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Tables of nutritional requirements for beef cattle

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INTRODUCTION

We will present examples of application of the equations proposed throughout the chapters of the current edition of BR-CORTE (BR-CORTE, 2023). Thus, Tables will be provided with the estimates of the nutritional requirements according to different categories (growing and finishing animals, lactating cows and lactating calves), production systems (feedlot and pasture), genetic groups (Zebu, crossbred beef and crossbred dairy cattle) and sex classes (bulls, steers and heifers).

To facilitate visualization and interpretation of the data, three different worksheets are shown for each example: the first shows the general energy and protein requirements, as well as dry matter (DMI) and water intake; the second the mineral requirements; and the third shows the amino acid requirements for gain.

In Tables 17.1 and 17.2 are presented the summaries with their numbering for each category, as well as the pages where they can be found.

Table 17.1 - Summary of the Tables with the nutritional requirements of growing and finishing beef cattle, split by production system, genetic group and sex

System	Genetic Group	Sex	Tables			Pages
			General	Minerals	Amino acids	
Feedlot	Zebu	Bulls	17.3a	17.3b	17.3c	427 - 429
		Steers	17.4a	17.4b	17.4c	430 - 432
		Heifers	17.5a	17.5b	17.5c	433 - 435
	Crossbred beef cattle	Bulls	17.6a	17.6b	17.6c	436 - 438
		Steers	17.7a	17.7b	17.7c	439 - 441
		Heifers	17.8a	17.8b	17.8c	442 - 444
	Crossbred dairy cattle	Bulls	17.9a	17.9b	17.9c	445 - 447
		Steers	17.10a	17.10b	17.10c	448 - 450
		Heifers	17.11a	17.11b	17.11c	451 - 453
Pasture	Zebu	Bulls	17.12a	17.12b	17.12c	454 - 456

Table 17.2 - Summary of the Tables with the estimated nutritional requirements of lactating beef cows and lactating calves

Category	Tables		Pages
	General	Minerals	
Primiparous Cows	17.13a	17.13b	459 - 460
Multiparous Cows	17.14a	17.14b	461 - 462
Calves - 100 e 150 kg BW	17.15a	17.15b	463 - 464
Calves - 200 e 250 kg BW	17.16a	17.16b	465 - 466

*BW = body weight;

In addition to the nutritional requirement Tables available in this chapter, an Excel® spreadsheet has also been developed to estimate the nutritional requirements of beef cattle, which is available for free download at the following address: <https://www.brcorte.com.br>. This worksheet allows the user to enter the specific information of the animal for which you want to formulate a diet (genetic group, sexual class, production system, etc.), for example a crossbred beef cattle, finished in feedlot, with 438kg of BW and 1.67kg of ADG, located in a region with 32.8°C maximum temperature and 72.4% humidity.

It is recommended that during the process of formulating diets, users should preferably use the actual information of the composition of the available feeds, whether obtained through conventional laboratory analysis or through technologies applied on the farm itself (NIR, for example). Despite providing greater accuracy in meeting the nutritional requirements of animals, the determination of feed composition is often not feasible, either by the delay in obtaining the results or by the high cost. An alternative is the use of tabulated values of feed composition, which are usually averages of several observations obtained in animal nutrition studies.

In this context, the average composition of various foods used in ruminant feed in Brazilian conditions is available at as Brazilian Tables of Feed Composition for Ruminants (CQBAL 4.0), which can be accessed at the following address: <https://www.cqbal.com.br>.

It is worth noting that the formulated diet will hardly correspond exactly to what is being mixed and/or offered and effectively consumed by the animals, due to the need to make assumptions at the time of formulation (animal characteristics and feed composition, for example) and the variation in several other factors that affect the DMI and rumen environment (environmental conditions, feed management, etc.) Thus, the formulation of the diet is only one point of the animal feeding process, which needs to be constantly monitored and possibly adjusted in production systems.

EXAMPLES OF APPLICATION OF THE BR-CORTE (2023) RECOMMENDATIONS

Three examples of calculations of nutritional requirements for beef cattle are described as follows: the first for growing and finishing animals; the second for lactating beef cows; and the third for suckling beef calves.

