Beef Cattle Nutrient Requirements

Nutrients Required by Beef Cattle

Beef cattle require nutrients to support body maintenance, reproduction, lactation, and growth. The nutritional needs of beef cattle vary by age, class, stage of production, performance level, and weight. Physiological and environmental stressors, such as sickness and weather, can also impact nutritional requirements.

Beef cattle need water, protein, carbohydrates, fats, minerals, and vitamins. Of these nutrients, they require water in the greatest amounts daily. For more information on beef cattle water requirements, refer to Mississippi State University Extension Service Publication 2490 *Beef Cattle Water Requirements and Source Management*.

The second greatest need is energy, which is supplied by carbohydrates, fats, and protein. This publication reports energy values for total digestible nutrients, net energy for maintenance, and net energy for gain. Mississippi State University Extension Service Publication 2504 *Energy in Beef Cattle Diets*, contains a detailed discussion of beef cattle energy needs.

Protein is essential in beef cattle diets. This publication contains a table of crude protein values. Refer to Mississippi State University Extension Service Publication 2499 *Protein in Beef Cattle Diets* for information on the role of protein in beef cattle diets.

Of the nutrients listed above, beef cattle need minerals and vitamins in the smallest quantities, but they are essential to health and productivity. Mineral requirement values for calcium and phosphorus appear in this publication. Mississippi State University Extension Service Publication 2484 *Mineral and Vitamin Nutrition for Beef Cattle* outlines in detail calcium and phosphorus as well as other mineral and vitamin nutritional requirements of beef cattle.

Dry Matter Intake

While specific requirements for forage or feed intake do not exist, estimates of how much forage or feed animals will consume is needed for diet formulation and prediction of animal performance. This publication includes nutrient requirement tables that report dry matter intake and average daily gain values. Daily dry matter intake of forage and feed is the amount of forage and feed (excluding the moisture content) consumed in a day. Cattle require certain amounts of certain nutrients every day, such as protein, calcium, and vitamin A. To meet specific nutrient requirements, the percentage of nutrients in the diet for cattle is based on the quantities of forages and feeds consumed daily.

Many factors affect dry matter intake, including animal weight, condition, stage of production, milk production level, environmental conditions, forage quality, and amount and type of forage or feed offered. Forages typically make up the majority of cattle diets on both cow-calf and stocker cattle operations in Mississippi. Forage intake capacity is affected by stage of production and forage type and maturity (**Table 1**).

Forage Availability

Forage availability is the most important factor affecting forage intake on pasture. Insufficient available forage restricts intake. On high quality pasture, intake is typically adequate when available forage dry matter is at least 1000 to 1500 pounds per acre. Cattle harvest forages with their tongues, so very short forage can limit the amount of forage intake per bite (bite size). The animal has to walk farther and take more bites to consume an adequate level of forage. The extra walking allows less time for chewing and ruminating. When cattle are grazing short pasture, increased grazing time is often not enough to compensate for reduced bite size on forage intake.

The proportion of leaf to stem can greatly affect the bite size, as cattle prefer leaves. Higher proportions of stems effectively reduce bite size even if total forage available is adequate. When stocking rate is high, cattle on rotationally stocked pastures may be forced to consume more stem or low quality forage, which can reduce intake. In contrast, cattle on a continuously grazed pasture can be more selective unless the pasture is overstocked and has low forage availability. Warm-season perennial grasses, such as bermudagrass, bahiagrass, and dallisgrass, with a higher proportion of stem may require the animal to harvest more but in smaller bites to obtain the desired amount of forage. Cattle avoid dead material if green leaf is available, and bite size may be restricted as the grazing animal seeks out green leaves.

Table 1. Forage intake capacity of beef cows.[1]		
Forage Type and Maturity	**Stage of Production**	**Forage Dry Matter Intake Capacity (% of body weight)**
Low quality forage (< 52% total digestible nutrients)	Non-lactating	1.8
	Lactating	2.2
Average quality forage (52 to 59% total digestible nutrients)	Non-lactating	2.2
	Lactating	2.5
High quality forage (> 59% total digestible nutrients)	Non-lactating	2.5
	Lactating	2.7
Lush, growing pasture	Non-lactating	2.5
	Lactating	2.7
Silage	Non-lactating	2.5
	Lactating	2.7

[1]Intake estimates assume that protein requirements are met in the total diet. When protein requirements are not met, forage intake will be lower than the values in the table. Source: Hibbard and Thrift, 1992.

Palatability

Palatability refers to how acceptable a forage or feed is to an animal. Animals may spend time seeking out certain forage species and avoiding others, which affects bite size and effective forage availability. Cattle generally prefer grasses over clover and alfalfa. The tannins found in forages such as arrowleaf clover can reduce palatability. Nitrogen fertilization will generally increase forage protein content and can increase forage palatability. Cattle prefer certain feed ingredients as well. For example, newly arrived stocker calves usually prefer dry feeds to wet feeds, such as silages. Cattle may even refuse extremely moldy or otherwise unpalatable feeds. Palatability problems with hay or feed can increase feed waste.

Feeding Drive

If adequate forage is available, increased feeding drive usually increases forage intake. Body size, lactation level, growth rate, age, sex, and environmental factors all affect an animal's demand for nutrients. Lactating beef cattle can consume 35 to 50 percent more dry matter than nonlactating cattle of the same size on the same diet. Cattle with greater milk-producing ability often also have increased feed intake needs. Body composition, particularly the amount of body fat, can impact feed intake. Dry matter intake decreases once cattle exceed a certain degree of condition. Specifically, there is about a 2.7 percent decrease in dry matter intake for each 1 percent increase in body fat past the range of 21.3 to 31.5 percent body fat. Diligent feed intake monitoring can help determine when cattle have reached appropriate finish condition.

Physical Satiety

Physical satiety is the degree of "fullness" or distention of the digestive tract or abdomen caused by the volume of digesta in the tract. It is affected by forage quality, which determines how rapidly forage moves through the digestive tract. For example, intake on low quality bermudagrass will typically be lower than on annual ryegrass or white clover because bermudagrass remains in the rumen much longer. The beef animal's digestive tract breaks down annual ryegrass and white clover quickly, absorbs the nutrients, and rapidly passes the small amount of residue through the digestive tract. Forage intake can be limited by the capacity of the digestive tract because receptors in the rumen wall are sensitive to stretch. Yet factors other than gut capacity may influence rate of digestion and intake.

Intake by beef cattle fed high-concentrate, grain-based diets is likely controlled by metabolic factors, not bulk fill. Feedlot cattle may increase their dry matter intake in response to a change in the level of bulky roughage (by as little as 5 percent or less of dry matter) or a shift to a more fibrous roughage. Percentage of dietary neutral detergent fiber (NDF) supplied by roughage appears to be useful for predicting effects of roughage quantity and source on dry matter intake. In general, as NDF levels increase, dry matter intake decreases.

Toxic Factors

There is considerable evidence that cattle can learn to avoid toxic or imbalanced feeds and to choose between two feeds of different nutritional value in order to avoid nutrient excesses or deficiencies. For example, cattle will graze a shorter time without changing bite size on toxic

endophyte-infected tall fescue than on endophyte-free or nontoxic endophyte infected tall fescue. Selenium, cyanide (from prussic acid), or an alkaloid (for example, from toxic endophyte-infected tall fescue) can severely reduce intake.

Nutrient Deficiencies

Intake can be depressed whenever feed is deficient in essential nutrients, particularly protein. Nitrogen deficiency is common in cattle consuming low-nitrogen, high-fiber forage. Correcting this deficiency with supplemental nitrogen (protein) can increase dry matter intake substantially. Supplementing with protein helps increase intake when forage crude protein levels fall below 6 to 8 percent. Low protein levels are most commonly seen in poor quality forage with inadequate nitrogen fertilization. Supplementing with grain-based concentrate feeds tends to decrease forage intake, and forage intake drops more with high-quality forages than with low-quality forages.

Feed Physical Form

The physical form of feeds and forages can impact feed intake. With forage, fine grinding can improve intake, possibly by allowing it to pass through the digestive tract more rapidly. However, fine grinding of concentrate feeds can decrease feed intake.

Ionophore Use

Monensin is an ionophore used in beef cattle diets that helps improve cattle growth and efficiency. Beef cattle may drop dry matter intake by approximately 4 to 6 percent when fed monensin at recommended levels. Monensin can be added to receiving rations at levels required for coccidiosis control without affecting feed intake of lightweight calves. Monensin can reduce feed intake variation among individuals in group-fed cattle. Other ionophores, such as lasalocid, have limited effects on feed intake.

Implant Use

Growth-promoting implants tend to increase feed intake by 4 to 16 percent. The actual increase in feed intake may depend upon the animal's stage of growth at the time the implant is administered. Dry matter intake predictions should be decreased by about 8 percent for non-implanted cattle.

Environment

Extreme temperatures and weather can impact feed intake. The thermal neutral zone is the effective temperature range within which performance rate and efficiency are maximized. As temperatures rise above the animal's thermal neutral zone upper critical temperature, the point at which heat stress begins, dry matter intake falls (**Figure 1**). As temperatures drop below the animal's thermal neutral zone lower critical temperature, the point at which cold stress begins, dry matter intake increases. Temperature-based stress on cattle impacts energetic efficiency.

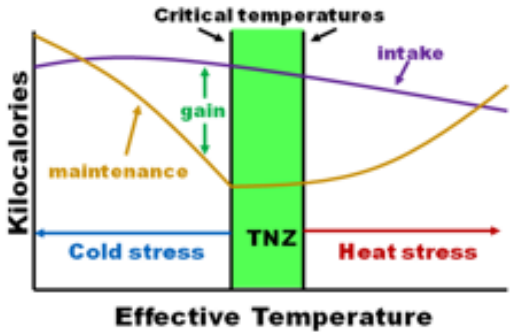

Figure 1. Effects of temperature on beef cattle maintenance, gain, and intake.
[1]TNZ = Thermal Neutral Zone
Source: Adapted from Taylor, 1994.

The effects of temperature on feed intake depend upon the animal's thermal susceptibility, acclimation to the conditions, and diet. Mud, precipitation, humidity, and wind heighten temperature effects on feed intake (**Table 2**). The duration of these adverse conditions and the photoperiod, or length of daylight, may also influence feed intake. Breed also strongly influences how environmental conditions affect feed intake. Adaptability of cattle to the environment can impact feed intake and cattle productivity.

Table 2. Dry matter intake adjustment factors for specific environmental conditions.[1]

Environmental Condition	Dry Matter Intake Adjustment Factor[1]
Temperature, degrees Fahrenheit	
> 95 with no night cooling	.65
> 95 with night cooling	.90
77 to 95	.90
59 to 77	1.00
41 to 59	1.03
23 to 41	1.05
5 to 23	1.07
< 5	1.16
Mud, inches	
None	1.00
Mild, 3.9 to 7.9	.85
Severe, 11.8 to 23.6	.70

[1]Multiply this factor by predicted dry matter intake to determine adjusted dry matter intake for the specific environmental condition.
Source: NRC, 1987. Adapted from Predicting Feed Intake of Food-Producing Animals.

Management

Management can impact feed intake levels in beef cattle. Commingled newly weaned calves tend to consume more dry matter in the first weeks after weaning. Management practices such as programmed feeding, multiple feed deliveries per day, and consistent timing of feed delivery help regulate feeding behavior and reduce variations in feed intake by penned cattle. However, the effectiveness of these practices is typically evaluated by the pen and does not usually account for individual variation.

Individual Animal Variation

There is considerable individual animal variation in feed intake beyond what would be predicted based on size and growth rate. This difference in intake is called net or residual feed intake (RFI). Genetic variation in RFI of beef cattle exists both during growth and in adult cattle. Residual feed intake is moderately heritable, indicating that genetic improvement can be made through selection. From a cost production standpoint, a lower RFI value is more desirable. An animal with a negative RFI is more efficient because it consumes less feed than expected, while a positive-RFI animal is less efficient because it consumes more feed than expected.

Nutrient Requirement Tables

Data provided in the following nutrient requirement tables can assist producers in determining specific beef cattle nutrient requirements (**Tables 3**–**9**). The values listed in the tables serve as a general guide for matching forage and feeding programs to cattle nutrient needs. Actual nutrient requirements vary depending on many animal and environmental factors. Monitor body condition and weight in mature cattle and growth rates of growing cattle to make adjustments to cattle diets to achieve desired performance results.

Dry matter intake values are estimates based on published prediction equations. These predictions assume that adequate protein is supplied in the diet for maximum rumen fermentation. If the diet is deficient in protein, the dry matter intake values will overestimate actual cattle consumption.

Tabular values are intended for healthy, unstressed cattle in good body condition. Thin cattle need additional nutrients to improve body condition. Cattle under stresses, such as weather extremes or physical exertion, also require extra energy for maintenance.

