Feeding Beef Cattle During Periods of Feed Shortages

Feed shortages occur periodically in parts of most of the western states. Although customary feeds may be scarce, usually alternate feeds can be obtained and, if properly supplemented, work well.

When feed is in short supply, open dry cows and other cull animals should be sold as soon as practical. A management program to eradicate both internal and external parasites will result in more thrifty animals and will save valuable feed. A herd health program planned with your veterinarian will help to prevent animal losses and waste of feed. An investment now in analyzing your herd health program with your veterinarian should pay dividends in the future.

If a high level of management is being maintained, the next step is to select the most economical feed ingredients available to supply the requirements of your cattle. The National Research Council nutrient requirements for various classes of beef cattle are given in Table 1. Nutritional values are expressed as crude protein and total digestible nutrients (TDN). It is possible to feed cattle for extended periods of time at levels somewhat less than the requirements shown; however, they will lose body weight, which will have to be replaced later when feed is more plentiful. Gross underfeeding for extended periods of time will result in emaciation, increased susceptibility to stress and disease, and problems during calving which can result in excessive calf losses.

Average crude protein and TDN percentages of commonly available feed stuffs are listed in Table 2. In addition, the feeding value of each feed stuff is compared to that of barley. Note that some of the lower quality forages, including grass straw, have considerable value for maintenance and can be considered for use if economical.

Table 1. Nutrient Requirements of Various Classes of Beef Cattle.

Class of cattle	Crude protein		Total digestible nutrients (TDN)
	Pounds	*Percent*[1]	*Pounds*
1,000-pound pregnant cow (mature)	.97	5.9	8.5
1,000-pound lactating cow	1.90	9.2	10.6
880-pound pregnant heifer (gain 0.9 pound per day)	1.40	8.7	8.5
450-pound growing steer calves (gain 0.7 pound per day)	1.00	9.1	6.5

Source: Nutrient Requirements of Beef, 5th revised edition, 1976, National Research Council—National Academy of Science.

[1] Percentage of crude protein in the total ration.

Alfalfa is probably the most nearly complete forage for cattle. It can be a good source of protein and TDN as well as minerals and vitamins. Its quality varies considerably, depending primarily on stage of maturity when harvested. Alfalfa in the mid-bloom stage contains about 15 percent crude protein (as-fed basis). Late-cut, very mature alfalfa may contain only about 12 percent crude pro-

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tein, while early-cut, pre-bloom alfalfa may contain 18 to 20 percent or more crude protein. TDN may also vary from about 55 percent (as-fed basis) for early-cut alfalfa to about 45 percent for late-cut alfalfa.

Quality of native meadow hay and improved grass hay also varies with stage of maturity when harvested. Late cutting means lower crude protein content as well as lower digestibility; TDN usually is reduced to 50 percent or less. The crude protein content (as-fed basis) of grass hay may commonly vary from as low as 3 to 4 percent to as high as 14 to 15 percent. A full feed of 18 pounds of 7 percent crude protein grass hay has adequate protein for 1,000-pound pregnant beef cows.

Table 2. Average Protein and TDN Content (as-fed basis) of Some Common Feeds.

Feed	Average crude protein	Average TDN	Barley equivalent for maintenance[1]	(barley @ $110/T)
	Percent	*Percent*	*Percent*	
Hays				
Alfalfa hay	15.0	54	69	$75.90
Native meadow hay	7.0	51	65	71.50
Bluegrass hay	10.0	51	65	71.50
Barley hay	6.0	50	64	70.40
Oat hay	7.0	50	64	70.40
Wheat hay	6.0	48	61	67.10
Rye hay	7.0	45	58	63.80
Straws[2]				
Barley	2.5	42	54	59.40
Oat	2.5	45	58	63.80
Wheat	2.5	40	51	56.10
Wheat chaff	3.0	36	46	50.60
Bentgrass	5.0	46	59	64.90
Ryegrass, perennial turf-type	6.5	45	58	63.80
Fescue, tall	5.5	45	58	63.80
Bluegrass	7.5	43	55	60.50
Ryegrass, perennial forage-type	4.8	41	53	58.30
Orchardgrass	4.8	36	46	50.60
Ryegrass, annual	3.7	35	45	49.50
Fescue, chewings and red	3.1	34	44	48.40
Silage				
Corn silage (28 percent dry matter)	2.5	18	23	25.30
Grass silage (28 percent dry matter)	4.0	17	22	24.20
Mint silage[3] (30 percent dry matter)	4.0	15	19	20.90
Grains and concentrates				
Barley	10	78	100	110.00
Oats	9	70	90	99.00
Wheat	10	78	100	110.00
Corn	8.9	81	104	114.40
Beet pulp	9	68	87	95.70
Cane molasses (not over 10 percent of ration)	3.2	68	87	95.70
Beet molasses (not over 10 percent of ration)	6.7	68	87	95.70
Cottonseed meal	41	69	88	
Soybean oil meal	44	78	100	
36-percent-protein supplement (liquid or dry)	36	65	83	

[1] For example, alfalfa hay has a calculated TDN feeding value of 65 percent of barley and a relative price of $75.90/ton.
[2] Some grass straws are treated with chemicals not cleared for feed.
[3] The protein in mint silage is poorly available to the animal.

