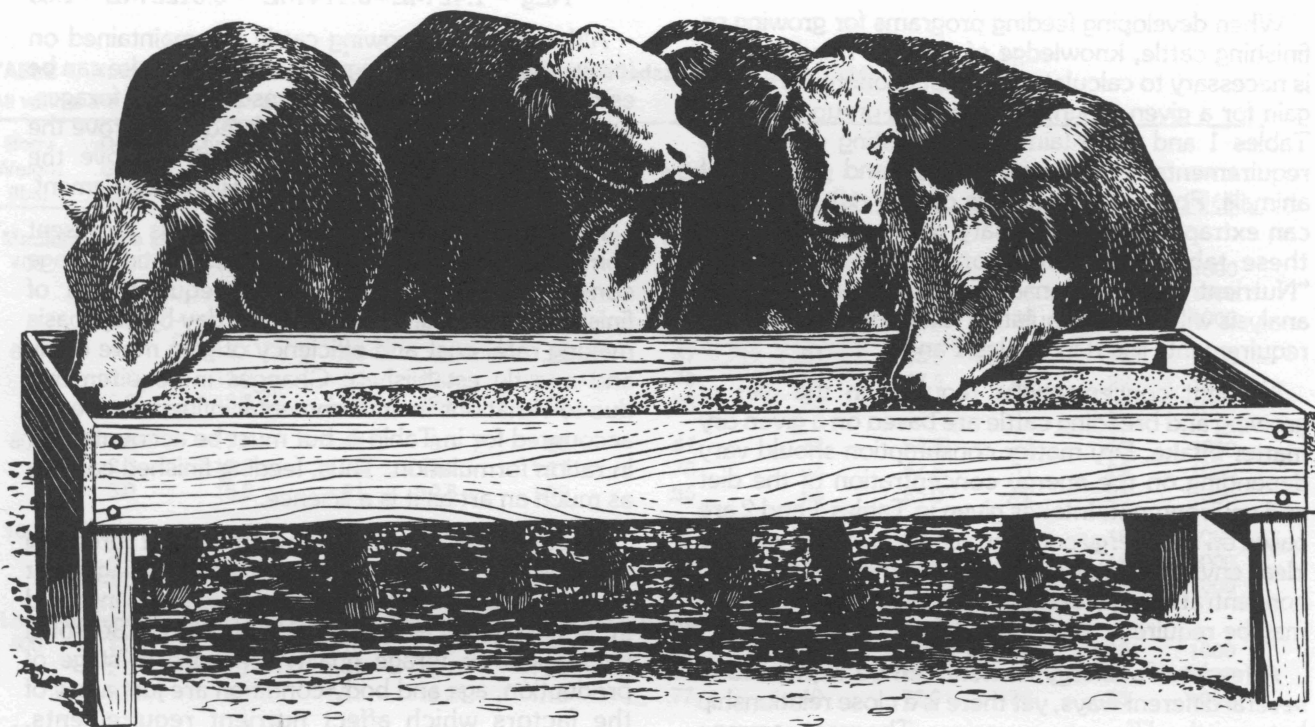


# Texas Agricultural Extension Service

*People Helping People*

## Nutrient Requirements of Beef Cattle



# Nutrient Requirements of Beef Cattle

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Meeting nutritional requirements of beef cattle is extremely important in maintaining acceptable performance of growing, finishing and breeding animals. To ensure acceptable results, the producer must consider not only actual performance, but the economic impact of feed inputs required to achieve that level of performance.

When developing feeding programs for growing or finishing cattle, knowledge of nutrient requirements is necessary to calculate the most economical rate of gain for a given weight, sex and age-group of cattle. Tables 1 and 2 contain a partial listing of nutrient requirements for various classes and weights of animals. For weights or rates of gain not listed, one can extrapolate the necessary requirements. Use of these tables and Extension publication B-1553, "Nutrient Composition of Feeds" or actual forage analysis will aid in formulating rations which meet the requirements listed in Tables 1 and 2.

Nutrient concentrations required in the diet of growing and breeding cattle are based on a given dry matter intake. Dry matter consumption should vary depending on the energy concentration of the diet and environment. Intakes given in Tables 1 and 2 are based on the energy concentration shown and assume ideal environmental conditions. If the diet's energy concentrations exceed the table values, limiting feed may be required.