Table 3. Nutrient requirements of mature beef cows.[1,2]

Animal Description			Dry Matter Intake (DMI)		Diet Nutrient Density					Daily Nutrients per Animal				
Months since calving	Milk, lb/day	Body weight, lb	DMI, lb/day	DMI, % of BW	TDN, % DM	NEm, Mcal/ lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	CP, lb	Ca, lb	P, lb
900 lb mature weight														
10 lb peak milk														
1	8.3	900	20.2	2.2	56.4	.55	8.9	.24	.16	11.4	11.1	1.79	.049	.033
2	10.0	900	20.6	2.3	56.8	.57	9.3	.26	.17	11.7	11.7	1.92	.053	.035
3	9.0	901	21.4	2.4	54.7	.53	8.6	.24	.16	11.7	11.3	1.84	.051	.035
4	7.2	902	21.0	2.3	53.8	.51	8.1	.22	.15	11.3	10.8	1.70	.046	.031
5	5.4	904	20.5	2.3	52.7	.50	7.7	.20	.14	10.8	10.2	1.57	.042	.029
6	3.9	907	20.2	2.2	52.0	.49	7.2	.18	.13	10.5	9.8	1.45	.037	.026
20 lb peak milk														
1	16.7	900	22.6	2.5	60.2	.61	10.8	.30	.19	13.6	13.8	2.44	.068	.044
2	20.0	900	23.5	2.6	61.7	.63	11.5	.33	.22	14.5	14.9	2.70	.077	.051
3	18.0	901	23.8	2.6	59.2	.60	10.7	.31	.19	14.1	14.3	2.54	.073	.046
4	14.4	902	22.9	2.5	57.6	.57	9.9	.28	.18	13.2	13.1	2.26	.064	.042
5	10.8	904	21.9	2.4	55.7	.55	9.1	.25	.17	12.2	12.0	1.99	.055	.037
6	7.8	907	21.1	2.3	54.5	.52	8.3	.22	.16	11.5	11.0	1.76	.046	.033
30 lb peak milk														
1	25.0	900	24.9	2.8	63.5	.66	12.4	.35	.23	15.8	16.5	3.09	.088	.057
2	30.0	900	26.3	2.9	65.4	.69	13.2	.38	.24	17.2	18.2	3.48	.101	.064
3	27.0	901	26.3	2.9	62.7	.65	12.3	.36	.23	16.5	17.2	3.24	.095	.060
4	21.6	902	24.8	2.7	60.9	.63	11.4	.33	.21	15.1	15.5	2.83	.082	.053
5	16.2	904	23.4	2.6	58.5	.59	10.3	.29	.19	13.7	13.7	2.41	.068	.044
6	11.7	907	22.2	2.4	56.3	.55	9.3	.26	.17	12.5	12.3	2.06	.057	.037
10, 20, 30 lb peak milk														
7	0.0	911	18.0	2.0	46.7	.40	6.5	.16	.12	8.4	7.2	1.17	.029	.022
8	0.0	918	18.3	2.0	47.0	.40	6.6	.16	.12	8.6	7.4	1.20	.029	.022
9	0.0	929	18.7	2.0	47.6	.42	6.7	.16	.12	8.9	7.8	1.25	.029	.022
10	0.0	944	19.4	2.1	49.0	.43	6.9	.24	.15	9.5	8.4	1.33	.046	.029
11	0.0	966	19.4	2.0	51.5	.48	7.6	.24	.15	10.0	9.3	1.47	.046	.029
12	0.0	997	19.7	2.0	55.3	.54	8.6	.23	.15	10.9	10.7	1.70	.046	.029
1,000 lb mature weight														
10 lb peak milk														
1	8.2	1,000	21.6	2.2	55.8	.55	8.7	.24	.17	12.1	11.9	1.88	.052	.037
2	10.0	1,000	22.1	2.2	56.6	.56	9.1	.25	.17	12.5	12.4	2.01	.055	.038
3	9.0	1,002	23.0	2.3	54.3	.52	8.4	.23	.16	12.5	12.0	1.93	.053	.037
4	7.2	1,003	22.5	2.2	53.4	.51	8.0	.22	.15	12.0	11.5	1.79	.050	.034
5	5.4	1,005	22.1	2.2	52.5	.49	7.5	.20	.14	11.6	10.8	1.66	.044	.031
6	3.9	1,009	21.7	2.2	51.8	.48	7.1	.19	.14	11.2	10.4	1.55	.041	.030
20 lb peak milk														
1	16.7	1,000	24.0	2.4	59.6	.60	10.5	.30	.20	14.3	14.4	2.53	.072	.048
2	20.0	1,000	25.0	2.5	60.9	.62	11.2	.32	.21	15.2	15.5	2.80	.080	.053
3	18.0	1,002	25.4	2.5	58.6	.59	10.4	.30	.19	14.9	15.0	2.64	.076	.048
4	14.4	1,003	24.4	2.4	57.0	.56	9.7	.27	.18	13.9	13.7	2.35	.066	.044
5	10.8	1,005	23.5	2.3	55.4	.54	8.9	.24	.17	13.0	12.7	2.08	.056	.040
6	7.8	1,009	22.7	2.3	54.0	.52	8.2	.22	.15	12.3	11.8	1.85	.050	.034

Table 3 (continued). Nutrient requirements of mature beef cows.[1,2]

Animal Description			Dry Matter Intake (DMI)		Diet Nutrient Density					Daily Nutrients per Animal				
Months since calving	Milk, lb/day	Body weight, lb	DMI, lb/day	DMI, % of BW	TDN, % DM	NEm, Mcal/ lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	CP, lb	Ca, lb	P, lb
30 lb peak milk														
1	25.0	1,000	26.4	2.6	62.8	.65	12.1	.35	.22	16.6	17.2	3.18	.092	.058
2	30.0	1,000	27.8	2.8	64.5	.68	12.9	.38	.24	17.9	18.9	3.58	.106	.067
3	27.0	1,002	27.8	2.8	62.1	.64	12.0	.35	.22	17.3	17.8	3.34	.097	.061
4	21.6	1,003	26.4	2.6	60.1	.61	11.1	.32	.21	15.9	16.1	2.92	.084	.055
5	16.2	1,005	24.9	2.5	57.9	.58	10.0	.28	.19	14.4	14.4	2.50	.070	.047
6	11.7	1,009	23.7	2.3	55.9	.55	9.1	.25	.17	13.2	13.0	2.15	.059	.040
1,100 lb mature weight														
10 lb peak milk														
1	8.3	1,100	23.1	2.1	55.6	.54	8.5	.24	.16	12.8	12.5	1.97	.055	.037
2	10.0	1,100	23.5	2.1	56.3	.55	8.9	.26	.17	13.2	13.0	2.10	.060	.040
3	9.0	1,102	24.5	2.2	54.1	.52	8.2	.22	.16	13.3	12.7	2.02	.055	.040
4	7.2	1,103	24.1	2.2	53.2	.50	7.8	.21	.15	12.8	12.1	1.89	.051	.037
5	5.4	1,105	23.6	2.1	52.3	.49	7.4	.19	.14	12.3	11.6	1.75	.046	.033
6	3.9	1,108	23.3	2.1	51.6	.48	7.0	.19	.13	12.0	11.2	1.64	.044	.031
20 lb peak milk														
1	16.7	1,100	25.4	2.3	59.1	.60	10.3	.30	.20	15.0	15.2	2.62	.075	.051
2	20.0	1,100	26.4	2.4	60.4	.62	10.9	.32	.21	15.9	16.3	2.88	.084	.055
3	18.0	1,102	26.9	2.4	58.1	.58	10.1	.29	.19	15.6	15.6	2.73	.077	.051
4	14.4	1,103	26.0	2.4	56.6	.56	9.4	.26	.18	14.7	14.5	2.45	.068	.046
5	10.8	1,105	25.0	2.3	55.0	.53	8.7	.24	.17	13.8	13.3	2.17	.060	.042
6	7.8	1,108	24.2	2.2	53.7	.51	8.1	.22	.15	13.0	12.4	1.95	.053	.037
30 lb peak milk														
1	25.0	1,100	27.8	2.5	62.2	.64	11.8	.34	.22	17.3	17.9	3.27	.095	.062
2	30.0	1,100	29.2	2.7	63.9	.67	12.5	.37	.23	18.7	19.5	3.66	.108	.068
3	27.0	1,102	29.4	2.7	61.5	.63	11.7	.34	.22	18.1	18.6	3.43	.099	.064
4	21.6	1,103	27.9	2.5	59.5	.60	10.8	.31	.20	16.6	16.8	3.01	.086	.057
5	16.2	1,105	26.4	2.4	57.4	.57	9.8	.28	.19	15.2	15.1	2.59	.073	.049
6	11.7	1,108	25.3	2.3	55.6	.54	8.9	.25	.17	14.1	13.7	2.25	.062	.042
10, 20, 30 lb peak milk														
7	0.0	1,114	20.9	1.9	46.8	.40	6.5	.16	.12	9.8	8.4	1.36	.033	.026
8	0.0	1,122	21.2	1.9	47.2	.41	6.6	.16	.12	10.0	8.7	1.40	.033	.026
9	0.0	1,135	21.8	1.9	47.9	.42	6.7	.15	.12	10.4	9.1	1.45	.033	.026
10	0.0	1,154	22.6	2.0	48.9	.44	6.9	.24	.15	11.1	9.9	1.56	.055	.035
11	0.0	1,181	22.5	1.9	52.1	.49	7.7	.24	.16	11.7	11.0	1.73	.055	.035
12	0.0	1,218	23.0	1.9	56.0	.55	8.7	.24	.15	12.9	12.6	2.00	.055	.035
1,200 lb mature weight														
10 lb peak milk														
1	8.3	1,200	24.4	2.0	55.3	.54	8.4	.24	.17	13.5	13.2	2.06	.059	.041
2	10.0	1,200	24.9	2.1	56.0	.55	8.8	.25	.17	13.9	13.7	2.19	.062	.042
3	9.0	1,202	26.0	2.2	53.7	.51	8.1	.23	.16	14.0	13.3	2.11	.060	.042
4	7.2	1,203	25.6	2.1	52.9	.50	7.7	.21	.15	13.5	12.8	1.98	.054	.038
5	5.4	1,205	25.1	2.1	52.1	.49	7.3	.20	.14	13.1	12.3	1.84	.050	.035
6	3.9	1,209	24.8	2.1	51.5	.48	7.0	.19	.14	12.8	11.9	1.74	.047	.035

Table 3 (continued). Nutrient requirements of mature beef cows.[1,2]