Lower quality forages such as the grass and cereal straws can be used for maintenance of mature animals if properly supplemented with protein, minerals, and vitamin A. *However, the use of straw is not recommended for growing animals, and its use should be limited in rations for lactating cows.* The large quantities of lignin in straw reduce digestibility, available protein, and palatability.

Mature cattle can make the best use of low and medium quality forages. Young, growing cattle, such as replacement heifers, need more protein than mature, dry cows. Bred yearlings and 2-year-olds should be segregated according to age groups and fed to gain at a rate of about 1 pound per day. Weaner heifer calves should gain at least 0.7 pound per day.

In formulating a balanced ration, you should understand the characteristics of the various types and species of grass straws in order to use them to their best advantage. Grass straws are lower than most legume hays in both crude protein and digestible energy, but the higher quality grass *straws* can be superior to some of the late-cut grass *hays.*

There is a wide variation in the amount of crude protein in grass straws. The range varies from a low of less than 2 percent to a high of almost 12 percent. Some types or species of grass are of higher quality than others. Of those generally available for feed purposes, bentgrass and tall fescue have higher average crude protein contents and lower fiber contents than the forage-type perennial ryegrass, orchardgrass, annual ryegrass, and chewings and red fescues. Keep this in mind if you are or will be shopping for grass straw; but, above all else, be aware of the wide range in quality, even within a particular type or species of grass straw. Also note in Table 2 that the TDN contents of grass and cereal straws will average between 34 and 46 percent. In addition to the rather low crude protein and TDN values of the cereal straws and poor-quality grass straws, you should be aware that digestible protein may be less than 1 percent in some cases. Twenty pounds of these low-quality forages may supply only 0.1 to 0.2 pound of digestible protein.

With any forage, a chemical analysis is recommended since it is difficult to determine quality differences visually. Forage tests are available through Oregon State University as well as a number of commercial laboratories in Oregon and sur-

rounding states. These laboratories generally do accurate work at reasonable prices. Your county Extension agent can help you locate a laboratory.

The chemical analysis necessary for forage evaluation includes moisture, crude protein, and fiber (either crude fiber or acid detergent fiber). The cost of this type of analysis will be approximately $12 to $15 per forage sample. Some laboratories evaluate a feed for digestible protein and TDN. These are not determined chemically in the laboratory, but are calculated from crude protein and fiber values.

A few dollars spent on forage analyses will take the guess work out of comparing your feed with average values listed in tables of feed composition. Considering the wide variations in forage quality, this is a good management tool and is particularly important if you are considering purchasing large quantities of any type of forage.

Knowing the nutrient requirements of the livestock to be fed and the nutrient contents of the forage(s) available for feeding, the livestock producer can formulate balanced rations using combinations of various forages or combinations of forages and protein and/or energy supplements. Table 3 lists the crude protein contents of the common protein supplements as well as their relative value in comparison to soybean oil meal. Both dry and liquid protein supplements are available and are fed extensively. Management factors such as cost, ease of handling, mixing, and feeding facilities are items to consider.

Non-protein nitrogen, such as urea or biuret, can be fed successfully to all classes of beef cattle except creep-fed calves under 3 months of age. (Biuret is a condensation product of urea. It is less soluble and releases nitrogen more slowly in the rumen.) Beef cows can be fed from 0.1 to 0.2 pound daily of urea, so long as 2 pounds or more of grain or molasses are included in the ration. *It is most important that urea be fed with a source of readily available carbohydrate such as grain or molasses.* It should *not* be fed with an all-forage diet. Also keep in mind that biuret requires a feeding period of 2 to 3 weeks before cattle utilize it most efficiently. As a protein supplement, 86.5 pounds of corn or similar grain plus 13.5 pounds of urea have as much protein and energy as 100 pounds of 44-percent-protein soybean oil meal or similar protein supplement for ruminant animals. Urea must be mixed *thoroughly* with the carrier.

Table 3. **Value of Some Protein Supplements Compared to Soybean Oil Meal.**

Protein supplements	Crude protein	Value as percent of soybean meal
	Percent	*Percent*
Soybean meal	44	100
Cottonseed meal	41	93
36-percent-protein supplement	36	81
Alfalfa	15	36
Whey	15	36
Hydrolized feather meal	87	197
Austrian field peas (seeds)	23	52

Urea should not replace more than one-third of the protein in the ration. This recommendation has been established to minimize the possibility of urea toxicity when feeds containing urea are fed to ruminants. Urea poisoning should not be a problem if the above recommendation is followed or if the total ration does not contain over 1 percent urea.

Addition of a nitrogen (urea, biuret, etc.) or protein (soybean meal, cottonseed meal, etc.) supplement in combination with an energy supplement such as corn generally increases the voluntary consumption of low-quality forage by 4 to 5 pounds per day. Digestibility and animal utilization of feed is improved.