A feedstuff's energy content can be expressed in several different ways, yet there is a close relationship between the different expressions. The most common method of expressing a feedstuff's energy value is percent total digestible nutrients (TDN). More precise methods of determining energy content have been developed and are generally expressed in one of the following means: gross energy (GE), digestible energy (DE), metabolizable energy (ME), net energy for maintenance (NEm) and net energy for growth (NEg). Because of the close relationship between these values, mathematical conversions can be made

between most of them. Formulas necessary to make these conversions are given below:

$$1 \text{ lb. TDN} = 2.00 \text{ Mcal DE}$$

$$1 \text{ lb. TDN} = 1.64 \text{ Mcal ME}$$

$$\text{ME} = .82 \text{ DE}$$

$$\text{NEm} = 1.37 \text{ ME} - 0.138 \text{ ME}^2 + 0.0105 \text{ ME}^3 - 1.12$$

$$\text{NEg} = 1.42 \text{ ME} - 0.174 \text{ ME}^2 + 0.0122 \text{ ME}^3 - 1.65$$

Although most growing cattle are maintained on forage development programs, nutrient intake can be estimated based on average consumption of forages. Supplements can then be formulated to improve the nutrient ratio in the diet which will improve the efficiency of utilization of both forage and supplement.

Feeding programs for finishing rations represent complete diets. Variables such as estimating forage consumption are avoided, and requirements of finishing cattle can be met on a day-by-day basis making rate, cost and efficiency of gain more easily and exactly established. Changes in requirements due to variations in environmental influences are not accounted for in Table 1, but must be accounted for in ration formulation. Thus, feeding finished cattle is as much an art as it is a science.

Meeting the nutrient requirements of breeding cattle is the most difficult nutritional management program because of the numerous variables involved in typical cow-calf production systems. Seasonal fluctuations in forage quality, changes in stage of production, age and body condition are just a few of the factors which affect nutrient requirements. Requirements listed in the following tables are an average of many research reports and assume a thermoneutral environment without any adverse climatic conditions. Most cow-calf producers and cattle feeders know there is no "average animal" maintained under a thermoneutral environment. Therefore, these requirements should only be used as a starting point and guide in ration formulation.

Management programs which separate cattle based on stage of production, age and body condition are a must to allow efficient use of available forage and supplements. A management program's main

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requirement is to time the breeding seasons of the cows to coincide with periods of high quality forage growth. Other management practices and average weaning weights tend to improve when breeding seasons are controlled.

From a practical standpoint a nutritional program should ensure adequate mineral and vitamin intake through a supplementation program which corrects deficiencies in available forage. A list of commonly used mineral supplements is provided in Extension publication B-1553 "Nutrient Composition of Feeds". Mineral requirements are shown in Table 3. When forage quality, not quantity, declines, supplementing protein will ensure adequate consumption and digestibility to meet requirements.

In a nutritional program such as this, any changes in body condition would then indicate a deficiency of energy and a need for energy supplementation. The energy sources listed in B-1553, "Nutrient Composition of Feeds", can be used to correct energy deficiencies which result in weight loss of breeding cattle.

Forage programs can generally meet the nutrient requirements of mature cows; however, yearling and two-year-old heifers carrying or nursing a calf often need some form of additional supplementation. By using forage tests and Table 1, a producer should be able to develop the most economical program to eliminate any deficiencies.

Remember that a feeding program which meets requirements on an animal-to-animal, day-to-day, or pound-to-pound basis is not a reasonable goal. Management should be developed to meet requirements on the basis of group averages. However, the better cattle are sorted by age, weight, sex, stage of production and body condition, the closer a producer can come to meeting requirements on an animal-to-animal basis and the more efficiently available roughage, protein, energy, mineral and vitamin sources can be utilized. Minimizing cost and optimizing returns is the goal of any cattle producer, and because feed requirements represent the largest component in most production systems, an understanding of nutrient requirements is a must.

**TABLE 1. Nutrient requirements for growing and finishing cattle (adapted from NRC, 1984).**

All values are expressed on a 100% dry matter (DM) basis.