Animal Description			Dry Matter Intake (DMI)		Diet Nutrient Density					Daily Nutrients per Animal				
Months since calving	Milk, lb/day	Body weight, lb	DMI, lb/day	DMI, % of BW	TDN, % DM	NEm, Mcal/ lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	CP, lb	Ca, lb	P, lb
20 lb peak milk														
1	16.7	1,200	26.8	2.2	58.7	.59	10.1	.29	.19	15.7	15.8	2.71	.078	.051
2	20.0	1,200	27.8	2.3	59.9	.61	10.7	.31	.21	16.7	17.0	2.97	.086	.058
3	18.0	1,202	28.4	2.4	57.6	.57	9.9	.29	.19	16.4	16.2	2.82	.082	.054
4	14.4	1,203	27.4	2.3	56.2	.55	9.3	.26	.18	15.4	15.1	2.53	.071	.049
5	10.8	1,205	26.5	2.2	54.7	.53	8.5	.24	.17	14.5	14.0	2.26	.064	.045
6	7.8	1,209	25.7	2.1	53.4	.51	7.9	.22	.15	13.7	13.1	2.04	.057	.039
30 lb peak milk														
1	25.0	1,200	29.2	2.4	61.6	.64	11.5	.34	.22	18.0	18.7	3.36	.099	.064
2	30.0	1,200	30.6	2.6	63.2	.66	12.3	.36	.23	19.3	20.2	3.75	.110	.070
3	27.0	1,202	30.8	2.6	60.8	.62	11.4	.34	.22	18.7	19.1	3.51	.105	.068
4	21.6	1,203	29.4	2.4	59.0	.59	10.6	.31	.20	17.3	17.3	3.10	.091	.059
5	16.2	1,205	27.9	2.3	57.0	.56	9.6	.27	.18	15.9	15.6	2.68	.075	.050
6	11.7	1,209	26.7	2.2	55.2	.54	8.8	.25	.17	14.7	14.4	2.34	.067	.045
10, 20, 30 lb peak milk														
7	0.0	1,215	24.2	2.0	44.9	.37	6.0	.15	.12	10.9	9.0	1.45	.036	.029
8	0.0	1,224	24.1	2.0	45.8	.38	6.2	.15	.12	11.0	9.2	1.49	.036	.029
9	0.0	1,238	24.0	1.9	47.1	.41	6.5	.15	.12	11.3	9.8	1.56	.036	.029
10	0.0	1,259	23.9	1.9	49.3	.44	7.0	.26	.16	11.8	10.5	1.67	.062	.038
11	0.0	1,288	24.1	1.9	52.3	.49	7.7	.25	.16	12.6	11.8	1.86	.060	.039
12	0.0	1,329	24.6	1.9	56.2	.55	8.8	.25	.16	13.8	13.5	2.16	.062	.039
1,300 lb mature weight														
10 lb peak milk														
1	8.3	1,300	25.8	2.0	55.0	.53	8.3	.23	.16	14.2	13.8	2.15	.060	.042
2	10.0	1,300	26.3	2.0	55.9	.54	8.7	.24	.17	14.7	14.3	2.28	.064	.046
3	9.0	1,302	27.5	2.1	53.5	.51	8.0	.23	.16	14.7	14.0	2.20	.062	.044
4	7.2	1,303	27.0	2.1	52.6	.50	7.6	.21	.16	14.2	13.4	2.06	.057	.042
5	5.4	1,306	26.6	2.0	51.9	.48	7.3	.20	.15	13.8	12.9	1.93	.053	.040
6	3.9	1,310	26.3	2.0	51.3	.48	6.9	.19	.14	13.5	12.5	1.82	.051	.037
20 lb peak milk														
1	16.7	1,300	28.2	2.2	58.5	.59	9.9	.29	.20	16.5	16.5	2.80	.082	.055
2	20.0	1,300	29.1	2.2	59.5	.60	10.5	.30	.21	17.3	17.6	3.06	.088	.060
3	18.0	1,302	29.9	2.3	57.2	.57	9.7	.28	.19	17.1	16.9	2.91	.084	.057
4	14.4	1,303	28.9	2.2	56.1	.55	9.1	.26	.18	16.2	15.8	2.63	.075	.051
5	10.8	1,306	28.0	2.1	54.3	.52	8.4	.24	.16	15.2	14.6	2.35	.066	.046
6	7.8	1,310	27.2	2.1	53.3	.50	7.8	.22	.15	14.5	13.7	2.13	.060	.042
30 lb peak milk														
1	25.0	1,300	30.6	2.4	61.1	.63	11.3	.33	.22	18.7	19.2	3.45	.101	.066
2	30.0	1,300	32.0	2.5	62.8	.65	12.0	.36	.23	20.1	20.8	3.84	.115	.073
3	27.0	1,302	32.3	2.5	60.4	.62	11.2	.33	.21	19.5	19.9	3.61	.106	.068
4	21.6	1,303	30.8	2.4	58.8	.59	10.4	.30	.20	18.1	18.1	3.19	.093	.062
5	16.2	1,306	29.4	2.3	56.5	.56	9.4	.27	.19	16.6	16.4	2.77	.079	.055
6	11.7	1,310	28.2	2.2	55.0	.53	8.6	.24	.17	15.5	15.0	2.43	.068	.049

Table 3 (continued). Nutrient requirements of mature beef cows.[1,2]

Animal Description			Dry Matter Intake (DMI)		Diet Nutrient Density					Daily Nutrients per Animal				
Months since calving	Milk, lb/day	Body weight, lb	DMI, lb/day	DMI, % of BW	TDN, % DM	NEm, Mcal/ lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	CP, lb	Ca, lb	P, lb
10, 20, 30 lb peak milk														
7	0.0	1,316	23.8	1.8	47.1	.40	6.5	.17	.13	11.2	9.5	1.54	.040	.031
8	0.0	1,326	24.2	1.8	47.1	.40	6.4	.17	.13	11.4	9.8	1.58	.040	.031
9	0.0	1,342	24.8	1.8	48.0	.42	6.7	.16	.13	11.9	10.4	1.66	.040	.031
10	0.0	1,364	25.8	1.9	48.8	.44	6.9	.26	.16	12.6	11.3	1.78	.066	.042
11	0.0	1,396	25.6	1.8	52.3	.49	7.8	.26	.16	13.4	12.6	1.99	.066	.042
12	0.0	1,440	26.1	1.8	56.3	.56	8.9	.25	.16	14.7	14.5	2.31	.066	.042
1,400 lb mature weight														
10 lb peak milk														
1	8.3	1,400	27.1	1.9	54.9	.53	8.2	.23	.17	14.9	14.4	2.23	.062	.046
2	10.0	1,400	27.6	2.0	55.5	.54	8.6	.25	.17	15.3	14.9	2.36	.069	.047
3	9.0	1,402	28.9	2.1	53.3	.51	7.9	.23	.16	15.4	14.7	2.29	.066	.046
4	7.2	1,403	28.5	2.0	52.5	.49	7.6	.21	.15	15.0	14.0	2.15	.060	.043
5	5.4	1,406	28.0	2.0	51.8	.48	7.2	.20	.15	14.5	13.4	2.01	.056	.042
6	3.9	1,410	27.7	2.0	51.2	.47	6.9	.19	.14	14.2	13.0	1.91	.053	.039
20 lb peak milk														
1	16.7	1,400	29.5	2.1	58.0	.58	9.8	.28	.19	17.1	17.1	2.88	.083	.056
2	20.0	1,400	30.5	2.2	59.1	.60	10.3	.30	.20	18.0	18.3	3.14	.092	.061
3	18.0	1,402	31.3	2.2	56.8	.56	9.6	.28	.19	17.8	17.5	2.99	.088	.059
4	14.4	1,403	30.3	2.2	55.5	.54	8.9	.26	.18	16.8	16.4	2.71	.079	.055
5	10.8	1,406	29.4	2.1	54.1	.52	8.3	.24	.17	15.9	15.3	2.44	.071	.050
6	7.8	1,410	28.6	2.0	53.0	.50	7.7	.22	.16	15.2	14.3	2.21	.063	.046
30 lb peak milk														
1	25.0	1,400	31.9	2.3	60.7	.62	11.1	.33	.22	19.4	19.8	3.53	.105	.070
2	30.0	1,400	33.3	2.4	62.2	.64	11.8	.35	.23	20.7	21.3	3.92	.117	.077
3	27.0	1,402	33.7	2.4	59.8	.61	11.0	.32	.21	20.2	20.6	3.69	.108	.071
4	21.6	1,403	32.3	2.3	58.1	.58	10.2	.30	.20	18.8	18.7	3.28	.097	.065
5	16.2	1,406	30.8	2.2	56.2	.55	9.3	.27	.18	17.3	16.9	2.86	.083	.055
6	11.7	1,410	29.6	2.1	54.7	.53	8.5	.24	.17	16.2	15.7	2.51	.071	.050
10, 20, 30 lb peak milk														
7	0.0	1,417	27.2	1.9	45.0	.37	6.0	.16	.12	12.2	10.1	1.63	.044	.033
8	0.0	1,428	27.0	1.9	45.8	.39	6.2	.16	.12	12.4	10.5	1.67	.043	.032
9	0.0	1,445	26.9	1.9	47.3	.41	6.5	.16	.12	12.7	11.0	1.76	.043	.032
10	0.0	1,469	26.8	1.8	49.5	.44	7.0	.27	.17	13.3	11.8	1.89	.072	.046
11	0.0	1,503	27.0	1.8	52.6	.49	7.8	.26	.17	14.2	13.2	2.11	.070	.046
12	0.0	1,550	27.6	1.8	56.6	.56	8.9	.26	.16	15.6	15.5	2.45	.072	.044

[1]To maintain moderate body condition
[2]BW = total body weight = shrunk body weight or 96% full body weight, TDN = total digestible nutrients, NEm = net energy for maintenance, CP = crude protein, Ca = calcium, P = phosphorus
Source: NRC, 2000. Adapted from NRC Nutrient Requirements of Beef Cattle, 7th revised edition.

Table 4. Nutrient requirements of two-year-old heifers.[1,2]

Animal Description			Dry Matter Intake (DMI)		Diet Nutrient Density					Daily Nutrients per Animal				
Months since calving	Milk, lb/day	Body weight, lb	DMI, lb/day	DMI, % of BW	TDN, % DM	NEm, Mcal/ lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	CP, lb	Ca, lb	P, lb
900 lb mature weight														
1	12.3	729	19.1	2.6	61.4	.63	10.8	.31	.20	11.7	12.1	2.07	.060	.037
2	14.8	738	19.9	2.7	62.6	.65	11.4	.33	.21	12.5	12.9	2.27	.066	.042
3	13.3	748	20.4	2.7	60.3	.61	10.6	.30	.19	12.3	12.5	2.16	.062	.040
4	10.7	758	19.8	2.6	58.8	.60	9.9	.28	.18	11.6	11.8	1.96	.055	.035
5	8.0	769	19.3	2.5	57.4	.57	9.2	.25	.17	11.1	11.0	1.77	.049	.033
6	5.8	781	18.8	2.4	56.2	.55	8.6	.23	.15	10.6	10.4	1.61	.044	.029
7	0.0	794	17.4	2.2	48.5	.43	6.8	.18	.13	8.4	7.4	1.18	.031	.022
8	0.0	810	17.5	2.2	49.2	.44	7.0	.18	.13	8.6	7.7	1.22	.031	.022
9	0.0	830	17.7	2.1	50.5	.46	7.2	.17	.12	8.9	8.2	1.28	.031	.022
10	0.0	854	17.9	2.1	52.4	.49	7.7	.27	.16	9.4	8.8	1.38	.049	.029
11	0.0	885	18.3	2.1	55.2	.54	8.3	.27	.16	10.1	9.8	1.52	.049	.029
12	0.0	825	18.9	2.3	58.7	.59	9.3	.27	.15	11.1	11.2	1.75	.051	.029
1,000 lb mature weight														
1	12.3	810	20.4	2.5	61.0	.63	10.6	.30	.19	12.4	12.8	2.16	.062	.040
2	14.8	820	21.2	2.6	62.1	.64	11.1	.32	.21	13.2	13.6	2.36	.068	.044
3	13.3	831	21.8	2.6	59.8	.61	10.4	.30	.19	13.0	13.2	2.26	.066	.042
4	10.7	843	21.2	2.5	58.5	.59	9.7	.28	.18	12.4	12.5	2.06	.060	.037
5	8.0	854	20.7	2.4	57.1	.57	9.0	.26	.17	11.8	11.7	1.87	.053	.035
6	5.8	868	20.3	2.3	56.0	.55	8.4	.23	.15	11.4	11.1	1.71	.046	.031
7	0.0	883	18.8	2.1	48.6	.43	6.8	.18	.13	9.1	8.1	1.29	.033	.024
8	0.0	900	18.9	2.1	49.4	.44	7.0	.17	.13	9.3	8.4	1.33	.033	.024
9	0.0	922	19.1	2.1	50.7	.47	7.3	.17	.13	9.7	8.9	1.39	.033	.024
10	0.0	949	19.4	2.0	52.7	.49	7.7	.28	.17	10.2	9.6	1.50	.055	.033
11	0.0	984	19.9	2.0	55.5	.54	8.4	.28	.17	11.0	10.7	1.66	.055	.033
12	0.0	1,028	20.6	2.0	59.1	.60	9.3	.27	.16	12.2	12.3	1.92	.055	.033
1,100 lb mature weight														
1	12.3	891	21.6	2.4	60.7	.62	10.4	.31	.19	13.1	13.4	2.25	.066	.042
2	14.8	902	22.5	2.5	61.7	.64	10.9	.32	.21	13.9	14.3	2.45	.073	.046
3	13.3	915	23.2	2.5	59.5	.60	10.1	.29	.19	13.8	13.9	2.35	.068	.044
4	10.7	927	22.6	2.4	58.2	.58	9.5	.27	.18	13.2	13.2	2.16	.062	.040
5	8.0	940	22.1	2.4	56.9	.56	8.9	.25	.17	12.6	12.4	1.96	.055	.037
6	5.8	954	21.7	2.3	55.9	.55	8.3	.23	.15	12.1	11.9	1.81	.051	.033
7	0.0	971	20.2	2.1	48.8	.43	6.9	.19	.13	9.9	8.7	1.39	.037	.026
8	0.0	990	20.4	2.1	49.5	.45	7.0	.18	.13	10.1	9.1	1.43	.037	.026
9	0.0	1,014	20.6	2.0	50.8	.47	7.3	.18	.13	10.5	9.6	1.50	.037	.026
10	0.0	1,044	20.9	2.0	52.8	.50	7.7	.28	.17	11.0	10.4	1.61	.060	.035
11	0.0	1,082	21.4	2.0	55.7	.54	8.4	.28	.16	11.9	11.6	1.79	.060	.035
12	0.0	1,130	22.1	2.0	59.4	.60	9.4	.27	.16	13.1	13.3	2.07	.060	.035
1,200 lb mature weight														
1	12.3	972	22.9	2.4	60.4	.62	10.2	.30	.19	13.8	14.1	2.34	.068	.044
2	14.8	984	23.8	2.4	61.4	.63	10.7	.31	.20	14.6	15.0	2.55	.075	.049
3	13.3	998	24.5	2.5	59.2	.60	10.0	.29	.19	14.5	14.6	2.44	.071	.046
4	10.7	1,011	24.0	2.4	58.0	.58	9.4	.28	.17	13.9	13.9	2.25	.066	.042

