423	1.92	1.70
80	89	209	1.38	425	1.94	1.69

1/ ADSG is average daily suckling gain.