Growing and finishing beef cattle

To calculate the nutritional requirements of growing and finishing cattle, a Zebu bull, with an average body weight of 520 kg and average daily gain of 1.4 kg/day, raised in a feedlot in a region with 25.7°C maximum temperature and 65.0% humidity, will be considered.

a) Dry matter intake

$$\begin{aligned} \text{DMI} &= -2.1948 + 0.08338 \times \text{BW}^{0.75} + 3.9328 \times \text{ADG} - 0.9030 \times \text{ADG}^2 \\ \text{DMI} &= -2.1948 + 0.08338 \times 520^{0.75} + 3.9328 \times 1.4 - 0.9030 \times 1.4^2 \\ \text{DMI} &= 10.62 \text{ kg/day} \end{aligned}$$

b) Energy requirements

Step 1: EBG calculation

$$\text{EBG} = 0.963 \times \text{ADG}^{1.0151} \rightarrow 0.963 \times 1.4^{1.0151} \rightarrow 1.355 \text{ kg/day}$$

Step 2: EQEBW calculation

$$\text{SBW} = 0.8915 \times \text{BW}^{1.0151} \rightarrow 0.8915 \times 520^{1.0151} \rightarrow 509.5 \text{ kg}$$

$$\text{EBW} = 0.8126 \times \text{SBW}^{1.0134} \rightarrow 0.8126 \times 509.5^{1.0134} \rightarrow 450.1 \text{ kg}$$

$$\text{EQEBW} = (\text{EBW} / 517) \times 517 \rightarrow (450.1 / 517) \times 517 \rightarrow 450.1 \text{ kg}$$

Step 3: MEg calculation

$$\text{NEg} = 0.061 \times \text{EQEBW}^{0.75} \times \text{EBG}^{1.035} \rightarrow 0.061 \times 450.1^{0.75} \times 1.355^{1.035} \rightarrow 8.16 \text{ Mcal/day}$$

$$\text{REprot} = 1.140 \times (\text{NEg} / \text{EBG})^{-1.137} \rightarrow 1.140 \times (8.16 / 1.355)^{-1.137} \rightarrow 0.148$$

$$\text{kg} = 0.327 / (0.539 + \text{REprot}) \rightarrow 0.327 / [0.539 + 0.148] \rightarrow 0.476$$

$$\text{MEg} = \text{NEg} / \text{kg} \rightarrow 8.16 / 0.476 \rightarrow 17.15 \text{ Mcal/day}$$

Step 4: MEm calculation

$$\text{NEm} = 0.075 \times \text{EBW}^{0.75} \rightarrow 0.075 \times 450.1^{0.75} \rightarrow 7.33 \text{ Mcal/day}$$

$$km = (0.513 + 0.173 \times \text{kg} + 0.100 \times \text{EBG}) \times 1 \rightarrow [(0.513 + 0.173 \times 0.476 + 0.100 \times 1.355) \times 1] \rightarrow 0.73$$

$$\text{MEm} = \text{NEm} / km \rightarrow 7.33 / 0.73 \rightarrow 10.03 \text{ Mcal/day}$$

Step 5: ME total and DE calculation

$$\text{ME total} = \text{MEg} + \text{MEm} \rightarrow 17.15 + 10.03 \rightarrow 27.18 \text{ Mcal/day}$$

$$\text{DE} = [((\text{ME total} / \text{DMI}) + 0.3032) / 0.9455] \times \text{DMI} \rightarrow [((27.18 / 10.62) + 0.3032) / 0.9455] \times 10.62 \rightarrow 32.15 \text{ Mcal/day}$$

Step 6: TDN calculation

$$\text{TDN} = \text{DE} / 4.4 \rightarrow 32.15 / 4.4 \rightarrow 7.31 \text{ kg/day}$$

Step 7: TDN % calculation

$$\text{TDN (\%)} = \text{TDN} \times 100 / \text{DMI} = 7.31 \times 100 / 10.62 = 68.8\%$$

c) Protein requirements

Step 1: MPm calculation

$$\text{MPm} = 3.6 \times \text{SBW}^{0.75} = 3.6 \times 509.5^{0.75} = 386.1 \text{ g/day}$$

Step 2: MPg calculation

$$\text{NPg} = 176.01 \times \text{EBG} - 0.381 \times \text{EQEBW}^{0.75} \times \text{EBG}^{1.035}$$

$$\text{NPg} = 176.01 \times 1.355 - 0.381 \times 450.1^{0.75} \times 1.355^{1.035}$$

$$\text{NPg} = 187.5$$

$$k = 47.4\%$$

$$\text{MPg} = \text{NPg} / k = 187.5 / 0.474 = 395.6 \text{ g/day}$$

Step 3: MP total calculation

$$\text{MP total} = \text{MPm} + \text{MPg} = 386.1 + 395.6 = 781.7 \text{ g/day}$$