Table 4 (continued). Nutrient requirements of two-year-old heifers.[1,2]

Animal Description			Dry Matter Intake (DMI)		Diet Nutrient Density					Daily Nutrients per Animal				
Months since calving	Milk, lb/day	Body weight, lb	DMI, lb/day	DMI, % of BW	TDN, % DM	NEm, Mcal/ lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	CP, lb	Ca, lb	P, lb
5	8.0	1,025	23.4	2.3	56.8	.56	8.8	.25	.17	13.3	13.1	2.05	.060	.040
6	5.8	1,041	23.0	2.2	55.8	.55	8.3	.23	.15	12.8	12.6	1.90	.053	.035
7	0.0	1,059	21.5	2.0	48.9	.44	6.9	.18	.13	10.5	9.4	1.48	.040	.029
8	0.0	1,080	21.7	2.0	49.7	.45	7.1	.18	.13	10.8	9.7	1.53	.040	.029
9	0.0	1,106	22.0	2.0	51.0	.47	7.3	.18	.13	11.2	10.3	1.61	.040	.029
10	0.0	1,139	22.3	2.0	53.1	.50	7.8	.30	.18	11.8	11.2	1.73	.066	.040
11	0.0	1,180	22.8	1.9	55.9	.55	8.5	.29	.17	12.7	12.5	1.93	.066	.040
12	0.0	1,233	23.7	1.9	59.7	.60	9.4	.28	.17	14.1	14.3	2.23	.066	.040
1,300 lb mature weight														
1	12.3	1,053	24.1	2.3	60.2	.61	10.1	.30	.19	14.5	14.8	2.43	.073	.046
2	14.8	1,066	25.0	2.3	61.1	.63	10.5	.31	.20	15.3	15.7	2.63	.077	.051
3	13.3	1,081	25.8	2.4	58.9	.59	9.8	.29	.19	15.2	15.3	2.53	.075	.049
4	10.7	1,095	25.3	2.3	57.8	.57	9.2	.27	.17	14.6	14.5	2.34	.068	.044
5	8.0	1,111	24.8	2.2	56.6	.56	8.7	.25	.17	14.0	13.8	2.15	.062	.042
6	5.8	1,128	24.4	2.2	55.7	.55	8.2	.23	.15	13.6	13.3	1.99	.057	.037
7	0.0	1,147	22.9	2.0	49.0	.44	6.9	.19	.13	11.2	10.0	1.58	.044	.031
8	0.0	1,170	23.1	2.0	49.8	.45	7.1	.19	.13	11.5	10.4	1.63	.044	.031
9	0.0	1,199	23.3	1.9	51.2	.47	7.3	.19	.13	11.9	11.0	1.71	.044	.031
10	0.0	1,234	23.7	1.9	53.3	.51	7.8	.30	.18	12.6	12.0	1.85	.071	.042
11	0.0	1,279	24.3	1.9	56.2	.55	8.5	.29	.17	13.7	13.4	2.06	.071	.042
12	0.0	1,336	25.2	1.9	60.0	.61	9.5	.28	.17	15.1	15.4	2.40	.071	.042
1,400 lb mature weight														
1	12.3	1,134	25.3	2.2	60.0	.61	9.9	.30	.19	15.2	15.4	2.52	.075	.049
2	14.8	1,148	26.2	2.3	60.9	.62	10.4	.31	.20	16.0	16.3	2.72	.082	.053
3	13.3	1,164	27.1	2.3	58.7	.59	9.7	.28	.19	15.9	16.0	2.62	.077	.051
4	10.7	1,179	26.6	2.3	57.6	.57	9.1	.27	.17	15.3	15.2	2.43	.073	.046
5	8.0	1,196	26.1	2.2	56.5	.56	8.6	.25	.17	14.7	14.5	2.23	.066	.044
6	5.8	1,214	25.7	2.1	55.7	.54	8.1	.23	.15	14.3	14.0	2.08	.060	.040
7	0.0	1,235	24.2	2.0	49.1	.44	6.9	.19	.14	11.9	10.6	1.67	.046	.033
8	0.0	1,260	24.4	1.9	49.9	.45	7.1	.19	.14	12.2	11.0	1.72	.046	.033
9	0.0	1,291	24.7	1.9	51.3	.47	7.3	.19	.13	12.7	11.7	1.81	.046	.033
10	0.0	1,329	25.1	1.9	53.4	.51	7.8	.30	.18	13.4	12.7	1.96	.075	.046
11	0.0	1,377	25.7	1.9	56.4	.56	8.5	.30	.18	14.5	14.3	2.19	.077	.046
12	0.0	1,438	26.7	1.9	60.2	.61	9.5	.29	.17	16.1	16.4	2.54	.077	.046

[1]20 lb peak milk production
[2]BW = total body weight = shrunk body weight or 96% full body weight, TDN = total digestible nutrients, NEm = net energy for maintenance, CP = crude protein, Ca = calcium, P = phosphorus
Source: NRC, 2000. Adapted from NRC Nutrient Requirements of Beef Cattle, 7th revised edition.

Table 5. Nutrient requirements of pregnant replacement heifers.[1]

Animal Description			Dry Matter Intake (DMI)		Diet Nutrient Density					Daily Nutrients per Animal						
Months since conception	Body weight, lb	ADG, lb	DMI, lb/ day	DMI, % of BW	TDN, % DM	NEm, Mcal/ lb	NEg, Mcal/ lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P, lb
900 lb mature weight																
1	562	0.70	15.5	2.8	50.2	.46	.21	7.1	.21	.13	7.8	7.1	3.3	1.10	.033	.020
2	584	0.73	15.9	2.7	50.3	.46	.21	7.1	.21	.13	8.0	7.3	3.3	1.13	.033	.020
3	607	0.77	16.3	2.7	50.4	.46	.21	7.1	.20	.12	8.2	7.5	3.4	1.16	.033	.020
4	631	0.84	16.8	2.7	50.7	.46	.21	7.1	.20	.12	8.5	7.7	3.5	1.20	.033	.020
5	658	0.94	17.3	2.6	51.3	.47	.22	7.2	.19	.12	8.9	8.1	3.8	1.25	.033	.020
6	689	1.08	17.8	2.6	52.3	.49	.24	7.4	.20	.12	9.3	8.7	4.3	1.31	.035	.022
7	724	1.26	18.4	2.5	54.1	.51	.26	7.7	.29	.16	10.0	9.4	4.8	1.41	.053	.029
8	766	1.51	19.1	2.5	57.1	.56	.30	8.2	.28	.15	10.9	10.7	5.7	1.57	.053	.029
9	817	1.82	19.7	2.4	62.0	.63	.37	9.2	.27	.16	12.2	12.4	7.3	1.81	.053	.031
1,000 lb mature weight																
1	625	0.78	16.7	2.7	50.1	.46	.21	7.2	.22	.17	8.4	7.7	3.5	1.20	.036	.028
2	649	0.81	17.2	2.7	50.2	.46	.21	7.2	.22	.17	8.6	7.9	3.6	1.24	.038	.029
3	674	0.86	17.7	2.6	50.4	.46	.21	7.2	.22	.17	8.9	8.1	3.7	1.27	.039	.030
4	701	0.94	18.2	2.6	50.7	.46	.21	7.2	.21	.17	9.2	8.4	3.8	1.31	.038	.031
5	731	1.05	18.7	2.6	51.3	.47	.22	7.3	.21	.17	9.6	8.8	4.1	1.37	.039	.032
6	765	1.20	19.4	2.5	52.3	.49	.24	7.6	.20	.16	10.1	9.5	4.7	1.47	.039	.031
7	805	1.41	20.0	2.5	54.0	.52	.26	8.0	.32	.23	10.8	10.4	5.2	1.60	.064	.046
8	852	1.68	20.7	2.4	56.8	.56	.30	8.7	.31	.23	11.8	11.6	6.2	1.80	.064	.048
9	908	2.02	21.3	2.3	61.3	.63	.37	10.0	.31	.22	13.1	13.4	7.9	2.13	.066	.047
1,100 lb mature weight																
1	687	.86	18.0	2.6	50.3	.46	.21	7.2	.23	.18	9.1	8.3	3.8	1.30	.041	.032
2	714	.89	18.5	2.6	50.4	.46	.21	7.2	.22	.17	9.3	8.5	3.9	1.33	.041	.031
3	742	.95	19.0	2.6	50.5	.46	.21	7.2	.22	.17	9.6	8.7	4.0	1.37	.042	.032
4	771	1.03	19.5	2.5	50.8	.47	.22	7.2	.22	.17	9.9	9.2	4.3	1.40	.043	.033
5	804	1.15	20.1	2.5	51.3	.48	.22	7.3	.21	.17	10.3	9.6	4.4	1.47	.042	.034
6	842	1.31	20.8	2.5	52.3	.49	.24	7.5	.21	.17	10.9	10.2	5.0	1.56	.044	.035
7	885	1.54	21.5	2.4	53.9	.52	.26	7.9	.32	.23	11.6	11.2	5.6	1.70	.069	.049
8	936	1.84	22.3	2.4	56.5	.56	.30	8.6	.31	.22	12.6	12.5	6.7	1.92	.069	.049
9	998	2.21	22.9	2.3	60.6	.62	.36	9.8	.30	.22	13.9	14.2	8.2	2.24	.069	.050
1,200 lb mature weight																
1	750	.93	19.3	2.6	50.5	.46	.21	7.2	.23	.18	9.7	8.9	4.1	1.39	.044	.035
2	779	.97	19.8	2.5	50.5	.46	.21	7.2	.23	.18	10.0	9.1	4.2	1.43	.046	.036
3	809	1.03	20.3	2.5	50.7	.46	.21	7.2	.22	.18	10.3	9.3	4.3	1.46	.045	.035
4	842	1.12	20.9	2.5	50.9	.47	.22	7.2	.22	.17	10.6	9.8	4.6	1.50	.046	.036
5	878	1.25	21.5	2.4	51.4	.48	.23	7.3	.22	.17	11.1	10.3	4.9	1.57	.047	.037
6	918	1.44	22.2	2.4	52.3	.49	.24	7.5	.21	.17	11.6	10.9	5.3	1.67	.047	.038
7	966	1.69	23.0	2.4	53.8	.51	.26	7.9	.31	.23	12.4	11.7	6.0	1.82	.071	.053
8	1,022	2.01	23.7	2.3	56.2	.55	.30	8.5	.31	.22	13.3	13.0	7.1	2.01	.073	.052
9	1,089	2.42	24.4	2.2	59.9	.61	.35	9.6	.30	.22	14.6	14.9	8.5	2.34	.073	.054
1,300 lb mature weight																
1	812	1.01	20.5	2.5	50.6	.46	.21	7.2	.24	.18	10.4	9.4	4.3	1.48	.049	.037
2	843	1.05	21.0	2.5	50.7	.46	.21	7.2	.23	.18	10.6	9.7	4.4	1.51	.048	.038

Table 5 (continued). Nutrient requirements of pregnant replacement heifers.[1]

Animal Description			Dry Matter Intake (DMI)		Diet Nutrient Density					Daily Nutrients per Animal						
Months since conception	Body weight, lb	ADG, lb	DMI, lb/ day	DMI, % of BW	TDN, % DM	NEm, Mcal/ lb	NEg, Mcal/ lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P, lb
3	876	1.12	21.6	2.5	50.8	.47	.22	7.2	.23	.18	11.0	10.2	4.8	1.56	.050	.039
4	912	1.22	22.2	2.4	51.0	.47	.22	7.2	.22	.18	11.3	10.4	4.9	1.60	.049	.040
5	951	1.36	22.9	2.4	51.5	.48	.23	7.3	.22	.18	11.8	11.0	5.3	1.67	.050	.041
6	995	1.56	23.6	2.4	52.4	.49	.24	7.5	.22	.17	12.4	11.6	5.7	1.77	.052	.040
7	1,046	1.83	24.4	2.3	53.7	.51	.26	7.9	.31	.23	13.1	12.4	6.3	1.93	.076	.056
8	1,107	2.19	25.2	2.3	56.0	.55	.29	8.5	.30	.22	14.1	13.9	7.3	2.14	.076	.055
9	1,180	2.63	25.9	2.2	59.5	.60	.34	9.5	.30	.22	15.4	15.5	8.8	2.46	.078	.057
1,400 lb mature weight																
1	875	1.09	21.7	2.5	50.7	.47	.22	7.3	.24	.18	11.0	10.2	4.8	1.58	.052	.039
2	908	1.13	22.3	2.5	50.8	.47	.22	7.2	.24	.18	11.3	10.5	4.9	1.61	.054	.040
3	944	1.20	22.9	2.4	50.9	.47	.22	7.2	.23	.18	11.7	10.8	5.0	1.65	.053	.041
4	982	1.31	23.5	2.4	51.2	.47	.22	7.2	.23	.18	12.0	11.0	5.2	1.69	.054	.042
5	1,024	1.46	24.2	2.4	51.6	.48	.23	7.3	.22	.18	12.5	11.6	5.6	1.77	.053	.044
6	1,071	1.67	24.9	2.3	52.4	.49	.24	7.5	.22	.18	13.0	12.2	6.0	1.82	.055	.045
7	1,126	1.96	25.8	2.3	53.7	.51	.26	7.8	.31	.23	13.9	13.2	6.7	2.01	.080	.059
8	1,192	2.34	26.6	2.2	55.8	.55	.29	8.4	.30	.22	14.8	14.6	7.7	2.23	.080	.059
9	1,270	2.82	27.4	2.2	59.0	.60	.34	9.3	.30	.22	16.2	16.4	9.3	2.55	.082	.060

[1]BW = total body weight = shrunk body weight or 96% full body weight, ADG = average daily gain, TDN = total digestible nutrients, NEm = net energy for maintenance, NEg = net energy for gain, CP = crude protein, Ca = calcium, P = phosphorus
Source: NRC, 2000. Adapted from NRC Nutrient Requirements of Beef Cattle, 7th revised edition.

