

## Nutrient Requirements for Beef Cattle

Ed Rayburn, Extension Specialist  
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Beef cattle production, using pasture and hay crops, is a major agricultural enterprise in West Virginia. It enables producers to convert solar energy to hamburgers and steaks using their management abilities and the genetic resources in their forage crops and livestock. This is accomplished in context with their land's soils and the ability of different forage species to grow best in different parts of the landscape. The forage manager develops a forage system consisting of fences, water sources, and management practices that optimize the use of these forages. Livestock genetics and management practices are selected that work best within the forage system to meet the product quality desired by the market. By grazing pastures and aftermath hay meadows, fuel and machinery costs are kept low, with solar energy being used to power the cow in harvesting her own feed.

Well-managed forage crops provide the energy, protein, and minerals needed by most classes of beef cattle. At times, supplemental feeds can improve animal performance or health when forage quality is not adequate. Grazing and haying management determine forage quality, the livestock's intake of forage dry matter, and the total intake of available nutrients from the forage. The animal's intake of nutrients from home-grown forage, its nutrient requirements, the supplement's cost, and the expected improvement in animal performance determine the economic benefit from feeding supplements.

Animal nutritional requirements are divided into the needs for body maintenance, activity, growth or change in body condition, milk production, fetal growth, and maintenance of body temperature during cold or hot weather. If the manager wants to improve or upgrade one of these production components, then the nutrition to sustain it must be satisfied.

The following tables of beef cattle nutrient requirements along with forage analysis of pasture and hay crops produced on the farm will enable the livestock manager to evaluate improvements needed in forage and livestock management and develop optimal supplemental feeding strategies for their animals. These table values have been adapted from the National Research Council's Nutrient Requirement of Beef Cattle, 2000.

<b>Nutrient requirements for mature beef cows.</b>								
Body Weight lbs	Avg. Daily Gain lbs	Dry Matter Intake lbs	Crude Protein %	Crude Protein lbs	TDN %	TDN lbs	Ca %	P %
Dry pregnant mature cows, middle third of pregnancy.								
900	0.0	16.7	7.0	1.2	49	8.2	0.18	0.18
1000	0.0	18.1	7.0	1.3	49	8.8	0.18	0.18
1100	0.0	19.5	7.0	1.4	49	9.5	0.19	0.19
1200	0.0	20.8	6.9	1.4	49	10.1	0.19	0.19
1300	0.0	22.0	6.9	1.5	49	10.8	0.20	0.20
1400	0.0	23.3	6.9	1.6	49	11.4	0.20	0.20
Dry pregnant mature cows, last third of pregnancy.								
900	0.9	18.2	8.0	1.5	54	9.8	0.27	0.21
1000	0.9	19.6	7.9	1.6	54	10.5	0.26	0.21
1100	0.9	21.0	7.8	1.6	53	11.2	0.26	0.21
1200	0.9	22.3	7.8	1.7	53	11.8	0.26	0.21
1300	0.9	23.6	7.7	1.8	53	12.5	0.26	0.21
1400	0.9	24.9	7.6	1.9	53	13.1	0.26	0.21
Cows nursing calves, average milking ability (10 lbs milk/day), first 3-4 months postpartum.								
900	0.0	18.8	9.9	1.9	57	10.8	0.28	0.22
1000	0.0	20.2	9.6	2.0	57	11.5	0.28	0.22
1100	0.0	21.6	9.4	2.0	56	12.1	0.27	0.22
1200	0.0	23.0	9.3	2.1	56	12.8	0.27	0.22
1300	0.0	24.3	9.1	2.2	55	13.4	0.27	0.22
1400	0.0	25.6	9.0	2.3	55	14.0	0.27	0.22
Cows nursing calves, superior milking ability (20 lbs milk/day), first 3-4 months postpartum.								
900	0.0	18.7	12.9	2.4	70	13.1	0.41	0.28
1000	0.0	20.6	12.3	2.5	67	13.8	0.39	0.27
1100	0.0	22.3	11.9	2.6	65	14.5	0.38	0.27
1200	0.0	23.8	11.5	2.7	64	15.2	0.36	0.26
1300	0.0	25.3	11.2	2.8	63	15.9	0.36	0.26
1400	0.0	26.7	11.0	2.9	62	16.5	0.35	0.26