Step 4: RDP calculation

$$\text{MCP} = -53.07 + 304.9 \times \text{CPI} + 90.8 \times \text{TDNI} - 3.13 \times \text{TDNI}^2$$

$$\text{MCP} = -53.07 + 304.9 \times 1.135 + 90.8 \times 7.31 - 3.13 \times 7.31^2 = 789.3 \text{ g/day}$$

$$\text{RDP} = \text{MCP} = 789.3 \text{ g/day}$$

Step 5: RUP calculation

$$\text{RUP} = [\text{MP} - (\text{MCP} \times 0.64)] / 0.80$$

$$\text{RUP} = [781.7 - (789.3 \times 0.64)] / 0.80 = 345.6 \text{ g/day}$$

Step 6: Calculation da CP

$$\text{CP} = \text{RDP} + \text{RUP} = 789.3 + 345.6 = 1135 \text{ g/day}$$

d) Calcium requirements

$$\text{Maintenance: } 11.7 \times \text{BW} = 11.7 \times 520 = 6084 \text{ mg} = 6.08 \text{ g/day}$$

$$\text{Average daily gain: } \text{EBG} \times (147 \times \text{EBW}^{-0.50}) = 1.355 \times (147 \times 450.1^{-0.50}) = 9.39 \text{ g/day}$$

$$\text{Total net requirements: Maintenance} + \text{Gain} = 6.08 + 9.38 = 15.47 \text{ g/day}$$

$$\text{Dietary requirements} = \text{Total net requirements} / \text{retention coefficient} = 15.46 / 0.568 = 27.24 \text{ g/day}$$

e) Phosphorus requirements

$$\text{Maintenance: } 13.5 \times \text{BW} = 13.5 \times 520 = 7020 \text{ mg} = 7.02 \text{ g/day}$$

$$\text{Average daily gain: } 0.0 \text{ g/day}$$

$$\text{Total net requirements} = \text{Maintenance} + \text{Gain} = 7.02 + 0 = 7.02 \text{ g/day}$$

$$\text{Dietary requirements} = \text{Total net requirements} / \text{retention coefficient} = 7.02 / 0.678 = 10.35 \text{ g/day}$$

$$\text{Ca:P ratio} = 27.24 / 10.35 = 2.63$$

f) Magnesium requirements

$$\text{Maintenance: } 5.9 \times \text{BW} = 5.9 \times 520 = 3068 \text{ mg} = 3.07 \text{ g/day}$$

$$\text{Average daily gain: } \text{EBG} \times (0.3466 \times \text{EBW}^{0.0113}) = 1.355 \times (0.3466 \times 450.1^{0.0113}) = 0.50 \text{ g/day}$$

$$\text{Total net requirements} = \text{Maintenance} + \text{Gain} = 3.07 + 0.50 = 3.57 \text{ g/day}$$

$$\text{Dietary requirements} = \text{Total net requirements} / \text{retention coefficient} = 3.57 / 0.355 = 10.06 \text{ g/day}$$

g) Sodium requirements

Maintenance: $6.3 \times \text{BW} = 6.3 \times 520 = 3276 \text{ mg} = 3.28 \text{ g/day}$

Average daily gain: $\text{EBG} \times (5.594 \times \text{EBW}^{-0.2998}) = 1.355 \times (5.594 \times 450.1^{-0.2998}) = 1.21 \text{ g/day}$

Total net requirements = Maintenance + Gain = $3.28 + 1.21 = 4.49 \text{ g/day}$

Dietary requirements = Total net requirements/retention coefficient = $4.49/0.371 = 12.10 \text{ g/day}$

h) Potassium requirements

Maintenance: $23.5 \times \text{BW} = 23.5 \times 520 = 12220 \text{ mg} = 12.2 \text{ g/day}$

Average daily gain: $\text{EBG} \times (0.9463 \times \text{EBW}^{0.1216}) = 1.355 \times (0.9463 \times 450.1^{0.1216}) = 2.70 \text{ g/day}$

Total net requirements = Maintenance + Gain = $12.2 + 2.70 = 14.92 \text{ g/day}$

Dietary requirements = Total net requirements/retention coefficient = $14.92/0.484 = 30.82 \text{ g/day}$

i) Sulfur requirements

Maintenance: $10.4 \times \text{BW} = 10.4 \times 520 = 5408 \text{ mg} = 5.41 \text{ g/day}$