Table 6. Nutrient requirements of growing steer and heifer calves.[1,2]

Animal Description		Dry Matter Intake (DMI)		Diet Nutrient Density						Daily Nutrients per Animal					
Body weight, lb	ADG, lb	DMI, lb/ day	DMI, % of BW	TDN, % DM	NEm, Mcal/ lb	NEg, Mcal/ lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P, lb
1,100 lb at finishing															
300	0.5	7.9	2.6	54	.50	.24	9.2	.30	.16	4.3	3.1	.4	.73	.024	.013
	1.0	8.4	2.8	59	.57	.31	11.4	.46	.23	5.0	3.1	.9	.95	.039	.019
	1.5	8.6	2.9	64	.64	.37	13.6	.62	.29	5.5	3.1	1.4	1.17	.053	.025
	2.0	8.6	2.9	69	.72	.44	16.2	.79	.36	5.9	3.1	1.9	1.39	.068	.031
	2.5	8.5	2.8	75	.81	.52	18.9	.96	.40	6.4	3.1	2.5	1.61	.082	.034
	3.0	8.2	2.7	83	.92	.62	22.2	1.17	.51	6.8	3.1	3.0	1.83	.096	.042
400	0.5	9.8	2.5	54	.50	.24	8.7	.27	.15	5.3	3.8	.5	.85	.026	.015
	1.0	10.4	2.6	59	.57	.31	10.4	.39	.20	6.1	3.8	1.1	1.08	.040	.021
	1.5	10.7	2.7	64	.64	.37	12.1	.50	.24	6.8	3.8	1.7	1.30	.053	.026
	2.0	10.7	2.7	69	.72	.44	14.1	.62	.29	7.4	3.8	2.4	1.51	.066	.031
	2.5	10.6	2.7	75	.81	.52	16.3	.75	.34	8.0	3.8	3.1	1.72	.079	.036
	3.0	10.2	2.6	83	.92	.62	19.0	.90	.41	8.5	3.8	3.7	1.94	.092	.042
500	0.5	11.6	2.3	54	.50	.24	8.4	.25	.15	6.3	4.5	.6	.97	.029	.017
	1.0	12.2	2.4	59	.57	.31	9.8	.34	.18	7.2	4.5	1.3	1.19	.041	.022
	1.5	12.6	2.5	64	.64	.37	11.2	.42	.22	8.1	4.5	2.1	1.41	.054	.027
	2.0	12.7	2.5	69	.72	.44	12.8	.52	.25	8.8	4.5	2.8	1.63	.066	.032
	2.5	12.5	2.5	75	.81	.52	14.7	.62	.30	9.4	4.5	3.6	1.84	.077	.037
	3.0	12.1	2.4	83	.92	.62	16.9	.74	.35	10.0	4.5	4.4	2.05	.089	.042
600	0.5	13.2	2.2	54	.50	.24	8.2	.23	.14	7.1	5.2	.7	1.08	.031	.019
	1.0	14.0	2.3	59	.57	.31	9.4	.30	.17	8.3	5.2	1.5	1.31	.043	.024
	1.5	14.4	2.4	64	.64	.37	10.6	.38	.20	9.2	5.2	2.4	1.53	.054	.028
	2.0	14.6	2.4	69	.72	.44	11.9	.44	.22	10.1	5.2	3.2	1.74	.065	.033
	2.5	14.4	2.4	75	.81	.52	13.6	.52	.26	10.8	5.2	4.1	1.95	.075	.037
	3.0	13.8	2.3	83	.92	.62	15.7	.62	.30	11.5	5.2	5.0	2.17	.086	.041
700	0.5	14.9	2.1	54	.50	.24	8.0	.22	.14	8.0	5.8	.8	1.19	.033	.021
	1.0	15.8	2.3	59	.57	.31	9.0	.28	.16	9.3	5.8	1.7	1.42	.044	.026
	1.5	16.2	2.3	64	.64	.37	10.1	.33	.19	10.4	5.8	2.7	1.64	.054	.030
	2.0	16.3	2.3	69	.72	.44	11.4	.39	.21	11.2	5.8	3.6	1.85	.064	.034
	2.5	16.1	2.3	75	.81	.52	12.8	.46	.24	12.1	5.8	4.6	2.06	.074	.038
	3.0	15.5	2.2	83	.92	.62	14.6	.54	.27	12.9	5.8	5.7	2.27	.084	.042
1,200 lb at finishing															
300	0.5	7.8	2.6	54	.49	.24	9.4	.31	.17	4.2	3.1	.4	.73	.025	.013
	1.0	8.3	2.8	58	.56	.30	11.5	.48	.23	4.8	3.1	.8	.95	.040	.019
	1.5	8.6	2.9	63	.63	.36	13.7	.63	.29	5.4	3.1	1.3	1.17	.054	.025
	2.0	8.6	2.9	68	.70	.42	16.2	.80	.36	5.8	3.1	1.8	1.40	.069	.031
	2.5	8.6	2.9	73	.78	.50	18.7	.96	.43	6.3	3.1	2.3	1.61	.083	.037
	3.0	8.3	2.8	80	.88	.58	22.0	1.18	.52	6.6	3.1	2.8	1.83	.098	.043
400	0.5	9.7	2.4	54	.49	.24	8.8	.28	.16	5.2	3.8	.5	.85	.027	.015
	1.0	10.3	2.6	58	.56	.30	10.4	.39	.20	6.0	3.8	1.0	1.07	.041	.021
	1.5	10.6	2.7	63	.63	.36	12.2	.51	.25	6.7	3.8	1.6	1.30	.054	.026
	2.0	10.7	2.7	68	.70	.42	14.1	.63	.30	7.3	3.8	2.2	1.51	.068	.032
	2.5	10.7	2.7	73	.78	.50	16.1	.76	.35	7.8	3.8	2.9	1.72	.081	.037
	3.0	10.4	2.6	80	.88	.58	18.7	.90	.41	8.3	3.8	3.5	1.94	.094	.043

Table 6 (continued). Nutrient requirements of growing steer and heifer calves.[1,2]

Animal Description		Dry Matter Intake (DMI)		Diet Nutrient Density						Daily Nutrients per Animal					
Body weight, lb	ADG, lb	DMI, lb/ day	DMI, % of BW	TDN, % DM	NEm, Mcal/ lb	NEg, Mcal/ lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P, lb
500	0.5	11.5	2.3	54	.49	.24	8.4	.25	.15	6.2	4.5	.6	.97	.029	.017
	1.0	12.2	2.4	58	.56	.30	9.8	.34	.18	7.1	4.5	1.2	1.19	.042	.022
	1.5	12.6	2.5	63	.63	.36	11.2	.43	.22	7.9	4.5	1.9	1.41	.055	.028
	2.0	12.6	2.5	68	.70	.42	12.9	.53	.26	8.6	4.5	2.6	1.63	.067	.033
	2.5	12.6	2.5	73	.78	.50	14.6	.63	.30	9.2	4.5	3.4	1.84	.079	.038
	3.0	12.2	2.4	80	.88	.58	16.8	.75	.35	9.8	4.5	4.1	2.05	.092	.043
600	0.5	13.2	2.2	54	.49	.24	8.2	.24	.15	7.1	5.2	.7	1.08	.031	.019
	1.0	14.0	2.3	58	.56	.30	9.3	.31	.17	8.1	5.2	1.4	1.31	.043	.024
	1.5	14.4	2.4	63	.63	.36	10.6	.38	.20	9.1	5.2	2.2	1.52	.055	.029
	2.0	14.4	2.4	68	.70	.42	12.1	.46	.23	9.8	5.2	3.0	1.74	.067	.034
	2.5	14.4	2.4	73	.78	.50	13.5	.54	.26	10.5	5.2	3.9	1.95	.078	.038
	3.0	14.0	2.3	80	.88	.58	15.4	.64	.31	11.2	5.2	4.7	2.16	.089	.043
700	0.5	14.8	2.1	54	.49	.24	8.0	.23	.14	8.0	5.8	.7	1.18	.034	.021
	1.0	15.7	2.2	58	.56	.30	9.0	.29	.17	9.1	5.8	1.6	1.42	.045	.026
	1.5	16.2	2.3	63	.63	.36	10.1	.34	.19	10.2	5.8	2.5	1.64	.056	.030
	2.0	16.3	2.3	68	.70	.42	11.3	.41	.21	11.1	5.8	3.4	1.85	.067	.035
	2.5	16.2	2.3	73	.78	.50	12.7	.47	.24	11.8	5.8	4.3	2.05	.077	.039
	3.0	15.8	2.3	80	.88	.58	14.4	.55	.27	12.6	5.8	5.3	2.27	.087	.043

[1]1,100 or 1,200 lb at finishing (28 percent body fat) or maturity (replacement heifers)
[2]BW = total body weight = shrunk body weight or 96% full body weight, ADG = average daily gain, TDN = total digestible nutrients, NEm = net energy for maintenance, NEg = net energy for gain, CP = crude protein, Ca = calcium, P = phosphorus
Source: NRC, 2000. Adapted from NRC Nutrient Requirements of Beef Cattle, 7th revised edition.

Table 7. Nutrient requirements of growing bull calves.[1,2]