<b>Nutrient requirements of bred heifers.</b>								
Body Weight lbs	Avg. Daily Gain lbs	Dry Matter Intake lbs	Crude Protein %	Crude Protein lbs	TDN %	TDN lbs	Ca %	P %
For pregnant yearling heifers, middle third of pregnancy see growing heifers.								
Pregnant yearling heifers, last third of pregnancy.								
700	0.9	15.3	8.4	1.3	55.4	8.5	0.27	0.20
	1.4	15.8	9.0	1.4	60.3	9.5	0.33	0.21
	1.9	15.8	9.8	1.5	67.0	10.6	0.33	0.21
800	0.9	16.8	8.2	1.4	54.8	9.2	0.28	0.20
	1.4	17.4	8.8	1.5	59.6	10.4	0.33	0.21
	1.9	17.5	9.3	1.6	66.1	11.6	0.35	0.21
900	0.9	18.3	8.1	1.5	54.3	9.9	0.26	0.20
	1.4	19.0	8.5	1.6	59.1	11.2	0.30	0.21
	1.9	19.2	9.0	1.7	65.4	12.6	0.32	0.21
Two year old heifers nursing calves first 3-4 months postpartum, 10 lbs milk/day.								
700	0.5	15.9	11.3	1.8	65.1	10.4	0.36	0.24
800	0.5	17.6	10.8	1.9	63.8	11.2	0.34	0.24
900	0.5	19.2	10.4	1.9	62.7	12.0	0.32	0.23
1000	0.5	20.8	10.0	2.1	61.9	12.9	0.31	0.23

<b>Nutrient requirements for growing medium frame steers.</b>								
Body Weight lbs	Avg. Daily Gain lbs	Dry Matter Intake lbs	Crude Protein %	Crude Protein lbs	TDN %	TDN lbs	Ca %	P %
300	0.5	7.8	9.6	0.8	54	4.2	0.31	0.20
	1.0	8.4	11.4	1.0	59	4.9	0.45	0.24
	1.5	8.7	13.2	1.1	63	5.5	0.58	0.28
	2.0	8.9	14.8	1.3	68	6.0	0.72	0.32
	2.5	8.9	16.7	1.5	74	6.5	0.87	0.37
	3.0	8.0	19.9	1.6	85	6.8	1.13	0.47
400	0.5	9.7	8.9	0.9	54	5.2	0.27	0.18
	1.0	10.4	10.3	1.1	59	6.1	0.38	0.21
	1.5	10.8	11.5	1.2	63	6.8	0.47	0.25
	2.0	11.0	12.7	1.4	68	7.4	0.56	0.26
	2.5	11.0	14.2	1.6	74	8.1	0.68	0.30
	3.0	10.0	16.6	1.7	85	8.5	0.86	0.37
500	0.5	11.5	8.5	1.0	54	6.2	0.25	0.17
	1.0	12.3	9.5	1.2	59	7.2	0.32	0.20
	1.5	12.8	10.5	1.3	63	8.1	0.40	0.22
	2.0	13.1	11.4	1.5	68	8.8	0.47	0.24
	2.5	13.0	12.5	1.6	74	9.6	0.56	0.27
	3.0	11.8	14.4	1.7	85	10.0	0.69	0.32
600	0.5	13.2	8.2	1.1	54	7.1	0.23	0.18
	1.0	14.1	9.0	1.3	59	8.2	0.28	0.19
	1.5	14.7	9.8	1.4	63	9.3	0.35	0.21
	2.0	15.0	10.5	1.6	68	10.1	0.40	0.22
	2.5	14.9	11.4	1.7	74	11.0	0.46	0.24
	3.0	13.5	12.9	1.7	85	11.5	0.57	0.29
700	0.5	14.8	7.9	1.2	54	8.0	0.22	0.18
	1.0	15.8	8.6	1.4	59	9.2	0.27	0.18
	1.5	16.5	9.2	1.5	63	10.4	0.31	0.20
	2.0	16.8	9.8	1.7	68	11.3	0.34	0.21
	2.5	16.7	10.5	1.8	74	12.3	0.40	0.22
	3.0	15.2	11.7	1.8	85	12.9	0.49	0.26
800	0.5	16.4	7.7	1.3	54	8.9	0.22	0.17
	1.0	17.5	8.3	1.4	59	10.2	0.24	0.19
	1.5	18.2	8.8	1.6	63	11.5	0.28	0.19
	2.0	18.6	9.2	1.7	68	12.6	0.31	0.20
	2.5	18.5	9.8	1.8	74	13.6	0.35	0.21
	3.0	16.8	10.8	1.8	85	14.3	0.42	0.25

