UNIVERSITY OF MINNESOTA
Extension
SERVICE

WINTER COW FEEDING Lesson 2

Introduction

Most beef cattle producers who have been raising cattle for years realize that there are many ups and downs to the cattle business. For almost 100 years, there have been several beef cattle cycles with characteristic peaks and valleys in cattle numbers and prices. Cattle producers who have survived though the good and bad years have a good understanding of the beef cycle as well as optimizing their winter feed costs.

This section of the Minnesota Beef Home Study Course will focus on winter feeding beef cows. Winter cow feeding plays a very important role in the profitability of a beef cow herd because it can comprise a large percentage of your cost of production. The integrated resource management (IRM) databank for Northern Plains Beef Cow Herds indicates that winter feed costs comprise 31 to 47%of the total cost of production.

Fundamental nutrients such as vitamins, minerals and water are very important for beef cattle production; however, they will not be discussed because they were covered in Lesson 1. This lesson will expand on energy and protein nutrition. Key topics that will be addressed in this section include: beef cattle nutrient requirements, proper cow body condition, environmental cold stress and benefits of crop aftermath.

Beef Cattle Nutrient Requirements

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 including hay, silage and crop residues. Nutrient requirements of beef cows are low compared to those of other cattle such as dairy or lot cattle.

The National Research Council (NRC) indicates that a 1,300-pound cow requires a ration with 1.59 pounds of protein and 10.1 pounds of TDN during the middle third of gestation and 1.98 pounds of protein and 12.7 pounds of TDN during late gestation. Additional nutrient requirements can be found in Tables 1 and 2. There is considerable variability in the nutritional values of forages; therefore, it is important to have a laboratory analysis of feeds, especially forages.

Benchmark values suggested by the NRC include: grass hay, 55% TDN and 10% crude protein (CP); mature alfalfa hay, 50% TDN and 14% CP; corn stover, 55% TDN and 6.3% CP; and corn grain, 88% TDN and 9.8% CP of feed on a dry matter basis. Nutrient requirements listed in Tables 1 and 2 need to be adjusted for environmental conditions, body condition, and anticipated feeding loss.

Proper nutrition for first-calf heifers is important because heifers typically comprise 21% of Minnesota beef cow herds. Tables 1 and 2 indicate that a 1,000-pound, first-calf heifer requires approximately the same amount of TDN and CP as a 1,300-pound mature cow. First-calf heifers should be fed apart from the cow herd because they typically will not compete well with mature cows. Additionally, a higher quality feed should be considered, because first-calf heifers are smaller and lighter and cannot consume as much feed as a mature cow.

Table 1. Mature beef cows crude protein and total digestible nutrient requirements

Weight	Weaned, dry		Late pregnant		Low lactation		High lactation	
lb	CP, lb	TDN, lb	CP, lb	TDN, lb	CP, lb	TDN, lb	CP, lb	TDN, lb
1100	1.41	9.0	1.81	11.6	2.19	13.7	2.74	16.0
1200	1.50	9.5	1.90	12.2	2.28	14.3	2.83	16.6
1300	1.59	10.1	1.98	12.7	2.36	15.0	2.92	17.3
1400	1.67	10.6	2.07	13.3	2.45	15.6	3.00	17.9

Table 2. First calf heifers crude protein and total digestible nutrient requirements

Weight	Weaned, dry		Late pregnant		Low lactation		High lactation	
lb	CP, lb	TDN, lb	CP, lb	TDN, lb	CP, lb	TDN, lb	CP, lb	TDN, lb
1000	1.53	9.9	1.90	12.5	2.06	13.4	2.44	14.9
1100	1.62	10.5	1.99	13.1	2.15	14.1	2.53	15.1
1200	1.71	11.1	2.09	13.7	2.24	14.8	2.62	16.2

Good quality forage provides most of a cow's nutritional needs. If supplementation is needed, energy and protein from grain or forage are usually best buys. To determine the most cost effective supplementation, nutrients should be selected based on a cost per unit of desired nutrient. Different feeds are most economical depending on which nutrients are needed in the ration. For example, Table 3 compares the cost of energy(TDN) in legume-grass hay and corn.

Table 3. Cost of Energy (TDN) in hay and corn

Price	TDN cost, cents/lb.	Energy-equivalent value of other feedstuff
Legume-grass hay, $/T	hay	corn, $/bu.
40	4.1	1.78
60	6.2	2.69
80	8.3	3.57
100	10.3	4.46
120	12.4	5.37
Whole corn, $/bu.	corn	hay, $/T
2.00	4.6	44.53
2.50	5.8	56.14
3.00	6.9	66.79
3.50	8.1	78.41
4.00	9.2	89.06

Assumptions: hay = 88% DM, 55% TDN in DM; corn = 85% DM, 91% TDN in DM

Source: Beef Cattle Management Update #16

Increasing alfalfa in a beef cow diet can be an excellent way to meet increasing protein requirements. This can be accomplished by feeding hay with a higher percent alfalfa hay, feeding a portion of forage as alfalfa or feeding the desired amount of alfalfa once a week. Research has indicated that supplemental protein does not have to be fed daily. Keep in mind that using some of the commercial supplements, may mean paying a big premium for added convenience in the delivery of the supplement.