Animal Description		Dry Matter Intake (DMI)		Diet Nutrient Density						Daily Nutrients per Animal					
Body weight, lb	ADG,lb	DMI, lb/ day	DMI, % of BW	TDN, % DM	NEm, Mcal/lb	NEg, Mcal/lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P, lb
2,000 lb mature weight															
300	0.5	8.0	2.7	55	.51	.25	9.1	.31	.16	4.4	3.5	.4	.73	.025	.013
	1.0	8.3	2.8	58	.56	.30	11.4	.48	.23	4.8	3.5	.8	.95	.040	.019
	1.5	8.5	2.8	61	.60	.34	13.8	.64	.29	5.2	3.5	1.3	1.17	.054	.025
	2.0	8.6	2.9	65	.65	.38	16.3	.80	.36	5.6	3.5	1.8	1.40	.069	.031
	2.5	8.7	2.9	68	.71	.43	18.5	.95	.43	5.9	3.5	2.3	1.61	.083	.037
	3.0	8.6	2.9	72	.76	.48	21.3	1.14	.50	6.2	3.5	2.8	1.83	.098	.043
400	0.5	9.9	2.5	55	.51	.25	8.6	.27	.15	5.4	4.4	.5	.85	.027	.015
	1.0	10.3	2.6	58	.56	.30	10.5	.40	.20	6.0	4.4	1.0	1.08	.041	.021
	1.5	10.5	2.6	61	.60	.34	12.4	.51	.25	6.4	4.4	1.6	1.30	.054	.026
	2.0	10.7	2.7	65	.65	.38	14.1	.64	.30	7.0	4.4	2.2	1.51	.068	.032
	2.5	10.7	2.7	68	.71	.43	16.2	.76	.35	7.3	4.4	2.9	1.73	.081	.037
	3.0	10.7	2.7	72	.76	.48	18.1	.88	.40	7.7	4.4	3.5	1.94	.094	.043
500	0.5	11.7	2.3	55	.51	.25	8.3	.25	.15	6.4	5.2	.6	.97	.029	.017
	1.0	12.2	2.4	58	.56	.30	9.8	.34	.18	7.1	5.2	1.2	1.19	.042	.022
	1.5	12.5	2.5	61	.60	.34	11.3	.44	.22	7.6	5.2	1.9	1.41	.055	.028
	2.0	12.6	2.5	65	.65	.38	12.9	.53	.26	8.2	5.2	2.6	1.63	.067	.033
	2.5	12.7	2.5	68	.71	.43	14.5	.63	.29	8.6	5.2	3.4	1.84	.080	.037
	3.0	12.6	2.5	72	.76	.48	16.3	.73	.34	9.1	5.2	4.1	2.05	.092	.043
600	0.5	13.4	2.2	55	.51	.25	8.1	.24	.14	7.4	5.9	.7	1.08	.032	.019
	1.0	13.9	2.3	58	.56	.30	9.4	.32	.17	8.1	5.9	1.4	1.31	.044	.024
	1.5	14.3	2.4	61	.60	.34	10.7	.38	.20	8.7	5.9	2.2	1.53	.055	.029
	2.0	14.5	2.4	65	.65	.38	12.0	.46	.23	9.4	5.9	3.0	1.74	.067	.034
	2.5	14.5	2.4	68	.71	.43	13.4	.54	.26	9.9	5.9	3.9	1.95	.078	.038
	3.0	14.5	2.4	72	.76	.48	14.9	.61	.30	10.4	5.9	4.7	2.16	.089	.043
700	0.5	15.1	2.2	55	.51	.25	7.9	.23	.14	8.3	6.7	.7	1.19	.034	.021
	1.0	15.6	2.2	58	.56	.30	9.1	.29	.17	9.0	6.7	1.6	1.42	.045	.026
	1.5	16.0	2.3	61	.60	.34	10.3	.35	.19	9.8	6.7	2.5	1.64	.056	.030
	2.0	16.3	2.3	65	.65	.38	11.4	.40	.21	10.6	6.7	3.4	1.86	.066	.035
	2.5	16.3	2.3	68	.71	.43	12.7	.47	.24	11.1	6.7	4.3	2.07	.077	.039
	3.0	15.3	2.2	72	.76	.48	13.9	.53	.26	11.7	6.7	5.3	2.27	.087	.043
800	0.5	16.7	2.1	55	.51	.25	7.7	.22	.14	9.2	7.4	.8	1.28	.036	.023
	1.0	17.3	2.2	58	.56	.30	8.7	.27	.16	10.0	7.4	1.8	1.51	.047	.028
	1.5	17.7	2.2	61	.60	.34	9.7	.32	.18	10.8	7.4	2.7	1.72	.057	.032
	2.0	18.0	2.3	65	.65	.38	10.7	.37	.19	11.7	7.4	3.8	1.93	.066	.035
	2.5	18.1	2.3	68	.71	.43	11.8	.42	.22	12.3	7.4	4.8	2.13	.076	.039
	3.0	18.0	2.3	72	.76	.48	12.9	.47	.24	13.0	7.4	5.9	2.33	.085	.043
900	0.5	18.2	2.0	55	.51	.25	7.5	.21	.14	10.0	8.0	.9	1.37	.039	.026
	1.0	18.9	2.1	58	.56	.30	8.3	.25	.15	11.0	8.0	1.9	1.57	.048	.029
	1.5	19.4	2.2	61	.60	.34	9.1	.29	.17	11.8	8.0	3.0	1.77	.057	.033
	2.0	19.6	2.2	65	.65	.38	9.9	.34	.19	12.7	8.0	4.1	1.95	.066	.037
	2.5	19.7	2.2	68	.71	.43	10.9	.38	.20	13.4	8.0	5.2	2.14	.075	.040
	3.0	19.6	2.2	72	.76	.48	11.9	.42	.22	14.1	8.0	6.4	2.33	.083	.043

[1]For bulls less than 12 months of age

[2]BW = total body weight = shrunk body weight or 96% full body weight, ADG = average daily gain, TDN = total digestible nutrients, NEm = net energy for maintenance, NEg = net energy for gain, CP = crude protein, Ca = calcium, P = phosphorus

Source: NRC, 2000. Adapted from NRC Nutrient Requirements of Beef Cattle, 7th revised edition.

Table 8. Nutrient requirements of growing yearlings.[1,2,3]

Animal Description		Dry Matter Intake (DMI)		Diet Nutrient Density						Daily Nutrients per Animal					
Body weight, lb	ADG, lb	DMI, lb/ day	DMI, % of BW	TDN,% DM	NEm, Mcal/lb	NEg, Mcal/lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P,lb
1,000 lb at finishing															
550	0.6	15.2	2.8	50	.45	.20	7.1	.21	.13	7.6	4.8	.9	1.08	.032	.020
	1.8	16.1	2.9	60	.61	.35	9.8	.36	.19	9.7	4.8	2.9	1.58	.058	.031
	2.7	15.7	2.9	70	.76	.48	12.4	.49	.24	11.0	4.8	4.5	1.95	.077	.038
	3.3	14.8	2.7	80	.90	.61	14.9	.61	.29	11.8	4.8	5.7	2.21	.090	.043
	3.8	13.7	2.5	90	1.04	.72	17.3	.73	.34	12.3	4.8	6.5	2.37	.100	.047
600	0.6	16.2	2.7	50	.45	.20	7.0	.21	.13	8.1	5.2	1.0	1.13	.034	.021
	1.8	17.2	2.9	60	.61	.35	9.5	.34	.18	10.3	5.2	3.0	1.63	.058	.031
	2.7	16.8	2.8	70	.76	.48	11.9	.45	.23	11.8	5.2	4.8	2.00	.076	.039
	3.3	15.8	2.6	80	.90	.61	14.3	.56	.27	12.6	5.2	6.1	2.26	.088	.043
	3.8	14.6	2.4	90	1.04	.72	16.5	.66	.32	13.1	5.2	6.9	2.41	.096	.047
650	0.6	17.3	2.7	50	.45	.20	6.9	.20	.12	8.7	5.5	1.1	1.19	.035	.021
	1.8	18.2	2.8	60	.61	.35	9.2	.32	.17	10.9	5.5	3.2	1.67	.058	.031
	2.7	17.8	2.7	70	.76	.48	11.5	.42	.21	12.5	5.5	5.1	2.05	.075	.037
	3.3	16.8	2.6	80	.90	.61	13.7	.52	.26	13.4	5.5	6.5	2.30	.087	.044
	3.8	15.5	2.4	90	1.04	.72	15.9	.61	.30	14.0	5.5	7.4	2.46	.095	.047
700	0.6	18.2	2.6	50	.45	.20	6.8	.19	.12	9.1	5.8	1.1	1.24	.035	.022
	1.8	19.3	2.8	60	.61	.35	8.8	.30	.16	11.6	5.8	3.4	1.70	.058	.031
	2.7	18.8	2.7	70	.76	.48	10.9	.39	.20	13.2	5.8	5.4	2.05	.073	.037
	3.3	17.8	2.5	80	.90	.61	13.0	.48	.24	14.2	5.8	6.8	2.31	.085	.044
	3.8	16.4	2.3	90	1.04	.72	15.0	.56	.28	14.8	5.8	7.8	2.46	.092	.047
750	0.6	19.2	2.6	50	.45	.20	6.7	.19	.12	9.6	6.1	1.2	1.29	.036	.022
	1.8	20.3	2.7	60	.61	.35	8.5	.28	.16	12.2	6.1	3.6	1.73	.057	.031
	2.7	19.8	2.6	70	.76	.48	10.3	.37	.19	13.9	6.1	5.7	2.04	.073	.038
	3.3	18.7	2.5	80	.90	.61	12.2	.45	.23	15.0	6.1	7.2	2.28	.084	.043
	3.8	17.3	2.3	90	1.04	.72	14.0	.52	.26	15.6	6.1	8.2	2.42	.090	.046
800	0.6	20.2	2.5	50	.45	.20	6.5	.19	.12	10.1	6.4	1.2	1.31	.038	.024
	1.8	21.3	2.7	60	.61	.35	8.1	.27	.15	12.8	6.4	3.8	1.73	.058	.032
	2.7	20.8	2.6	70	.76	.48	9.8	.34	.18	14.6	6.4	5.9	2.04	.071	.037
	3.3	19.6	2.5	80	.90	.61	11.5	.42	.22	15.7	6.4	7.6	2.25	.082	.043
	3.8	18.1	2.3	90	1.04	.72	13.2	.48	.25	16.3	6.4	8.6	2.39	.087	.045
1,100 lb at finishing															
605	0.7	16.3	2.7	50	.45	.20	7.2	.22	.13	8.2	5.2	1.0	1.17	.036	.021
	1.9	17.3	2.9	60	.61	.35	10.0	.36	.19	10.4	5.2	3.0	1.73	.062	.033
	2.9	16.9	2.8	70	.76	.48	12.7	.49	.24	11.8	5.2	4.8	2.15	.083	.041
	3.6	15.9	2.6	80	.90	.61	15.3	.61	.29	12.7	5.2	6.1	2.43	.097	.046
	4.0	14.7	2.4	90	1.04	.72	17.8	.72	.34	13.2	5.2	7.0	2.62	.106	.050
660	0.7	17.5	2.7	50	.45	.20	7.1	.21	.13	8.8	5.5	1.1	1.24	.037	.023
	1.9	18.4	2.8	60	.61	.35	9.7	.34	.18	11.0	5.5	3.2	1.78	.063	.033
	2.9	18.0	2.7	70	.76	.48	12.3	.45	.23	12.6	5.5	5.1	2.21	.081	.041
	3.6	17.0	2.6	80	.90	.61	14.7	.56	.27	13.6	5.5	6.5	2.50	.095	.046
	4.0	15.7	2.4	90	1.04	.72	17.1	.66	.32	14.1	5.5	7.4	2.68	.104	.050
715	0.7	18.5	2.6	50	.45	.20	6.9	.20	.13	9.3	5.9	1.1	1.28	.037	.024
	1.9	19.6	2.7	60	.61	.35	9.2	.32	.17	11.8	5.9	3.5	1.80	.063	.033

Table 8 (continued). Nutrient requirements of growing yearlings.[1,2,3]

Animal Description		Dry Matter Intake (DMI)		Diet Nutrient Density						Daily Nutrients per Animal					
Body weight, lb	ADG, lb	DMI, lb/ day	DMI, % of BW	TDN,% DM	NEm, Mcal/lb	NEg, Mcal/lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P,lb
715	2.9	19.1	2.7	70	.76	.48	11.5	.42	.21	13.4	5.9	5.5	2.20	.080	.040
	3.6	18.1	2.5	80	.90	.61	13.7	.52	.26	14.5	5.9	6.9	2.48	.094	.047
	4.0	16.7	2.3	90	1.04	.72	15.9	.61	.30	15.0	5.9	7.9	2.66	.102	.050
770	0.7	19.6	2.5	50	.45	.20	6.8	.20	.12	9.8	6.2	1.2	1.33	.039	.024
	1.9	20.7	2.7	60	.61	.35	8.8	.30	.16	12.4	6.2	3.6	1.82	.062	.033
	2.9	20.2	2.6	70	.76	.48	10.9	.39	.20	14.1	6.2	5.8	2.20	.079	.040
	3.6	19.1	2.5	80	.90	.61	12.9	.48	.24	15.3	6.2	7.3	2.46	.092	.046
	4.0	17.6	2.3	90	1.04	.72	14.8	.56	.28	15.8	6.2	8.3	2.60	.099	.049
825	0.7	20.6	2.5	50	.45	.20	6.6	.19	.12	10.3	6.6	1.3	1.36	.039	.025
	1.9	21.8	2.6	60	.61	.35	8.4	.28	.16	13.1	6.6	3.8	1.83	.061	.035
	2.9	21.3	2.6	70	.76	.48	10.3	.37	.19	14.9	6.6	6.1	2.19	.079	.040
	3.6	20.1	2.4	80	.90	.61	12.1	.44	.23	16.1	6.6	7.7	2.43	.088	.046
	4.0	18.6	2.3	90	1.04	.72	13.9	.52	.26	16.7	6.6	8.8	2.59	.097	.048
880	0.7	21.7	2.5	50	.45	.20	6.5	.19	.12	10.9	6.9	1.3	1.41	.041	.026
	1.9	22.9	2.6	60	.61	.35	8.1	.27	.15	13.7	6.9	4.0	1.85	.062	.034
	2.9	22.4	2.5	70	.76	.48	9.8	.34	.18	15.7	6.9	6.4	2.20	.076	.040
	3.6	21.1	2.4	80	.90	.61	11.4	.42	.22	16.9	6.9	8.1	2.41	.089	.046
	4.0	19.5	2.2	90	1.04	.72	13.1	.48	.25	17.6	6.9	9.2	2.55	.094	.049
1,200 lb at finishing															
660	0.7	17.5	2.7	50	.45	.20	7.3	.22	.13	8.8	5.5	1.1	1.28	.039	.023
	1.9	18.4	2.8	60	.61	.35	10.2	.36	.19	11.0	5.5	3.3	1.88	.066	.035
	2.9	18.0	2.7	70	.76	.48	13.0	.49	.24	12.6	5.5	5.2	2.34	.088	.043
	3.6	17.0	2.6	80	.90	.61	15.8	.61	.29	13.6	5.5	6.5	2.69	.104	.049
	4.0	15.7	2.4	90	1.04	.72	18.4	.72	.34	14.1	5.5	7.4	2.89	.113	.053
720	0.7	18.6	2.6	50	.45	.20	7.1	.21	.13	9.3	5.9	1.1	1.32	.039	.024
	2.0	19.7	2.7	60	.61	.35	9.7	.34	.18	11.8	5.9	3.5	1.91	.067	.035
	3.0	19.2	2.7	70	.76	.48	12.2	.45	.23	13.4	5.9	5.5	2.34	.086	.044
	3.8	18.2	2.5	80	.90	.61	14.6	.56	.27	14.6	5.9	7.0	2.66	.102	.049
	4.2	16.8	2.3	90	1.04	.72	17.0	.66	.32	15.1	5.9	7.9	2.86	.111	.054
780	0.7	19.8	2.5	50	.45	.20	6.9	.20	.13	9.9	6.3	1.2	1.37	.040	.026
	2.0	20.9	2.7	60	.61	.35	9.2	.32	.17	12.5	6.3	3.7	1.92	.067	.036
	3.0	20.4	2.6	70	.76	.48	11.4	.42	.21	14.3	6.3	5.8	2.33	.086	.043
	3.8	19.3	2.5	80	.90	.61	13.6	.52	.26	15.4	6.3	7.4	2.62	.100	.050
	4.2	17.8	2.3	90	1.04	.72	15.8	.61	.30	16.0	6.3	8.4	2.81	.109	.053
840	0.7	20.9	2.5	50	.45	.20	6.8	.20	.13	10.5	6.6	1.3	1.42	.042	.027
	2.0	22.1	2.6	60	.61	.35	8.8	.30	.16	13.3	6.6	3.9	1.94	.071	.035
	3.0	21.6	2.6	70	.76	.48	10.8	.39	.20	15.1	6.6	6.2	2.33	.091	.043
	3.8	20.4	2.4	80	.90	.61	12.8	.48	.24	16.3	6.6	7.8	2.61	.106	.049
	4.2	18.8	2.2	90	1.04	.72	14.7	.56	.28	16.9	6.6	8.9	2.76	.115	.053
900	0.7	22.0	2.4	50	.45	.20	6.6	.19	.12	11.0	7.0	1.3	1.45	.042	.026
	2.0	23.3	2.6	60	.61	.35	8.4	.28	.16	14.0	7.0	4.1	1.96	.065	.037
	3.0	22.7	2.5	70	.76	.48	10.2	.37	.19	15.9	7.0	6.5	2.32	.084	.043
	3.8	21.5	2.4	80	.90	.61	12.0	.44	.23	17.2	7.0	8.3	2.58	.095	.049
	4.2	19.8	2.2	90	1.04	.72	13.8	.52	.26	17.8	7.0	9.4	2.73	.103	.051

