COW/CALF NUTRITION

Winter Feeding Forages for Beef Cows

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INTRODUCTION

Cows have been consuming forages for thousands of years for their survival. This would indicate that there is little or no need for man to become involved with this age-old process. However, when cows are a part of a larger enterprise--the commercial cow herd for profit--there is little doubt that man needs to become aware of available forages and their quality, and cow nutrient requirements during winter.

In most situations in the upper Midwest, winter feeding includes the middle and last trimester of gestation, and a portion of the first trimester of lactation. Most winter feeding is accomplished with harvested forages -- hays and silages. Nutrient requirements of beef cows are low (Table 1) compared to those of other cattle (dairy or feedlot). This may encourage some producers to consider winter feeding a low priority issue. However, even in areas of Minnesota where pasture is the main source of forages, producers fed, on average, over 600 lb of grain, 8264 lb of hay and 2500 lb of silage per cow in 1991 (MN Farm Bus. Mgmt. Areas, 1991).

Utilizing Table 1 to generate annual energy requirements for a 1200 lb cow yielded 4391 lb TDN. From the grain, hay and silage totals for Minnesota pasture-based systems, and assuming 89, 90 and 30% dry matter (DM) and 88, 55 and 62% TDN, respectively, the annual TDN on these average farms was 5026 lb. This estimate does not include summer pasture contribution to TDN. Thus, it is apparent that management of supplemental grain and forage expenditure on beef farms may have room for improvement.

Table 1. Daily nutrient requirements for a 1200 lb cow, average (15 lb/d) milk production.

	Period			
Nutrient	Early lactation, 85 d	Early gestation, 120 d	Mid gestation, 110 d	Late gestation, 50 d
TDN, lb	14.0	12.5	10.1	11.8
Protein, lb	2.4	2.0	1.4	1.7
Calcium, g	34	30	18	26
Phosphorus, g	26	24	18	21
Vitamin A, IU	41,000	38,000	26,000	28,000

Meiske, 1993.

Because cows are weaned and wintered in various body conditions, a theoretical analyses was made to identify strategies to manage cows of different conditions coming into winter. Condition scores and weights used in the analyses included a standard 1100-lb cow with a body condition score (BCS) of 5 (9-point scale) wintered from November 15 through May 15, and scheduled to calve April 15. Because it is recognized that minimum BCS for optimum reproduction is 5, all cows were simulated to attain BCS 5 90 days after calving. Cow weights and BCS were used to estimate their nutrient requirements; these and the wintering strategies simulated are presented in Table 2. The last column on the right represents an estimate of total winter TDN expenditure.

From this table it is readily apparent that, if cows are to be kept at the same condition and weight throughout the year, then mid-April calving affords lower energy supplementation needs during winter feeding then calving in mid-February (2000 to 2439 lb TDN vs 2164 to 2881 lb TDN). Also, it is quite apparent that cows coming into winter in thin condition require the greatest amount of winter energy supplementation (2265 to 2881 lb TDN) if they are to remain in the breeding herd the coming year; while cows coming into winter in fat condition require the least amount of winter energy supplementation (2000 to 2267 lb TDN).

For producers calving cows in mid-April, the best strategy (lowest TDN expenditure) is to start with a cow in BCS 6 in early winter, permit her to lose weight before calving to a BCS 5, and then allowing her to maintain weight after calving (2000 lb TDN). This strategy permits dealing with harsh winters because it is supported by early cow turn-out to pasture after calving (30 days). Under these circumstances there is little incentive to maintaining cow weight and condition prior to calving to use fat stores after calving, unless poor pasture conditions are expected in May. Further insurance for poor pasture conditions would be to have good quality hay (>56% TDN) properly stored for use as emergency feed in early spring. In contrast, although the table indicates that if cows are thin at the beginning of winter, it pays to maintain them thin through winter and to permit them to gain weight after calving on pasture (2265 lb TDN); a possible drawback of this system would be poor pasture growth in the summer. These pasture conditions resulting from a delayed thaw, dry spring conditions, or overgrazed pastures will lead to continued weight loss and lowered reproductive performance. Therefore, winter gains for thin cows prior to calving are appropriate to maintain them in the breeding herd.

If a producer is to calve mid-February, then the best strategy (lowest TDN expenditure) is to start with a cow in BCS 6 in early winter, maintain her that way through calving, and let her lose weight and condition to BCS 5 between calving and breeding in the spring (2164 lb TDN). In this scenario, even if winter is harsh, or there is little good quality forage available, permitting the cow to lose weight prior to calving and then maintaining this weight after calving still affords economical winter feeding strategies. If, unfortunately, the cows are thin in early winter, cow body weight gains should be made in early winter prior to calving to reduce the negative effects of early calving and thin condition at the beginning of winter (2742 lb TDN). The worst scenario, under these circumstances, is to wait for the cow to make up body weight gains after calving (2881 lb TDN).