Body Weight (lbs)	Daily Gain (lbs)	Minimum DM Intake (lbs)	Total Protein (lbs)	CP (%)	ME (Mcal/lb)	NEm (Mcal/lb)	NEg (Mcal/lb)	TDN (%)	Ca (%)	P (%)	Vit. A (IU/lb)
<b>Medium-frame steer calves</b>											
400	1.0	10.4	1.06	10.3	.96	.57	.31	58.5	.38	.21	1000
	2.0	11.0	1.41	12.7	1.11	.70	.44	67.5	.56	.26	1000
	3.0	10.0	1.65	16.6	1.39	.95	.64	85.0	.86	.37	1000
600	1.0	14.1	1.26	9.0	.96	.57	.31	58.5	.28	.19	1000
	2.0	15.0	1.57	10.5	1.11	.70	.44	67.5	.40	.22	1000
	3.0	13.5	1.73	12.9	1.39	.95	.64	85.0	.57	.29	1000
800	1.0	17.5	1.44	8.3	.96	.57	.31	58.5	.24	.19	1000
	2.0	18.6	1.72	9.2	1.11	.70	.44	67.5	.31	.20	1000
	3.0	16.8	1.81	10.8	1.39	.95	.64	85.0	.42	.25	1000
1000	1.0	20.7	1.60	7.8	.96	.57	.31	58.5	.21	.18	1000
	2.0	22.0	1.85	8.4	1.11	.70	.44	67.5	.25	.19	1000
	3.0	19.8	1.88	9.5	1.39	.95	.64	85.0	.32	.22	1000
<b>Large-frame steer calves and compensating medium-frame yearling steers</b>											
400	1.0	10.8	1.10	10.2	.92	.54	.28	56.0	.37	.20	1000
	2.0	11.7	1.47	12.7	1.04	.64	.38	63.5	.57	.26	1000
	3.0	11.9	1.81	15.2	1.18	.77	.49	72.0	.76	.33	1000
600	1.0	14.6	1.31	9.0	.92	.54	.28	56.0	.29	.18	1000
	2.0	15.8	1.66	10.5	1.04	.64	.38	63.5	.40	.22	1000
	3.0	16.1	1.95	12.1	1.18	.77	.49	72.0	.52	.26	1000
800	1.0	18.2	1.51	8.3	.92	.54	.28	56.0	.24	.18	1000
	2.0	19.6	1.82	9.3	1.04	.64	.38	63.5	.32	.20	1000
	3.0	19.9	2.07	10.4	1.18	.77	.49	72.0	.40	.22	1000
1000	1.0	21.5	1.69	7.8	.92	.54	.28	56.0	.23	.17	1000
	2.0	23.2	1.98	8.6	1.04	.64	.38	63.5	.27	.18	1000
	3.0	23.6	2.19	9.3	1.18	.77	.49	72.0	.32	.20	1000

**TABLE 1. Nutrient Requirements for Growing and Finishing Cattle (Continued).**

All values are expressed on a 100% dry matter (DM) basis.