Several example rations are listed below. Each ration meets the nutritional requirements for crude protein and energy (TDN). Exceeding these requirements typically increases winter feed cost with no benefit in production if beef cows are in proper body condition. An excellent way to evaluate your nutritional program is to monitor body condition score changes. Another consideration is the amount of forage a beef cow can consume. Dry matter intake (DMI) of forage or feed consumed by beef cows is affected by how fast forages are digested and passed through the intestinal tract. Forage dry matter intake information can be found in the Forage Quality Tests and Interpretation bulletin. This bulletin was a supplemental resource for Lesson 1.

Example rations for a 1,300-lb. cow, mid-gestation, requiring 1.59 lbs. CP and 10.1 lbs. TDN

Grass hay (100%):

19 lbs. grass hay @ 10% CP	= 1.9 lbs. CP provided
19 lbs. grass hay @ 55% TDN	= 10.45 lbs. TDN provided

Grass hay and corn stover (50:50):

10 lbs. grass hay @ 10% CP	= 1.00 lbs. CP
10 lbs. corn stover @ 6.3% CP	= 0.63 lbs. CP
	1.63 lbs. CP provided in diet
10 lbs. grass hay @ 55% TDN	= 5.5 lbs. TDN
10 lbs. corn stover @ 50% TDN	= 5.0 lbs. TDN
	10.5 lbs. TDN provided in diet

Alfalfa hay, mature (100%):

21 lbs. alfalfa hay @ 14% CP	= 2.9 lbs. CP provided
21 lbs. alfalfa hay @ 50% TDN	= 10.5 lbs. TDN provided

Proper Cow Body Condition

Body condition score (BCS) is a term used to describe the visual estimate of body fat reserves of an animal. BCS is a function of energy requirements and energy intake, and is an excellent tool for monitoring energy status of the cow herd. Six areas of the body used to evaluate fat on a cow are brisket, ribs, over the top, hooks, pins and tail head. The scoring system is described in the additional resource titled "Beef Cow Condition Scoring System" included with Lesson 1. A body condition score of 5 or above is recommended at calving and the beginning of the breeding season for mature cows. First-calf heifers should be at a condition score 6 at calving to achieve adequate rebreeding performance. Body condition scores above 7 are generally not needed to maintain a high level of production.

It is generally desirable to keep the cow in a 5 to 6 condition score. Cows that have a BCS lower than 5 tend to have more calving problems, a lower quality and quantity of colostrum, and require more days to rebreed. At BCS 7 or greater, feed is wasted, and consequently cost of production increases.

Cows in good condition at calving will generally cycle well at 60 days post-calving whether they lose or gain weight after calving. However, cows that calve in moderate or thin condition will usually cycle and conceive late. Many will have difficulty maintaining a 12-month calving interval. Beef cattle producers need to assess their operations and determine the most cost effective way to get cows into proper condition prior to calving. Good planning is the first step. Producers who do not plan ahead tend to get caught with thin cows in the dead of winter and only a few weeks before calving. If weight gain is needed during this late gestation period, supplemental grain or high-quality silage will be needed.

It is difficult to put body condition on cows after calving and prior to breeding because of their high energy requirement during early lactation. It is much easier to improve body condition on cows during mid-lactation. Mid-lactation for spring calving cow herds begins mid-summer. If cows are thin (condition score 3 and 4) during mid-lactation, evaluate your pasture management system and/or consider early weaning to maintain or increase cow body condition.

Pasture management is an excellent way for producers to keep cows in the proper condition. Rotating pastures increases quantity and quality of forage. Pasture management will be discussed in Lesson 6 in greater detail. Lactating cows grazing short or mature grasses late in the fall have a difficult time maintaining condition. Consequently, their calves do not gain at the anticipated rate. Creep feeding calves during this period can improve weaning weight and may improve cow body condition score.

Weaning time is also important in maintaining cow body condition. For best results calves should be weaned when they are 180 to 210 days old. Older calves (over 210 days old) at weaning tend to have lower gains because of poorer pasture conditions and their dams' reduced milk production. Cows that wean older calves also tend to have lower body condition scores going into the winter.

Environmental Cold Stress

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 each degree of coldness below the lower critical temperature of a cow. For practical purposes, a 20^0 F temperature can be used as the lower critical temperature. Thus, if outside temperature is 0^0 F with calm wind speed, then energy intake should be increased 20%. If daily TDN requirement during this period is 11.2 pounds, then an additional 2.24 pounds TDN are required to prevent environmental stress on the cow.