<b>Nutrient requirements of growing medium frame heifers.</b>								
Body Weight lbs	Avg. Daily Gain lbs	Dry Matter Intake lbs	Crude Protein %	Crude Protein lbs	TDN %	TDN lbs	Ca %	P %
300	0.5	7.5	9.6	0.8	56	4.2	0.29	0.21
	1.0	8.0	11.4	1.0	62	5.0	0.44	0.22
	1.5	8.2	13.1	1.1	69	5.6	0.59	0.27
	2.0	8.0	15.1	1.3	77	6.2	0.74	0.33
400	0.5	9.3	8.9	0.9	56	5.2	0.26	0.19
	1.0	9.9	10.2	1.1	62	6.1	0.36	0.20
	1.5	10.2	11.4	1.2	69	7.0	0.45	0.24
	2.0	10.0	12.9	1.4	77	7.7	0.57	0.29
500	0.5	11.0	8.5	1.0	56	6.2	0.24	0.18
	1.0	11.8	9.4	1.2	62	7.3	0.30	0.21
	1.5	12.1	10.3	1.3	69	8.3	0.38	0.22
	2.0	11.8	11.4	1.5	77	9.1	0.45	0.24
600	0.5	12.6	8.1	1.1	56	7.1	0.23	0.18
	1.0	13.5	8.8	1.3	62	8.4	0.28	0.20
	1.5	13.8	9.5	1.4	69	9.5	0.32	0.21
	2.0	13.5	10.4	1.6	77	10.4	0.38	0.23
700	0.5	14.1	7.9	1.2	56	7.9	0.22	0.19
	1.0	15.1	8.4	1.4	62	9.4	0.25	0.19
	1.5	15.5	9.0	1.5	69	10.6	0.28	0.20
	2.0	15.2	9.6	1.7	77	11.7	0.32	0.22
800	0.5	15.6	7.7	1.3	56	8.7	0.21	0.18
	1.0	16.7	8.1	1.4	62	10.4	0.22	0.18
	1.5	17.2	8.5	1.6	69	11.8	0.24	0.19
	2.0	16.8	9.0	1.7	77	12.9	0.28	0.20
1000	0.5	18.5	7.4	1.4	56	10.4	0.20	0.19
	1.0	19.8	7.6	1.5	62	12.3	0.20	0.18
	1.5	20.3	7.8	1.6	69	13.9	0.21	0.18
	2.0	19.8	8.1	1.6	77	15.2	0.22	0.19

**Suggested mineral and vitamin requirements of beef cattle.**  
**(Adapted from Nutrient Requirements of Beef Cattle, National Research Council, 2000.)**

Mineral	Growing and Finishing	Cows		Maximum Tolerable Level
		Gestation	Early Lactation	
Cobalt (Co), ppm	0.10	0.10	0.10	10.0
Copper (Cu), ppm	10	10	10	100
Iodine (I), ppm	0.50	0.50	0.50	50.0
Iron (Fe), ppm	50	50	50	1000
Magnesium (Mg), %	0.10	0.12	0.20	0.40
Manganese (Mn), ppm	20	40	40	1000
Molybdenum (Mo), ppm				6
Potassium (K), %	0.60	0.60	0.70	3
Selenium (Se), ppm †	0.10	0.10	0.10	2
Sodium (Na), %	0.06-0.08	0.06-0.08	0.10	--
Sulfur (S), %	0.15	0.15	0.15	0.40
Zinc (Zn), ppm	30	30	30	500
Vitamin A IU/kg	2200	2800	3900	--
Vitamin D IU/kg	275	275	275	--

† It is legal to supplement Se to beef cattle at the level of 0.30 mg/kg of the total diet up to 3 mg/head/day (NRC Beef Update 2000, p.68).