Body Weight (lbs)	Daily Gain (lbs)	Minimum DM Intake (lbs)	Total Protein (lbs)	CP (%)	ME (Mcal/lb)	NE <sub>m</sub> (Mcal/lb)	NE <sub>g</sub> (Mcal/lb)	TDN (%)	Ca (%)	P (%)	Vit. A (IU/lb)
<b>Medium-frame bulls</b>											
600	1.0	13.9	1.27	9.2	.94	.56	.30	57.5	.30	.19	1000
	2.0	14.9	1.61	10.8	1.08	.68	.41	65.5	.43	.24	1000
	3.0	14.7	1.86	12.7	1.26	.84	.54	76.5	.57	.29	1000
800	1.0	17.3	1.45	8.4	.94	.56	.30	57.5	.25	.19	1000
	2.0	18.5	1.76	9.5	1.08	.68	.41	65.5	.33	.21	1000
	3.0	18.2	1.97	10.8	1.26	.84	.54	76.5	.44	.24	1000
1100	1.0	21.9	1.70	7.8	.94	.56	.30	57.5	.22	.19	1000
	2.0	23.4	1.97	8.4	1.08	.68	.41	65.5	.26	.19	1000
	3.0	23.1	2.11	9.2	1.26	.84	.54	76.5	.32	.21	1000
<b>Large-frame bull calves and compensating large-frame yearling steers</b>											
600	1.0	14.1	1.30	9.2	.92	.54	.28	56.0	.31	.20	1000
	2.0	15.2	1.67	10.9	1.03	.63	.37	62.5	.44	.23	1000
	3.0	15.5	1.97	12.7	1.16	.75	.47	70.5	.58	.27	1000
	4.0	13.8	2.16	15.6	1.41	.96	.66	86.0	.81	.37	1000
800	1.0	17.5	1.49	8.5	.92	.54	.28	56.0	.26	.19	1000
	2.0	18.8	1.84	9.7	1.03	.63	.37	62.5	.35	.21	1000
	3.0	19.3	2.11	10.9	1.16	.75	.47	70.5	.45	.24	1000
	4.0	17.1	2.24	13.0	1.41	.96	.66	86.0	.61	.31	1000
1100	1.0	22.3	1.75	7.9	.92	.54	.28	56.0	.23	.19	1000
	2.0	23.9	2.07	8.6	1.03	.63	.37	62.5	.28	.19	1000
	3.0	24.5	2.29	9.3	1.16	.75	.47	70.5	.32	.21	1000
	4.0	21.7	2.33	10.7	1.41	.96	.66	86.0	.43	.25	1000
<b>Medium-frame heifer calves</b>											
400	.5	9.3	.84	8.9	.92	.54	.28	56.0	.26	.19	1000
	1.0	9.9	1.01	10.2	1.02	.63	.36	62.0	.36	.20	1000
	1.5	10.2	1.17	11.4	1.13	.72	.44	68.5	.45	.24	1000
	2.0	10.0	1.29	12.9	1.26	.84	.55	77.0	.57	.29	1000
600	.5	12.6	1.04	8.1	.92	.54	.28	56.0	.23	.18	1000
	1.0	13.5	1.19	8.8	1.02	.63	.36	62.0	.28	.20	1000
	1.5	13.8	1.32	9.5	1.13	.72	.44	68.5	.32	.21	1000
	2.0	13.5	1.41	10.4	1.26	.84	.55	77.0	.38	.23	1000
800	.5	15.6	1.22	7.7	.92	.54	.28	56.0	.21	.18	1000
	1.0	16.7	1.36	8.1	1.02	.63	.36	62.0	.22	.18	1000
	1.5	17.2	1.46	8.5	1.13	.72	.44	68.5	.24	.19	1000
	2.0	16.8	1.51	9.0	1.26	.84	.55	77.0	.28	.20	1000
1000	.5	18.5	1.39	7.4	.92	.54	.28	56.0	.20	.19	1000
	1.0	19.8	1.51	7.6	1.02	.63	.36	62.0	.20	.18	1000
	1.5	20.3	1.59	7.8	1.13	.72	.44	68.5	.21	.18	1000
	2.0	19.8	1.61	8.1	1.26	.84	.55	77.0	.22	.19	1000

**TABLE 1. Nutrient requirements for growing and finishing cattle (continued).**

All values are expressed on a 100% dry matter (DM) basis.

Body Weight (lbs)	Daily Gain (lbs)	Minimum DM Intake (lbs)	Total Protein (lbs)	CP (%)	ME (Mcal/lb)	NE <sub>m</sub> (Mcal/lb)	NE <sub>g</sub> (Mcal/lb)	TDN (%)	Ca (%)	P (%)	Vit. A (IU/lb)
<b>Large-frame heifer calves and compensating medium-frame yearling heifers</b>											
500	.5	11.5	.98	8.4	.89	.50	.25	54.0	.23	.17	1000
	1.0	12.4	1.16	9.4	.98	.58	.32	59.0	.30	.20	1000
	1.5	12.9	1.32	10.3	1.05	.65	.39	64.0	.38	.20	1000
	2.0	13.1	1.46	11.2	1.14	.74	.46	69.5	.44	.24	1000
	2.5	12.8	1.57	12.4	1.26	.84	.55	77.0	.53	.26	1000
700	.5	14.8	1.18	7.9	.89	.50	.25	54.0	.21	.18	1000
	1.0	15.9	1.34	8.5	.98	.58	.32	59.0	.25	.18	1000
	1.5	16.6	1.49	9.0	1.05	.65	.39	64.0	.29	.19	1000
	2.0	16.8	1.61	9.6	1.14	.74	.46	69.5	.33	.20	1000
	2.5	16.4	1.68	10.3	1.26	.84	.55	77.0	.38	.22	1000
900	.5	17.8	1.36	7.5	.89	.50	.25	54.0	.20	.18	1000
	1.0	19.2	1.52	7.9	.98	.58	.32	59.0	.22	.18	1000
	1.5	20.0	1.64	8.2	1.05	.65	.39	64.0	.23	.18	1000
	2.0	20.3	1.74	8.6	1.14	.74	.46	69.5	.26	.18	1000
	2.5	19.8	1.78	9.0	1.26	.84	.55	77.0	.29	.20	1000
1100	.5	20.8	1.54	7.3	.89	.50	.25	54.0	.19	.18	1000
	1.0	22.3	1.68	7.5	.98	.58	.32	59.0	.20	.18	1000
	1.5	23.3	1.78	7.7	1.05	.65	.39	64.0	.20	.18	1000
	2.0	23.6	1.86	7.9	1.14	.74	.46	69.5	.21	.18	1000
	2.5	23.1	1.88	8.2	1.26	.84	.55	77.0	.22	.18	1000