Table 8 (continued). Nutrient requirements of growing yearlings.[1,2,3]

Animal Description		Dry Matter Intake (DMI)		Diet Nutrient Density						Daily Nutrients per Animal					
Body weight, lb	ADG, lb	DMI, lb/ day	DMI, % of BW	TDN,% DM	NEm, Mcal/lb	NEg, Mcal/lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P,lb
960	0.7	23.1	2.4	50	.45	.20	6.5	.19	.12	11.6	7.3	1.4	1.50	.044	.028
	2.0	24.4	2.5	60	.61	.35	8.1	.27	.15	14.6	7.3	4.3	1.98	.066	.037
	3.0	23.9	2.5	70	.76	.48	9.7	.34	.19	16.7	7.3	6.8	2.32	.081	.045
	3.8	22.5	2.3	80	.90	.61	11.3	.41	.22	18.0	7.3	8.7	2.54	.092	.050
	4.2	20.8	2.2	90	1.04	.72	13.0	.48	.25	18.7	7.3	9.9	2.70	.100	.052
1,300 lb at finishing															
715	0.8	18.5	2.6	50	.45	.20	7.3	.22	.13	9.3	5.9	1.1	1.35	.041	.024
	2.1	19.6	2.7	60	.61	.35	10.2	.36	.19	11.8	5.9	3.5	2.00	.071	.037
	3.2	19.1	2.7	70	.76	.48	13.0	.49	.24	13.4	5.9	5.5	2.48	.094	.046
	4.0	18.1	2.5	80	.90	.61	15.7	.61	.29	14.5	5.9	6.9	2.84	.110	.052
	4.5	16.7	2.3	90	1.04	.72	18.3	.72	.34	15.0	5.9	7.9	3.06	.120	.057
780	0.8	19.8	2.5	50	.45	.20	7.1	.21	.13	9.9	6.3	1.2	1.41	.042	.026
	2.1	20.9	2.7	60	.61	.35	9.6	.34	.18	12.5	6.3	3.7	2.01	.071	.038
	3.2	20.4	2.6	70	.76	.48	12.1	.45	.23	14.3	6.3	5.8	2.47	.092	.047
	4.0	19.3	2.5	80	.90	.61	14.5	.56	.27	15.4	6.3	7.4	2.80	.108	.052
	4.5	17.8	2.3	90	1.04	.72	16.9	.66	.32	16.0	6.3	8.4	3.01	.117	.057
845	0.8	21.0	2.5	50	.45	.20	6.9	.21	.13	10.5	6.7	1.3	1.45	.044	.027
	2.1	22.2	2.6	60	.61	.35	9.1	.32	.17	13.3	6.7	3.9	2.02	.071	.038
	3.2	21.7	2.6	70	.76	.48	11.4	.42	.22	15.2	6.7	6.2	2.47	.091	.048
	4.0	20.5	2.4	80	.90	.61	13.6	.51	.26	16.4	6.7	7.9	2.79	.105	.053
	4.5	18.9	2.2	90	1.04	.72	15.7	.60	.30	17.0	6.7	8.9	2.97	.113	.057
910	0.8	22.2	2.4	50	.45	.20	6.7	.20	.13	11.1	7.1	1.4	1.49	.044	.029
	2.1	23.5	2.6	60	.61	.35	8.7	.30	.17	14.1	7.1	4.1	2.04	.071	.040
	3.2	22.9	2.5	70	.76	.48	10.7	.39	.20	16.0	7.1	6.6	2.45	.089	.046
	4.0	21.6	2.4	80	.90	.61	12.7	.48	.24	17.3	7.1	8.3	2.74	.104	.052
	4.5	20.0	2.2	90	1.04	.72	14.6	.56	.28	18.0	7.1	9.4	2.92	.112	.056
975	0.8	23.4	2.4	50	.45	.20	6.6	.20	.13	11.7	7.4	1.4	1.54	.047	.030
	2.1	24.7	2.5	60	.61	.35	8.3	.28	.16	14.8	7.4	4.4	2.05	.069	.040
	3.2	24.1	2.5	70	.76	.48	10.2	.37	.19	16.9	7.4	6.9	2.46	.089	.046
	4.0	22.8	2.3	80	.90	.61	11.9	.44	.23	18.2	7.4	8.8	2.71	.100	.052
	4.5	21.0	2.2	90	1.04	.72	13.7	.52	.26	18.9	7.4	9.9	2.88	.109	.055
1,040	0.8	24.5	2.4	50	.45	.20	6.5	.19	.13	12.3	7.8	1.5	1.59	.047	.032
	2.1	25.9	2.5	60	.61	.35	8.0	.27	.15	15.5	7.8	4.6	2.07	.070	.039
	3.2	25.3	2.4	70	.76	.48	9.6	.34	.19	17.7	7.8	7.2	2.43	.086	.048
	4.0	23.9	2.3	80	.90	.61	11.3	.41	.22	19.1	7.8	9.2	2.70	.098	.053
	4.5	22.1	2.1	90	1.04	.72	12.9	.48	.25	19.9	7.8	10.4	2.85	.106	.055
1,400 lb at finishing															
770	0.8	19.6	2.5	50	.45	.20	7.3	.22	.13	9.9	6.2	1.2	1.43	.043	.025
	2.2	20.7	2.7	60	.61	.35	10.1	.36	.19	12.4	6.2	3.7	2.09	.075	.039
	3.4	20.2	2.6	70	.76	.48	12.9	.49	.24	14.1	6.2	5.8	2.61	.099	.048
	4.2	19.1	2.5	80	.90	.61	15.6	.61	.29	15.3	6.2	7.3	2.98	.117	.055
	4.7	17.6	2.3	90	1.04	.72	18.1	.72	.34	15.8	6.2	8.3	3.19	.127	.060

Table 8 (continued). Nutrient requirements of growing yearlings.[1,2,3]

Animal Description		Dry Matter Intake (DMI)		Diet Nutrient Density						Daily Nutrients per Animal					
Body weight, lb	ADG, lb	DMI, lb/ day	DMI, % of BW	TDN,% DM	NEm, Mcal/lb	NEg, Mcal/lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P,lb
840	0.8	20.9	2.5	50	.45	.20	7.1	.21	.13	10.5	6.6	1.3	1.48	.044	.027
	2.2	22.1	2.6	60	.61	.35	9.6	.34	.18	13.3	6.6	3.9	2.12	.075	.040
	3.4	21.6	2.6	70	.76	.48	12.1	.45	.23	15.1	6.6	6.2	2.61	.097	.050
	4.2	20.4	2.4	80	.90	.61	14.5	.56	.27	16.3	6.6	7.8	2.96	.114	.055
	4.7	18.8	2.2	90	1.04	.72	16.8	.65	.32	16.9	6.6	8.9	3.16	.122	.060
910	0.8	22.2	2.4	50	.45	.20	6.9	.21	.13	11.1	7.1	1.4	1.53	.047	.029
	2.2	23.5	2.6	60	.61	.35	9.1	.32	.17	14.1	7.1	4.1	2.14	.075	.040
	3.4	22.9	2.5	70	.76	.48	11.3	.42	.22	16.0	7.1	6.6	2.59	.096	.050
	4.2	21.6	2.4	80	.90	.61	13.5	.51	.26	17.3	7.1	8.3	2.92	.110	.056
	4.7	20.0	2.2	90	1.04	.72	15.6	.60	.30	18.0	7.1	9.5	3.12	.120	.060
980	0.8	23.5	2.4	50	.45	.20	6.7	.20	.13	11.8	7.5	1.4	1.57	.047	.031
	2.2	24.8	2.5	60	.61	.35	8.7	.30	.17	14.9	7.5	4.4	2.16	.074	.042
	3.4	24.2	2.5	70	.76	.48	10.7	.39	.20	16.9	7.5	6.9	2.59	.094	.048
	4.2	22.9	2.3	80	.90	.61	12.6	.47	.24	18.3	7.5	8.8	2.89	.108	.055
	4.7	21.1	2.2	90	1.04	.72	14.5	.56	.28	19.0	7.5	10.0	3.06	.118	.059
1,050	0.8	24.7	2.4	50	.45	.20	6.6	.20	.13	12.4	7.9	1.5	1.63	.049	.032
	2.2	26.1	2.5	60	.61	.35	8.3	.28	.16	15.7	7.9	4.6	2.17	.073	.042
	3.4	25.5	2.4	70	.76	.48	10.1	.37	.20	17.9	7.9	7.3	2.58	.094	.051
	4.2	24.1	2.3	80	.90	.61	11.9	.44	.23	19.3	7.9	9.3	2.87	.106	.055
	4.7	22.2	2.1	90	1.04	.72	13.6	.51	.26	20.0	7.9	10.5	3.02	.113	.058
1,120	0.8	25.9	2.3	50	.45	.20	6.5	.19	.13	13.0	8.2	1.6	1.68	.049	.034
	2.2	27.4	2.4	60	.61	.35	8.0	.27	.16	16.4	8.2	4.8	2.19	.074	.044
	3.4	26.8	2.4	70	.76	.48	9.6	.34	.19	18.8	8.2	7.7	2.57	.091	.051
	4.2	25.3	2.3	80	.90	.61	11.2	.41	.22	20.2	8.2	9.7	2.83	.104	.056
	4.7	23.3	2.1	90	1.04	.72	12.8	.48	.25	21.0	8.2	11.1	2.98	.112	.058

[1]Multiply expected mature bull weight by 0.60 for weight to use for growing yearling bull
[2]1,000 to 1,400 lb at finishing (28 percent body fat) or maturity (replacement heifers)
[3]BW = total body weight = shrunk body weight or 96% full body weight, ADG = average daily gain, TDN = total digestible nutrients, NEm = net energy for maintenance, NEg = net energy for gain, CP = crude protein, Ca = calcium, P = phosphorus
Source: NRC, 2000. Adapted from NRC Nutrient Requirements of Beef Cattle, 7th revised edition.