It is particularly important to supplement with minerals when a large part of the ration is made up of straw or other low-quality forages which are generally deficient in minerals, especially phosphorus. The following mineral mix, fed free-choice, is usually adequate for beef cattle:

- 30 pounds steamed bone meal or dicalcium phosphate
- 5 pounds of magnesium oxide
- 65 pounds trace mineral salt

Cattle may need some supplementary vitamin A, too, when they are fed on poor quality forage for several months. This can be provided in supplementary feed or by intramuscular injections.

Table 4, 5, 6, and 7 contain suggested rations for various classes of beef cattle. These tables are guidelines developed from average analyses of the feeds. Since there is considerable variation in forage quality, you should observe animal performance closely. Weigh, or at least tape, a few animals each month to be certain that rations are satisfactorily meeting the nutrient requirements of your animals. If not, then adjustments need to be made in the rations.

When using these tables, be aware that a feed with higher nutrient value can be substituted for one with a lower value. For example, barley can be used in place of beet pulp or soybean meal in place of cottonseed meal. If cows are thin when they calve, provide extra feed to support adequate milk production. Cows in good flesh can utilize body fat to support milk production during short periods of feed deficiencies. However, they will lose body weight during this time.

The rations suggested in Tables 4, 5, 6, and 7 are only a few of the many possible rations. You

may prefer to develop your own rations. If so, your Extension agent can assist you in developing balanced rations based on animal requirements and the nutritive values of feeds.

Table 4. Suggested Rations for 1,000-pound Pregnant Cows.

Pounds	Ration combinations (alternatives)
2	Alfalfa
16	Bluegrass, oat, barley, or wheat hays
18	Native meadow grass hays
57	Corn silage (28 percent dry matter) or grass silage (28 percent dry matter)
12	Native meadow grass hays
6	Forage-type perennial ryegrass straw
11	Oat, barley, or wheat straw; wheat chaff
5	Barley, wheat, or corn
1	Cottonseed, soybean oil meal, or 36-percent-protein supplement (liquid or dry)
5	Bentgrass, tall fescue, turf-type perennial ryegrass, or bluegrass straws
40	Corn silage (28 percent dry matter) or grass silage (28 percent dry matter)
8	Native meadow grass hays
7	Oats or beet pulp
18	Barley straw, oat straw, tall fescue straw or perennial forage-type ryegrass straw
2	Cottonseed meal, soybean oil meal, or 36-percent-protein supplement (liquid or dry)
16	Barley straw, oat straw, tall fescue straw or perennial forage-type ryegrass straw
4	Alfalfa

Table 5. Suggested Rations for 1,000-pound Lactating Cows.

Pounds	Ration combinations (alternatives)
20	Alfalfa
12	Alfalfa
8	Bluegrass, oat, barley, or wheat hays
8	Native meadow grass hays
8	Oats or beet pulp
2	Cottonseed meal, soybean oil meal, or 36-percent-protein supplement (liquid or dry)
5	Native meadow grass hays
10	Orchardgrass, annual ryegrass, or chewings or red fescue straws
5	Barley, wheat, or corn
3	Oat, barley, or wheat straw; wheat chaff
48	Corn silage (28 percent dry matter) or grass silage (28 percent dry matter)
2	Cottonseed meal, soybean oil meal, or 36-percent-protein supplement (liquid or dry)

Table 6. Suggested Rations for 880-pound Growing Heifers Gaining 0.9 Pound per Day

Pounds	Ration combinations (alternatives)
2	Alfalfa
15	Native meadow grass, bluegrass, oat, or barley hays
16	Native meadow grass, bluegrass, oat, or barley hays
1	Cottonseed meal, soybean oil meal, or 36-percent-protein supplement (liquid or dry)
7	Wheat hay
7	Barley, wheat, or corn
10	Native meadow grass, bluegrass, oat, or barley hays
5	Oats or beet pulp
5	Native meadow grass, bluegrass, oat, or barley hays
36	Corn silage (28 percent dry matter) or grass silage (28 percent dry matter)
1	Cottonseed meal, soybean oil meal, or 36-percent-protein supplement (liquid or dry)

Table 7. Suggested Rations for 450-pound Weaner Calf Gaining 0.7 Pound per Day.

Pounds	Ration combinations (alternatives)
10	Alfalfa
2	Oats or beet pulp
8	Native meadow grass, bluegrass, oat, or barley hays
3	Oats or beet pulp
1	Cottonseed meal, soybean oil meal, or 36-percent-protein supplement (liquid or dry)
5	Wheat hay
5	Oats or beet pulp
1	Cottonseed meal, soybean oil meal, or 36-percent-protein supplement (liquid or dry)
5	Native meadow grass, bluegrass, oat, or barley hays
10	Corn silage (28 percent dry matter) or grass silage (28 percent dry matter). (Note: Silage should be limited in rations for calves.)
1	Cottonseed meal, soybean oil meal, or 36-percent-protein supplement (liquid or dry)