**Abbreviations Used in Tables**

Ca - calcium	Vit - vitamin
P - phosphorus	NE <sub>m</sub> - net energy, maintenance
CP - crude protein	NE <sub>g</sub> - net energy, gain
DM - dry matter	TDN - total digestible nutrients
lb - pound	Mcal - megacalorie
IU - international unit	ME - metabolizable energy
g - grams	

**TABLE 2. Nutrient requirements of breeding cattle (adapted from NRC, 1984).**

All values are expressed on a 100% dry matter (DM) basis.

Body Weight (lbs)*	Daily Gain (lbs)**	Minimum DM Intake (lbs)	Total Protein (lbs)	ME (Mcal)	TDN (lbs)	Ca (g)	P (g)	Vit. A (1000 IU)	CP (%)	ME (Mcal/lb)	TDN (%)	Ca (%)	P (%)	Vit. A (IU/lb)
<b>Pregnant Yearling Heifer - last third of gestation</b>														
700	.9	15.3	1.3	13.9	8.5	19	14	19	8.4	.91	55.4	.27	.20	1273
700	1.4	15.8	1.4	15.7	9.6	24	15	20	9.0	.99	60.3	.33	.21	1273
750	.9	16.1	1.3	14.6	8.9	20	14	20	8.3	.90	55.1	.27	.19	1273
750	1.4	16.6	1.5	16.4	10.0	24	16	21	8.9	.98	59.9	.32	.21	1273
800	.9	16.8	1.4	15.2	9.2	21	15	21	8.2	.90	54.8	.28	.20	1273
800	1.4	17.4	1.5	17.1	10.4	25	16	22	8.8	.98	59.6	.33	.21	1273
850	.9	17.6	1.4	15.7	9.6	21	16	22	8.2	.89	54.5	.26	.20	1273
850	1.4	18.2	1.6	17.8	10.8	25	17	23	8.6	.97	59.3	.30	.21	1273
900	.9	18.3	1.5	16.3	9.9	22	17	23	8.1	.89	54.3	.26	.20	1273
900	1.4	19.0	1.6	18.5	11.3	26	18	24	8.5	.97	59.1	.30	.21	1273
950	.9	19.0	1.5	16.9	10.3	23	17	24	8.0	.89	54.1	.27	.20	1273
950	1.4	19.8	1.7	19.1	11.7	26	19	25	8.4	.97	58.9	.29	.21	1273
<b>Dry Pregnant Mature Cows - middle third of gestation</b>														
800	.0	15.3	1.1	12.3	7.5	12	12	19	7.1	.80	48.8	.17	.17	1273
900	.0	16.7	1.2	13.4	8.2	14	14	21	7.0	.80	48.8	.18	.18	1273
1000	.0	18.1	1.3	14.5	8.8	15	15	23	7.0	.80	48.8	.18	.18	1273
1100	.0	19.5	1.4	15.6	9.5	17	17	25	7.0	.80	48.8	.19	.19	1273
1200	.0	20.8	1.4	16.6	10.1	18	18	26	6.9	.80	48.8	.19	.19	1273
1300	.0	22.0	1.5	17.7	10.8	20	20	28	6.9	.80	48.8	.20	.20	1373
1400	.0	23.3	1.6	18.7	11.4	21	21	30	6.9	.80	48.8	.20	.20	1273
<b>Dry Pregnant Mature Cows - last third of gestation</b>														
800	.9	16.8	1.4	15.0	9.2	20	15	21	8.2	.89	54.5	.26	.20	1273
900	.9	18.2	1.5	16.2	9.8	22	17	23	8.0	.89	54.0	.27	.21	1273