Table 4. Wind-chill values for cattle [a]

Wind speed, mph	Temperature, ^{0} F						
	-10	-5	0	5	10	15	20
0	-10	-5	0	5	10	15	20
5	-16	-11	-6	-1	3	8	13
10	-21	-16	-11	-6	-1	3	8
15	-25	-20	-15	-10	-5	0	4
20	-30	-25	-20	-15	-10	-5	0
25	-37	-32	-27	-22	-17	-12	-7
30	-46	-41	-36	-31	-26	-21	-16
35	-60	-55	-50	-45	-40	-35	-30
40	-78	-73	-68	-63	-58	-53	-48

[a] Better Beef Business (1981)

Wind chill factors as presented in Table 4 are to be considered when adjusting energy intakes due to cold stress. This table identifies the importance of wind breaks. Livestock can be protected from wind with trees, buildings and constructed windbreak fences. Additional information on constructing windbreak fences is available in the Beef Housing and Equipment Handbook (4th Ed., 1987, MidWest Plan Service) and in a windbreak fences publication found in the Great Plains Beef Cattle Feeding Handbook.

Critical temperatures for cattle are listed in Table 5. During winter weather these temperatures are rapidly reduced if the cattle are wet. Therefore, during extremely cold weather it is vital to provide animals with a clean, dry location out of the wind.

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

Coat Description	^{0}F	^{0}C
Summer, or wet	59	15
Fall	45	7
Winter	32	0
Heavy winter	18	-8

[a] Ames (1978)

Benefit of Crop Aftermath

Extending the grazing period by utilizing crop residues is probably one of the more common practices to reduce winter feed costs. Common crop residues include corn stalks, small grain stubble and soybean stubble. Usually livestock can also graze waterways and grass along fences. Many times grazing crop residue has no or minimum cost. Major costs and concerns when grazing crop residue are associated with fence and water. Weather also plays a major role in grazing crop residues. Some years are much more favorable for grazing crop residues.

Daily winter feed costs can easily be reduced 50 to 100% for each day cows graze crop residues. It is difficult to price grazing crop residues. If baled hay is priced at $40 to $80/Ton, a fair price for leased cornstalks may be in the range of $9 to $16/cow/month. Harvested stalks would then be worth $18 to $37/Ton of DM.

Stock cows usually meet their nutrient requirements grazing corn stalk residue as long as the cows consume grain, leaves and husks. Cows need to be supplemented when they consume a high percentage of stalks. Protein supplementation of corn stalks is usually required during long grazing periods or when harvested residues are fed.

Harvesting crop residues is less desirable than grazing. However, this method removes many of the problems associated with weather. Harvested crop residues are typically lower in nutrient values than what the cow harvests in the field. Further, there is considerable added cost associated with harvesting

and transporting crop residue to the feedlot and hauling the manure back to the field. Because manure is returned to the land, you can expect little loss of nutrients.

Rules of Thumb

- A body condition score of 5 or above is recommended for mature cows at calving and at the beginning of breeding season.
- First-calf heifers should have a body condition score of 6 at calving to achieve adequate rebreeding performance.
- Select supplement based on nutrient content and price.
- Livestock that are provided a clean and dry area out of the wind during extreme winter weather have a lower energy requirement.
- Critical temperature for beef cows with a heavy winter coat is 18^0F.
- Increase energy intake 1% for every degree of coldness below the lower critical temperature of a cow.

Cold Stress Rule of Thumb for Beef Cows

Level of feeding	Temperature (degrees F)	Constant wind (MPH)*
Normal	25	5
Increase Energy or TDN:		
10 to 25%	10	5-10
	25	20-30
25 to 50%	0	10-20
	20	20-30
	-10	5
More than 50%	-20	20-30

*Cattle unprotected from wind
Older cattle may need greater adjustments; wet hair coat will add to cold stress

Source: Mader, UNL Extension Beef Specialist

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Additional Resources and Reading

- 1995 Minnesota Beef Cow/Calf Report
- 1997 Minnesota Beef Cow/Calf Report
- Nutrient Requirements of Beef Cattle (7th revised ed.). NRC. 1996.
- Beef Housing and Equipment Handbook - 4th Ed. 1987. (MidWest Plan Service)
- Great Plains Beef Cattle Feeding Handbook
- Beef Cattle Management Updates (U of M Animal Science Extension)
    - ⇒ Issue 44 Wintering Cows
    - ⇒ Issue 28 What Quality Forage for Wintering Beef Cows?
    - ⇒ Issue 29 Winter Feeding Forages for Beef Cows.
    - ⇒ Issue 15 Effects of Body Condition and Energy Intake on Reproduction of Beef Cows
    - ⇒ Issue 16 Managing Beef Cow Condition Scores through Feeding
    - ⇒ Issue 6 Low Input, High Output Management Practices for Beef Cow/calf Herds

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