

Nutrition Basics

Rations for beef herds must be economical, yet meet the nutrient requirements of the various classes of cattle. Two essentials for the herd manager to know are the daily nutrients required by the separate classes of cattle in the herd and the nutrient

composition of the feeds to be used. Formulation of rations is simply a matter of combining feeds to supply the nutrient needs of the animals.

The daily nutrient requirements of beef cattle as determined by the National Re-

search Council (NRC) are given in Table 1. Daily nutrient needs of cattle differ by age, sex, rate of gain, point in the reproduction cycle, weight of animal, and amount of milk produced.

The average nutrient composition of feeds often used for beef cattle is available in NRC tables. For better ration formulation, get a laboratory analysis to determine the nutrients in the feeds you are using. (Area extension livestock specialists can provide appropriate tables and up-to-date lists of laboratories offering this service.)

When cattle graze or have free access to harvested forage, the amount eaten daily is not always predictable. Uncertain consumption combined with nutrient variability of roughages means that beef cows may be getting insufficient amounts of nutrients

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even though the ration would be adequate under most situations. Thus, the appearance and performance of the herd should be observed closely at all times to see if the cattle are getting an adequate balance of food.

Feeding The Breeding Stock At Different Stages

Feeding Developing Heifers

Heifers nursing their first calf often have low settling rates. Inadequate rations after calving are often at fault. First-calf heifers need nutrients for their own growth in addition to those needed for milk and reproduction. The slowness of heifers to rebreed after their first calf is the reason it is recommended heifer calves be bred to calve 30 days sooner than the rest of the herd so they will have extra time to rebreed and still stay in phase with the herd's calving period.

Heifer calves must come into heat at 12 to 14 months of age if they are to conceive in time to calve at 23 months of age. The weight at which a heifer reaches puberty and comes into heat is influenced by breed and

Table 1. Daily nutrient requirements (NRC) for heifers, cows and bulls.

Weight (lb)	Daily Gain (lb)	Minimum Dry Matter Consumpt. (lb)	Roughage (%)	(Crude) Total Prot. (lb)	TDN (lb)	ME (Mcal)	Ca (gm)	P (gm)	Vitamin A (1000 IU)
<i>Growing Heifer Calves and Yearlings</i>									
330	1.1	9.0	70-80	0.99	5.7	9.4	14	12	9
330	2.0	8.8	25-30	1.19	6.8	11.3	23	17	9
440	0	7.7	100	0.66	4.2	7.0	6	6	8
440	1.1	13.2	80-90	1.28	7.7	12.7	14	13	13
550	0.7	14.1	100	1.25	7.8	12.8	12	12	14
550	1.1	14.3	80-90	1.36	8.6	14.2	13	13	14
660	0	10.4	100	0.88	5.7	9.5	9	9	10
660	0.7	16.3	100	1.39	8.4	14.5	13	13	16
770	0.7	18.1	100	1.52	10.0	16.5	15	15	18
880	0.7	20.0	100	1.67	11.0	18.2	16	16	19
990	0	14.1	100	1.21	7.9	12.9	12	12	14
990	0.4	19.2	100	1.63	10.6	17.4	16	16	19
<i>Pregnant Heifers, Last 3-4 Months of Pregnancy</i>									
720	0.9	14.5	100	1.28	7.7	12.6	15	15	19
770	0.9	15.2	100	1.34	8.1	13.2	15	15	19
830	0.9	15.9	100	1.39	8.4	13.7	15	15	20
940	0.9	17.2	100	1.52	9.0	14.8	16	16	22
<i>Cows Nursing Calves—Average Milking Ability^a—First 3-4 Months Postpartum</i>									
880	—	19.4	100	1.78	10.4 ^d	17.0	25	25	21
1100	—	21.6	100	1.98	11.7 ^d	19.2	27	27	24
1320	—	24.2	100	2.22	13.0 ^d	21.3	28	28	27
<i>Cows Nursing Calves—Superior Milking Ability^b—First 3-4 Months Postpartum</i>									
880	—	23.8	100 ^c	2.57	13.5 ^d	22.1	45	41	34
1100	—	26.0	100 ^c	2.84	14.8 ^d	24.3	46	43	38
1320	—	28.4	100 ^c	3.10	16.1 ^d	26.4	46	44	43
<i>Dry Pregnant Mature Cows—Middle Third of Pregnancy</i>									
880	—	13.4	100	0.79	7.3	11.9	11	11	17
1100	—	15.9	100	0.92	8.6	14.1	13	13	20
1320	—	18.3	100	1.08	9.7	16.1	15	15	23
<i>Dry Pregnant Cows—Last Third of Pregnancy</i>									
880	—	15.4	100	0.97	8.8	14.3	14	14	21
990	—	16.5	100	1.06	9.4	15.4	15	15	23
1210	—	19.0	100	1.19	10.7	17.5	16	16	26
1430	—	22.4	100	1.32	11.9	19.6	18	18	29
<i>Bulls, Growth and Maintenance (Moderate Activity)</i>									
880	2.0	24.2	70-75	2.27	15.4	25.3	23	23	43
1320	1.1	26.4	80-85	2.24	16.1	26.4	22	22	48
1760	0	23.1	100	1.96	12.8	21.0	19	19	41
2200	0	27.3	100	2.40	15.2	24.8	22	22	48