1000	.9	19.6	1.6	17.3	10.5	23	18	25	7.9	.88	53.6	.26	.20	1273
1100	.9	21.0	1.6	18.3	11.2	25	20	26	7.8	.87	53.2	.26	.21	1273
1200	.9	22.3	1.7	19.4	11.8	26	21	28	7.8	.87	52.9	.26	.21	1273
1300	.9	23.6	1.8	20.4	12.5	28	23	30	7.7	.87	52.7	.26	.21	1273
1400	.9	24.9	1.9	21.5	13.1	29	24	32	7.6	.86	52.5	.26	.21	1273
<b>Two Year-Old Heifers, nursing calves - first 3-4 months postpartum (10 lb milk/day)</b>														
700	.5	15.9	1.8	17.0	10.3	26	17	28	11.3	1.07	65.1	.36	.24	1773
750	.5	16.7	1.8	17.7	10.8	26	18	30	11.0	1.06	64.4	.34	.24	1773
800	.5	17.6	1.9	18.4	11.2	27	19	31	10.8	1.05	63.8	.34	.24	1773
850	.5	18.5	1.9	19.1	11.6	27	19	33	10.6	1.04	63.2	.33	.23	1773
900	.5	19.2	2.0	19.8	12.0	28	20	34	10.4	1.03	62.7	.32	.23	1773
950	.5	20.0	2.0	20.5	12.5	28	21	35	10.2	1.02	62.3	.31	.23	1773
1000	.5	20.8	2.1	21.1	12.9	29	22	37	10.0	1.02	61.9	.31	.23	1773
<b>Cows, nursing calves - first 3-4 months postpartum (10 lb milk/day)</b>														
800	.0	17.3	1.8	16.6	10.1	23	17	31	10.2	.96	58.2	.30	.22	1773
900	.0	18.8	1.9	17.7	10.8	24	19	33	9.9	.94	57.3	.28	.22	1773
1000	.0	20.2	2.0	18.8	11.5	25	20	36	9.6	.93	56.6	.28	.22	1773
1100	.0	21.6	2.0	19.9	12.1	27	22	38	9.4	.92	56.0	.27	.22	1773
1200	.0	23.0	2.1	21.0	12.8	28	23	41	9.3	.91	55.5	.27	.22	1773
1300	.0	24.3	2.2	22.0	13.4	30	25	43	9.1	.90	55.1	.27	.22	1773
1400	.0	25.6	2.3	23.0	14.0	31	26	46	9.0	.90	54.7	.27	.22	1773
<b>Cows, nursing calves - first 3-4 months postpartum (20 lb milk/day)</b>														
800	.0	15.7	2.2	19.9	12.1	34	22	28	14.2	1.27	77.3	.48	.31	1773
900	.0	18.7	2.4	21.5	13.1	35	24	33	12.9	1.15	69.8	.41	.28	1773
1000	.0	20.6	2.5	22.7	13.8	36	25	37	12.3	1.10	67.0	.39	.27	1773
1100	.0	22.3	2.6	23.9	14.5	38	27	40	11.9	1.07	65.2	.38	.27	1773
1200	.0	23.8	2.7	24.9	15.2	39	28	42	11.5	1.05	63.7	.36	.26	1773
1300	.0	25.3	2.8	26.0	15.9	41	30	45	11.2	1.03	62.6	.36	.26	1773
1400	.0	26.7	2.9	27.1	16.5	42	31	47	11.0	1.01	61.7	.35	.26	1773

\* Average weight for feeding period.

\*\* Approximately 0.9 lb. of weight gain/day over last trimester is accounted for by products of conception.

**TABLE 2. Nutrient requirements of breeding cattle (continued).**

All values are expressed on a 100% dry matter (DM) basis.