Initial		Calving		November to calving date TDN, lb	Breeding		Calving to mid-May TDN, lb	Total winter TDN, lb
BW, lb	BCS	BW, lb	BCS		BW, lb	BCS		
Calving in mid-April								
1100	5	1100	5	1776	1100	5	416	2192
1190	6	1190	6	1871	1100	5	294	2165
1020	4	1020	4	1699	1100	5	566	2265
1190	6	1100	5	1584	1100	5	416	2000
1020	4	1100	5	2023	1100	5	416	2439
Calving in mid-February								
1100	5	1100	5	1255	1100	5	1231	2486
1190	6	1190	6	1316	1100	5	848	2164
1020	4	1020	4	1194	1100	5	1687	2881
1190	6	1100	5	1036	1100	5	1231	2267
1020	4	1100	5	1511	1100	5	1231	2742

[a] Scores from 1 (thin) to 9 (fat).

Therefore, it may be generalized that cows need to come off pasture in good condition (BCS 6) and be permitted to maintain weight and condition prior to calving, if calving occurs early in the year. If calving occurs later, a producer may want to utilize cow reserves to sustain her early in winter, only if pasture condition is expected to be adequate, or good quality hay (>56% TDN) is properly stored for feeding after calving.

However, these strategies assume that cows do not differ in body weight and condition at least equivalent to those used here. To permit appropriate application of these recommendations, cows should have body weights and conditions simulated here. When cows within a herd differ greatly in body weight or condition, it is advised that cows be grouped by weight and condition, and fed and managed accordingly. Table 3 indicates effects of various small groups versus a single large group feeding of beef heifers to attain puberty and to breed.

Table 3. Reproduction in heifers fed as a single group or as three weight groups.

Feeding	No.	Weaning wt, lb	ADG to breeding, lb	Weight at breeding, lb	Estrus		Pregnancy	
					20 d	40 d	20 d	40 d
Single group								
Heavy	50	502	1.0	711	100	100	70	92
Medium	30	462	1.0	671	70	90	49	77
Light	20	409	1.0	620	50	70	35	60
Average		471	1.0	682	81	91	57	81
Weight groups								
Heavy	50	502	.86	680	90	100	63	90
Medium	30	462	1.10	693	90	100	63	90
Light	20	409	1.30	684	90	100	63	90
Average		471	1.00	686	90	100	63	90

Spitzer, 1986.

Heifers in the single group treatment were fed and managed as a group without regard to differences in body weight, while heifers in the other treatment were fed and managed as three distinct groups based on weight differences. At the end of the trial, daily gains and breeding weights were similar; however, heifers fed and managed as a single group averaged a 91% estrous occurrence rate and 81% pregnancy rate 40 d after the initiation of the breeding season. Heifers managed as three distinct groups averaged a 100% estrous occurrence rate and 90% pregnancy rate 40 d after the initiation of the breeding season.

Therefore, although it requires more management and feeding troughs, it is recommended to separate cows of different body weights and conditions to achieve appropriate winter feeding supplementation strategies. Winter utilization of electric fence to separate cow groups may provide an alternative to more expensive facilities.

Under conditions prevalent in Minnesota, adjustments to energy intake must be made to cope with winter conditions. A practical rule of thumb is to increase energy intake by 1% for every degree of coldness below the lower critical temperature of a cow. For practical purposes, a 20E F temperature can be used as the lower critical temperature. Thus, if outside temperature is 0E F with calm wind speed, then energy intake will have to be adjusted 20%. If the daily TDN requirement during this period is 11.2 lb, then an additional 2.24 lb TDN are required to prevent environmental stress on the cow.

Because wind increases the effective temperature cattle perceive, a wind chill table (Table 4) is provided below to adjust thermometer temperature readings. Also, a table (Table 5) to estimate lower critical temperature is provided. This table takes into consideration hair coat thickness.

Table 4. Windchill values for cattle.[a]

Wind speed, mph	Temperature, • F						
	B10	B5	0	5	10	15	20
0	B10	B5	0	5	10	15	20
5	B16	B11	B6	B1	3	8	13
10	B21	B16	B11	B6	B1	3	8
15	B25	B20	B15	B10	B5	0	4
20	B30	B25	B20	B15	B10	B5	0
25	B37	B32	B27	B22	B17	B12	B7
30	B46	B41	B36	B31	B26	B21	B16
35	B60	B55	B50	B45	B40	B35	B30
40	B78	B73	B68	B63	B58	B53	B48

[a] From Better Beef Business (1981).

Table 5. Critical temperatures for beef cattle.[a]

Coat description	• F	• C
Summer, or wet	59	15
Fall	45	7
Winter	32	0
Heavy winter	18	B8

[a] Ames (1978).

Additionally, requirements for vitamins and minerals must not be neglected. Injectable vitamin A (2 to 4 million IU) may be the easiest method to supply the requirements for this vitamin. An injection in the winter (when cows are dry lotted), and one at pasture turnout would be adequate. However, if a mineral premix is to be used to supplement phosphorus and other minerals, a vitamin A premix may be added.

Requirements for phosphorus range from 18 to 22 g/day and hay provides roughly 60% of these requirements. Therefore, producers should be prepared to provide from 6 to 8 g supplemental P. This supplemental need can be met by feeding .2 lb of a 50:50 mixture of salt-dicalcium phosphate.

Supplementation of trace minerals may be necessary, especially for cows fed corn silage. Requirements for Mn, Cu and Zn may be higher than those described by NRC, 1984. Manganese, supplemented to provide 55 ppm promoted better reproductive performance in cows wintered on a corn silage based diet. Most commercial mixes contain adequate amounts of trace minerals. Producers are encouraged to utilize mixes that appropriately fit their feeding program.