^a10 pounds of milk per day (Equivalent of approximately 450 lb of calf at weaning if there is adequate forage).

^b20 pounds of milk per day (Equivalent of approximately 650 lb of calf at weaning if there is adequate forage).

^cWould need to be high-quality roughage. Some concentrates may be needed for high pregnancy rates in heavy milking cows.

^dThere is evidence that the TDN requirement should be approximately 10% higher for satisfactory reproductive performance under variable environmental conditions.

Source: National Research Council, 1976. Nutrient Requirements of Beef Cattle.

mature size. Most British breeds reach puberty at 600 to 700 lb. This dictates that if a heifer weighs 400 to 500 lb. when she is weaned at seven months (210 days), she must average 1 to 1.25 lb. daily gain for the next seven months to reach puberty and settle at 14 months of age.

Calves weaned in the fall will have to be fed to gain about one pound daily during the winter months to have that much weight by the time they are 14 months of age. Rations to give approximately one pound daily gain on 400- to 500-lb. calves are given in Table 2.

Table 2. Winter rations for growing heifers.

	Lb.
A. Rations to give 1 lb. per head daily gain	
1. Silage and protein supplement:	
Silage	25-35
Protein (44%)	1
Mineral Mix	Free choice
Salt, 1 part	
Dicalcium phosphate, 1 part	
2. Silage and legume hay:	
Silage	20-30
Hay (legume)	5
Mineral mix	Free choice
Salt, 1 part	
Dicalcium phosphate, 1 part	
3. Hay ration:	
Hay (½ legume)—full fed	12-15
Mineral mix	Free choice
Salt, 1 part	
Monosodium phosphate, 1 part	
B. Rations to give 1½ lb. per head daily gain	
1. Silage and protein supplement:	
Silage—full fed	30-50
Protein (44%)	1½
Mineral mix	Free choice
Salt, 1 part	
Dicalcium phosphate, 1 part	
2. Hay and grain:	
Hay (at least ½ legume)	10
Grain (1 lb./100 lb. body wt.)	4-6
Protein (44%)	½
Mineral mix	Free choice
Salt, 1 part	
Dicalcium phosphate, 1 part	
Monosodium phosphate, 1 part	

Attention must be given to the energy and protein in the replacement heifer's ration the following winter while she is carrying a calf. Work at Missouri and Nebraska experiment stations indicated that pregnant heifers must be fed 6.5 to 7 lb. TDN daily in winter if they were to be bred back after calving. A British-breed pregnant heifer weighing 800 lb. in the fall would need to gain 0.5 lb. daily; and one weighing 750 lb. would need to gain 0.76 lb. daily during winter gestation to be in proper condition to rebreed after she has calved.