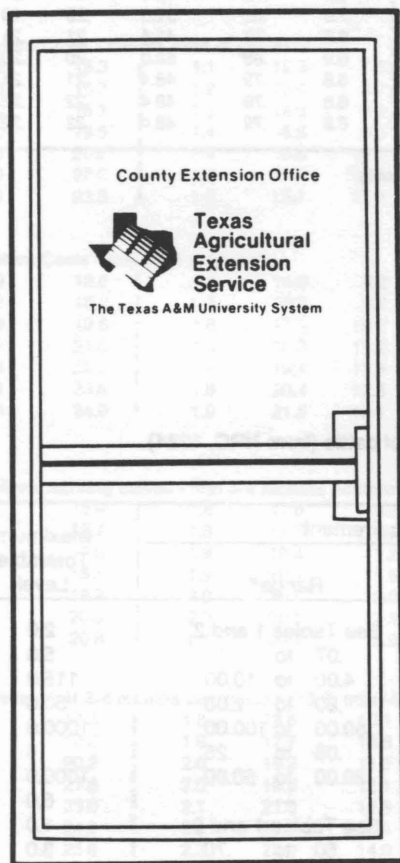
Body Weight (lbs)*	Daily Gain (lbs)**	Minimum DM Intake (lbs)	Total Protein (lbs)	ME (Mcal)	TDN (lbs)	Ca (g)	P (g)	Vit. A (1000 IU)	CP (%)	ME (Mcal/lb)	TDN (%)	Ca (%)	P (%)	Vit. A (IU/lb)
<b>Bulls, maintenance and slow rate of growth (regain body condition)</b>														
1300	1.0	25.4	1.9	23.3	14.2	25	22	45	7.6	.92	55.8	.22	.19	1773
1300	2.0	26.2	2.2	27.6	16.8	31	24	46	8.2	1.05	64.0	.26	.20	1773
1400	1.0	26.8	2.0	24.6	15.0	26	23	48	7.5	.92	55.8	.21	.19	1773
1400	2.0	27.7	2.2	29.1	17.8	31	25	49	8.0	1.05	64.0	.25	.20	1773
1500	.0	25.2	1.7	20.0	12.2	23	23	45	6.9	.79	48.4	.20	.20	1773
1500	1.5	29.0	2.2	28.4	17.3	29	25	51	7.6	.98	59.7	.22	.19	1773
1600	.0	26.5	1.8	21.0	12.8	23	24	47	6.9	.79	48.4	.19	.20	1773
1600	1.5	30.4	2.3	29.8	18.2	31	27	54	7.4	.98	59.7	.22	.20	1773
1700	.0	27.7	1.9	22.0	13.4	26	26	49	6.8	.79	48.4	.21	.21	1773
1700	.5	29.6	2.1	25.3	15.4	27	26	52	7.0	.85	52.0	.20	.19	1773
1800	.0	28.9	2.0	23.0	14.0	27	27	51	6.8	.79	48.4	.21	.21	1773
1800	.5	30.9	2.2	26.4	16.1	28	28	55	7.0	.85	52.0	.20	.20	1773
1900	.0	30.1	2.0	23.9	14.6	29	29	53	6.8	.79	48.4	.21	.21	1773
1900	.5	32.2	2.2	27.5	16.8	29	29	57	6.9	.85	52.0	.20	.20	1773
2000	.0	31.3	2.1	24.9	15.2	30	30	55	6.8	.79	48.4	.21	.21	1773
2100	.0	32.5	2.2	25.8	15.7	32	32	58	6.8	.79	48.4	.22	.22	1773
2200	.0	33.6	2.3	26.7	16.3	33	33	60	6.8	.79	48.4	.22	.22	1773

\* Average weight for a feeding period. Requirements for lighter weight bulls can be found in Table 1.

**TABLE 3. Mineral requirements and maximum tolerable levels for beef cattle (from NRC, 1984).**

Mineral	Units	Requirement		Maximum Tolerable Level
		Suggested Value	Range*	
Calcium	%	—	See Tables 1 and 2.	2.0
Cobalt	ppm	.10	.07 to .11	5.0
Copper	ppm	8.00	4.00 to 10.00	115.0
Iodine	ppm	.50	.20 to 2.00	50.0
Iron	ppm	50.00	50.00 to 100.00	1000.0
Magnesium	%	.01	.05 to .25	.4
Manganese	ppm	40.00	20.00 to 50.00	1000.0
Molybdenum	ppm	—	—	6.0
Phosphorus	%	—	See Tables 1 and 2.	1.0
Potassium	%	.65	.50 to .70	3.0
Selenium	ppm	.20	.05 to .30	2.0
Sodium	%	.08	.06 to .10	10.0
Chlorine	%	—	—	—
Sulfur	%	.10	.08 to .15	.4
Zinc	ppm	30.00	20.00 to 40.00	500.0

\* The listing of a range in which requirements are likely to be met recognizes that requirements for most minerals are affected by a variety of dietary and animal factors. It may be better to evaluate rations based on a range of mineral requirements and for content of interfering substances than to meet a specific dietary value.



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