Table 9. Nutrient requirements of growing and mature bulls.[1,2]

Animal Description		Dry Matter Intake (DMI)		Diet Nutrient Density						Daily Nutrients per Animal					
Body weight, lb	ADG, lb	DMI, lb/ day	DMI, % of BW	TDN, % DM	NEm, Mcal/lb	NEg, Mcal/lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P,lb
1,700 lb mature weight															
900	0.4	22.0	2.4	50	.45	.20	6.0	.16	.11	11.0	8.0	0.9	1.32	.036	.025
	1.6	23.3	2.6	60	.61	.35	7.3	.23	.14	14.0	8.0	3.5	1.71	.054	.032
	2.5	22.7	2.5	70	.76	.48	8.8	.30	.16	15.9	8.0	5.8	1.99	.068	.037
	3.1	21.5	2.4	80	.90	.61	10.2	.36	.19	17.2	8.0	7.6	2.19	.077	.041
1,000	0.4	23.8	2.4	50	.45	.20	5.9	.16	.11	11.9	8.7	1.0	1.40	.039	.027
	1.6	25.2	2.5	60	.61	.35	6.9	.22	.13	15.1	8.7	3.8	1.74	.055	.033
	2.5	24.6	2.5	70	.76	.48	8.1	.27	.15	17.2	8.7	6.3	1.99	.067	.038
	3.1	23.2	2.3	80	.90	.61	9.3	.32	.18	18.6	8.7	8.2	2.16	.074	.041
1,100	0.4	25.6	2.3	50	.45	.20	5.8	.16	.11	12.8	9.4	1.0	1.48	.041	.029
	1.6	27.0	2.5	60	.61	.35	6.6	.20	.13	16.2	9.4	4.1	1.78	.055	.034
	2.5	26.4	2.4	70	.76	.48	7.5	.25	.14	18.5	9.4	6.8	1.99	.065	.038
	3.1	24.9	2.3	80	.90	.61	8.6	.29	.16	19.9	9.4	8.8	2.13	.072	.041
1,200	0.4	27.3	2.3	50	.45	.20	5.7	.16	.11	13.7	10.0	1.1	1.55	.044	.031
	1.6	28.9	2.4	60	.61	.35	6.3	.19	.12	17.3	10.0	4.4	1.81	.056	.036
	2.5	28.2	2.4	70	.76	.48	7.1	.23	.14	19.7	10.0	7.2	1.99	.064	.039
	3.1	26.6	2.2	80	.90	.61	7.9	.26	.15	21.3	10.0	9.4	2.10	.069	.041
1,300	0.4	29.0	2.2	50	.45	.20	5.6	.16	.11	14.5	10.6	1.2	1.63	.046	.033
	1.6	30.7	2.4	60	.61	.35	6.0	.19	.12	18.4	10.6	4.6	1.85	.057	.037
1,400	0.4	30.7	2.2	50	.45	.20	5.5	.16	.11	15.4	11.2	1.2	1.70	.049	.035
	1.6	32.4	2.3	60	.61	.35	5.8	.18	.12	19.4	11.2	4.9	1.88	.057	.039
1,500	0.4	32.3	2.2	50	.45	.20	5.5	.16	.11	16.2	11.8	1.3	1.77	.051	.037
	1.6	34.1	2.3	60	.61	.35	5.6	.17	.12	20.5	11.8	5.1	1.92	.058	.040
1,600	0.4	33.9	2.1	50	.45	.20	5.4	.16	.12	17.0	12.4	1.4	1.84	.054	.039
	1.6	35.8	2.2	60	.61	.35	5.4	.16	.11	21.5	12.4	5.4	1.95	.059	.041
1,700	0.0	32.9	1.9	46	.39	.00	5.6	.16	.12	15.1	13.0	0.0	1.83	.052	.040
	1.6	35.5	2.1	50	.45	.20	5.4	.16	.12	17.8	13.0	1.4	1.91	.056	.041
2,000 lb mature weight															
1,000	0.5	23.8	2.4	50	.45	.20	6.1	.17	.12	11.9	8.7	1.0	1.44	.041	.028
	1.7	25.2	2.5	60	.61	.35	7.5	.25	.14	15.1	8.7	3.8	1.89	.062	.036
	2.8	24.6	2.5	70	.76	.48	9.1	.32	.17	17.2	8.7	6.3	2.23	.078	.043
	3.5	23.2	2.3	80	.90	.61	10.5	.38	.20	18.6	8.7	8.2	2.46	.088	.047
1,100	0.5	25.6	2.3	50	.45	.20	5.9	.17	.12	12.8	9.4	1.0	1.52	.043	.030
	1.7	27.0	2.5	60	.61	.35	7.1	.23	.14	16.2	9.4	4.1	1.92	.062	.037
	2.8	26.4	2.4	70	.76	.48	8.4	.29	.16	18.5	9.4	6.8	2.22	.076	.043
	3.5	24.9	2.3	80	.90	.61	9.8	.35	.19	19.9	9.4	8.8	2.43	.086	.047
1,200	0.5	27.3	2.3	50	.45	.20	5.8	.17	.12	13.7	10.0	1.1	1.59	.046	.032
	1.7	28.9	2.4	60	.61	.35	6.8	.22	.13	17.3	10.0	4.3	1.96	.063	.039
	2.8	28.2	2.4	70	.76	.48	7.9	.27	.16	19.7	10.0	7.2	2.22	.075	.044
	3.5	26.6	2.2	80	.90	.61	9.0	.32	.18	21.3	10.0	9.4	2.40	.084	.047
1,300	0.5	29.0	2.2	50	.45	.20	5.8	.17	.12	14.5	10.6	1.2	1.67	.048	.034
	1.7	30.7	2.4	60	.61	.35	6.5	.21	.13	18.4	10.6	4.6	2.00	.063	.040
	2.8	30.0	2.3	70	.76	.48	7.4	.25	.15	21.0	10.6	7.7	2.22	.074	.044
	3.5	28.3	2.2	80	.90	.61	8.4	.29	.17	22.6	10.6	10.0	2.38	.081	.047
1,400	0.5	30.7	2.2	50	.45	.20	5.7	.16	.12	15.4	11.2	1.2	1.74	.051	.036
	1.7	32.4	2.3	60	.61	.35	6.3	.20	.13	19.4	11.2	4.9	2.03	.064	.041

Table 9 (continued). Nutrient requirements of growing and mature bulls.[1,2]

Animal Description		Dry Matter Intake (DMI)		Diet Nutrient Density						Daily Nutrients per Animal					
Body weight, lb	ADG, lb	DMI, lb/ day	DMI, % of BW	TDN, % DM	NEm, Mcal/lb	NEg, Mcal/lb	CP, % DM	Ca, % DM	P, % DM	TDN, lb	NEm, Mcal	NEg, Mcal	CP, lb	Ca, lb	P,lb
1,500	0.5	32.3	2.2	50	.45	.20	5.6	.16	.12	16.2	11.8	1.3	1.81	.053	.038
	1.7	34.1	2.3	60	.61	.35	6.0	.19	.13	20.5	11.8	5.1	2.06	.065	.043
1,600	0.5	33.9	2.1	50	.45	.20	5.5	.17	.12	17.0	12.4	1.4	1.88	.056	.040
	1.7	35.8	2.2	60	.61	.35	5.8	.18	.12	21.5	12.4	5.4	2.09	.066	.044
1,700	0.5	35.5	2.1	50	.45	.20	5.5	.16	.12	17.8	13.0	1.4	1.95	.058	.042
	1.7	37.5	2.2	60	.61	.35	5.7	.18	.12	22.5	13.0	5.6	2.13	.066	.046
1,800	0.5	37.0	2.1	50	.45	.20	5.5	.16	.12	18.5	13.5	1.5	2.02	.061	.044
	1.7	39.1	2.2	60	.61	.35	5.5	.17	.12	23.5	13.5	5.9	2.16	.067	.047
1,900	0.5	38.6	2.0	50	.45	.20	5.4	.16	.12	19.3	14.1	1.5	2.09	.063	.047
	1.7	40.8	2.1	60	.61	.35	5.4	.17	.12	24.5	14.1	6.1	2.19	.068	.049
2,000	0.0	37.2	1.9	46	.39	.00	5.6	.17	.13	17.1	14.6	0.0	2.07	.062	.047
	0.5	40.1	2.0	50	.45	.20	5.2	.16	.12	20.1	14.6	1.6	2.15	.065	.049
2,300 lb mature weight															
1,200	0.5	27.3	2.3	50	.45	.20	6.0	.18	.12	13.7	10.0	1.1	1.63	.048	.032
	1.9	28.9	2.4	60	.61	.35	7.3	.24	.14	17.3	10.0	4.4	2.10	.070	.041
	3.0	28.2	2.4	70	.76	.48	8.7	.30	.17	19.7	10.0	7.2	2.45	.086	.048
	3.8	26.6	2.2	80	.90	.61	10.1	.36	.20	21.3	10.0	9.4	2.68	.097	.052
1,300	0.5	29.0	2.2	50	.45	.20	5.9	.17	.12	14.5	10.6	1.2	1.71	.050	.035
	1.9	30.7	2.4	60	.61	.35	7.0	.23	.14	18.4	10.6	4.6	2.14	.070	.043
	3.0	30.0	2.3	70	.76	.48	8.2	.28	.16	21.0	10.6	7.7	2.45	.085	.049
	3.8	28.3	2.2	80	.90	.61	9.4	.34	.19	22.6	10.6	10.0	2.66	.095	.053
1,400	0.5	30.7	2.2	50	.45	.20	5.8	.17	.12	15.4	11.2	1.2	1.78	.052	.037
	1.9	32.4	2.3	60	.61	.35	6.7	.22	.14	19.4	11.2	4.9	2.17	.071	.044
	3.0	31.7	2.3	70	.76	.48	7.7	.26	.15	22.2	11.2	8.1	2.45	.084	.049
	3.8	29.9	2.1	80	.90	.61	8.8	.31	.18	23.9	11.2	12.5	2.64	.092	.053
1,500	0.5	32.3	2.2	50	.45	.20	5.7	.17	.12	16.2	11.8	1.3	1.85	.055	.039
	1.9	34.1	2.3	60	.61	.35	6.5	.21	.13	20.5	11.8	5.2	2.20	.072	.045
1,600	0.5	33.9	2.1	50	.45	.20	5.7	.17	.12	17.0	12.4	1.4	1.92	.058	.041
	1.9	35.8	2.2	60	.61	.35	6.3	.20	.13	21.5	12.4	5.4	2.24	.072	.047
1,700	0.5	35.5	2.1	50	.45	.20	5.6	.17	.12	17.8	13.0	1.4	1.99	.060	.043
	1.9	37.5	2.2	60	.61	.35	6.1	.19	.13	22.5	13.0	5.7	2.27	.073	.048
1,800	0.5	37.0	2.1	50	.45	.20	5.6	.17	.12	18.5	13.5	1.5	2.06	.063	.045
	1.9	39.1	2.2	60	.61	.35	5.9	.19	.13	23.5	13.5	5.9	2.30	.074	.050
1,900	0.5	38.6	2.0	50	.45	.20	5.5	.17	.12	19.3	14.1	1.5	2.13	.065	.047
	1.9	40.8	2.1	60	.61	.35	5.7	.18	.13	24.5	14.1	6.2	2.33	.075	.051
2,000	0.5	40.1	2.0	50	.45	.20	5.5	.17	.12	20.1	14.6	1.6	2.19	.067	.050
	1.9	42.3	2.1	60	.61	.35	5.6	.18	.13	25.4	14.6	6.4	2.36	.075	.053
2,100	0.5	41.6	2.0	50	.45	.20	5.4	.17	.13	20.8	15.2	1.7	2.26	.070	.052
	1.9	43.9	2.1	60	.61	.35	5.5	.17	.12	26.3	15.2	6.6	2.40	.076	.054
2,200	0.5	43.1	2.0	50	.45	.20	5.4	.17	.13	21.6	15.7	1.7	2.32	.072	.054
	1.9	45.5	2.1	60	.61	.35	5.3	.17	.12	27.3	15.7	6.9	2.42	.077	.056
2,300	0.0	44.5	1.9	46	.39	.00	5.2	.16	.12	20.5	16.3	0.0	2.30	.071	.054
	0.5	47.0	2.0	50	.45	.20	5.1	.16	.12	23.5	16.3	1.8	2.39	.075	.056

[1]For bulls that are at least 12 months of age and weigh more than 50 percent of their mature weight

[2]BW = total body weight = shrunk body weight or 96% full body weight, ADG = average daily gain, TDN = total digestible nutrients, NEm = net energy for maintenance, NEg = net energy for gain, CP = crude protein, Ca = calcium, P = phosphorus

Source: NRC, 2000. Adapted from NRC Nutrient Requirements of Beef Cattle, 7th revised edition.

For more information on beef cattle nutrient requirements, contact your local MSU Extension office.

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Reviewed by **Brandi Karisch**, PhD, Associate Extension/Research Professor, Animal and Dairy Science. Written by **Jane Parish**, PhD, Professor and Head, North Mississippi Research and Extension Center.