Production Goals

Good production goals in a beef herd would be:

- 90 to 95% calf crop born within a 60-day calving period.
- a calf from each cow every 12 months.
- heavy weaning weights (500 lb. plus).

Stress Points

The nutritive needs of the herd must be met to reach these goals. Stress points when heifers and cows are most likely to have nutrient deficiencies follow.

- Heifers—when they are being developed to breed soon enough to calve at 22 to 24 months of age; when they are being prepared to rebreed after a first calf.
- Cows—in the last 90 days of pregnancy and first 90 days of lactation.

Feeding Pregnant Cows

The fleshing of pregnant cows should be watched. Cows in average flesh in the fall can lose 10 to 15 percent of their weight during pregnancy and still be in proper condition to nurse a calf and rebreed. Cows will lose about 100 to 130 lb. at calving. This weight loss represents the birth weight of the calf, fluid and fetal membranes. Approximately one-half of the fetal weight develops the last 60 days of pregnancy.

A practical approach in conditioning cows for calving is to feed them so they will gain about 100 lb. the last three or four months of pregnancy. At this rate, they neither lose nor gain body weight; the ration nutrients instead are used to develop the fetus. Thus,

after the cow calves, she would weigh about the same as she did three or four months before calving. Cows fed energy-deficient rations before calving are slower to come in

Energy is the nutrient most likely to be limiting a cow's milk production in early lactation.

heat. Thus, a sign of energy shortages during pregnancy is failure of cows to rebreed in time to have a calf every 12 months.

Don't starve cows in the last one-third of

pregnancy in an attempt to produce a smaller calf and thereby decrease calving difficulties. This results in the pregnant mother drawing nutrients from her body tissue and skeleton to develop the fetus. In many cases, such cows have trouble rebreeding. But do not overfeed, either. Calving problems are closely associated with overcondition of the cow and size of the calf.

Feeding Lactating Cows

Note in Table 1 that the daily protein requirement of the cow increases approximately 100 percent and the energy (TDN) 60 percent after she calves and starts lactation. Cows that are heavy milkers need even greater amounts of nutrients during lacta-

Table 3. Rations for pregnant cows which make maximum use of good-quality roughage.

Constituents	Percent Moisture	Rations					
		1	2	3	4	5	6
		(Lb.)					
Legume hay, good	-	-	-	-	-	-	3
Grass hay, good	-	16	-	7	-	-	-
Corn silage, good	67	-	-	-	35	-	-
Atlas sorghum silage	72	-	-	-	-	50	40
Grass or grass-legume haylage	60	-	40	25	-	-	-
Protein suppl. (40%)	-	-	-	-	-	¼	-
Mineral mix	-	+	+	+	+	+	-

Table 4. Rations for pregnant cows using low-grade roughage.

Constituents	Percent Moisture	Rations					
		1	2	3	4	5	6
		(Lb.)					
Corn cobs, cottonseed hulls, wheat straw, or cornstalks	-	14	14	10	14	10	10
Corn silage	67	-	-	-	-	-	20
Alfalfa meal, dehyd.	-	-	2	-	-	-	-
Legume Hay, good	-	6	-	5	-	-	-
Grass hay, good	-	-	-	-	-	8	-
Protein suppl. (40%)	-	-	-	-	¾	-	½
Molasses (wet)	-	-	-	3	-	-	-
Ground shelled corn	-	-	2½	-	2½	-	-
Vitamin A ¹	-	-	-	+	+	+	+
Mineral Mix	-	+	+	+	+	+	+

¹30,000 I.U. per cow daily

Table 5. Rations for cows in first four months of lactation.

Constituents	Percent Moisture	Rations					
		1	2	3	4	5	6
		(Lb.)					
Legume hay, good	-	6	-	-	-	7	-
Grass hay, good	-	18	24	-	-	-	16
Corn silage	70	-	-	60	-	-	-
Atlas sorghum silage	72	-	-	-	-	45	-
Grass or grass-legume haylage	60	-	-	-	50	-	-
Ground shelled corn	-	-	-	-	3	3	5
Protein suppl. (40%)	-	-	½	1½	-	-	1
Vitamin A ¹	-	-	+	+	-	-	+
Mineral mix	-	-	+	+	+	+	+

¹45,000 I.U. per cow daily

tion to produce the extra milk.

Energy is the nutrient most likely to be limiting a cow's milk production in early lactation. Phosphorus and protein are other nutrients that may need to be added to cow rations. Many roughages have inadequate levels of phosphorus for cattle. Protein is often deficient in winter rations of lactating cows unless some legume forage is fed.

A cow must come in heat and conceive by 85 days after she calves if she is to have a calf every 12 months. Nutrient intake after calving influences the pregnancy rate in a herd for the next year. After calving, a cow must have extra energy, protein and other nutrients, not only for milk but also to prepare her reproductive organs for pregnan-

cy. Studies have shown that when cows lose weight after calving, fewer of them conceive at first service and somewhat fewer cows show heat early in the breeding season.

First-calf heifers need nutrients for their own growth in addition to those needed for milk and reproduction.

Unless they are fleshy, cows should gain 0.25 to 0.5 lb. a day for the first 90 days after calving to have good reproductive performance. Some scientists think this is so

important to reproduction efficiency that they recommend that weight gain of a sampling of cows be checked every two weeks for the first 60 days to be sure rations are adequate.

Feeding Bulls

Rations for bulls should not differ greatly from those used for females. Since mature bulls are larger than cows, they should be fed a correspondingly larger allowance of feed. Rations used for pregnant replacement heifers will be suitable for young bulls except that more grain will be needed to get the growth usually desired on maturing bulls.

Young bulls weighing 700 to 900 lb.

should gain 2 to 2.2 lb. daily to show good growth gains. They should be fed a ration containing from 9.5 to 10.5 percent crude protein on a dry matter basis. A pound of grain per 100 lb. of body weight and free choice hay should give this rate of gain.

Growth gains, as used here, refers to a normal feeding condition in contrast to bulls on performance test where they are full fed a high energy ration with 12 percent protein for maximum gain (3 to 4 lb. daily).

A pound of 40 percent protein supplement per head daily will be needed if the hay contains less than 50 percent high quality legume. If good quality corn silage is full fed, the grain allowance should be reduced to about 0.5 lb. of grain for each 100 lb. of body weight. A similar amount of grain (0.5 lb./100 lb. body weight) will be needed with good quality pasture to get maximum growth on young bulls. Watch the condition on young bulls and keep them growing, but don't get them overfat. Check the adequacy of your rations by weighing young bulls every month. Mineral and vitamin requirements for bulls are similar to those for heifers.

Bulls to be used for breeding should be kept in medium flesh. Bulls that are too thin or fat will not have best sexual activity. Don't let over-fat bulls down during the breeding season. A mature bull often loses 200 to 300 lb. during the breeding season. This means he will need to gain 1 to 1.25 lb. daily the remainder of the year to be back in condition for the next season. A small amount of grain or other extra feed may be needed 60 days before the breeding season to get mature bulls in proper condition. The condition of the bull would be an indication of whether an extra feed allowance is needed as the breeding season approaches.

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Mature bulls can be maintained largely on pasture and other roughage. Bulls should be conditioned to pasture and not turned out with cows directly from dry lot. They need rations with approximately 8.5 percent protein (dry matter). No extra protein will be needed if good quality grass hay is fed or if 25 percent or more of the hay is composed of legumes. Vitamin and mineral supplements used for cows will be satisfactory for these mature bulls. Figure that it will take around 13 to 15 lb. of TDN and 2.25 lb. of crude protein daily to maintain an 1,800- to 2,000-lb. mature bull. This amount of TDN is contained in 25 to 30 lb. of hay or 60-75 lb. of corn silage. **AJ**

Reprinted from Beef Cow-Calf Manual, a publication of the University of Missouri-Columbia Extension Division.