Average daily gain: $\text{EBG} \times (0.03 \times \text{EBW}^{0.89}) = 1.355 \times (0.03 \times 450.1^{0.89}) = 9.34 \text{ g/day}$

Total net requirements = Maintenance + Gain = $5.41 + 9.34 = 14.75 \text{ g/day}$

Dietary requirements = Total net requirements/retention coefficient = $14.75/0.773 = 19.08 \text{ g/day}$

j) Copper requirements

Maintenance: $95.6 \times \text{BW} = 95.6 \times 520 = 49712 \text{ } \mu\text{g} = 49.71 \text{ mg/day}$

Average daily gain: $\text{EBG} \times (1.25 \times \text{EBW}^{0.33}) = 1.355 \times (1.25 \times 450.1^{0.33}) = 12.72 \text{ mg/day}$

Total net requirements = Maintenance + Gain = $49.71 + 12.72 = 62.43 \text{ mg/day}$

Dietary requirements = Total net requirements/retention coefficient = $62.43/0.735 = 84.94 \text{ mg/day}$

k) Iron requirements

Maintenance: $2942 \times \text{BW} = 2942 \times 520 = 1529840 \text{ } \mu\text{g} = 1530 \text{ mg/day}$

Average daily gain: $\text{EBG} \times (10.4 \times \text{EBW}^{0.24}) = 1.355 \times (10.4 \times 450.1^{0.24}) = 61.1 \text{ mg/day}$

Total net requirements = Maintenance + Gain = $1530 + 61.1 = 1591 \text{ mg/day}$

Dietary requirements = Total net requirements/retention coefficient = $1591/0.734 = 2167 \text{ mg/day}$

l) Manganese requirements

Maintenance: $184.9 \times \text{BW} = 184.9 \times 520 = 96148 \text{ } \mu\text{g} = 96.15 \text{ mg/day}$

Average daily gain: $\text{EBG} \times (0.07 \times \text{EBW}^{0.80}) = 1.355 \times (0.07 \times 450.1^{0.80}) = 12.58 \text{ mg/day}$

Total net requirements = Maintenance + Gain = $96.15 + 12.58 = 108.73 \text{ mg/day}$

Dietary requirements = Total net requirements/retention coefficient = $108.73/0.439 = 247.67 \text{ mg/day}$

m) Selenium requirements

Maintenance: $3.72 \times \text{BW} = 3.72 \times 520 = 1934 \text{ } \mu\text{g} = 1.93 \text{ mg/day}$

Average daily gain: $\text{EBG} \times (1.07 \times \text{EBW}^{-0.07}) = 1.355 \times (1.07 \times 450.1^{-0.07}) = 0.95 \text{ mg/day}$

Total net requirements = Maintenance + Gain = $1.93 + 0.95 = 2.88 \text{ mg/day}$

Dietary requirements = Total net requirements/retention coefficient = $2.88/0.487 = 5.91 \text{ mg/day}$

n) Zinc requirements

Maintenance: $334.4 \times \text{BW} = 334.4 \times 520 = 173888 \text{ } \mu\text{g} = 173.89 \text{ mg/day}$

Average daily gain: $\text{EBG} \times (1.16 \times \text{EBW}^{0.86}) = 1.355 \times (1.16 \times 450.1^{0.86}) = 300.78 \text{ mg/day}$

Total net requirements = Maintenance + Gain = $173.89 + 300.78 = 474.67 \text{ mg/day}$

Dietary requirements = Total net requirements/retention coefficient = $474.67/0.668 = 710.58 \text{ mg/day}$

o) Cobalt requirements

Maintenance: $13.5 \times \text{BW} = 13.5 \times 520 = 7020 \text{ } \mu\text{g} = 7.02 \text{ mg/day}$

Average daily gain: $\text{EBG} \times (0.045 \times \text{EBW}^{-0.023}) = 1.355 \times (0.045 \times 450.1^{-0.023}) = 0.05 \text{ mg/day}$

Total net requirements = Maintenance + Gain = $7.02 + 0.05 = 7.07 \text{ mg/day}$

Dietary requirements = Total net requirements/retention coefficient = $7.07/0.868 = 8.15 \text{ mg/day}$

p) Chromium requirements

Maintenance: $22.9 \times BW = 22.9 \times 520 = 11908 \mu\text{g} = 11.91 \text{ mg/day}$

Average daily gain: $EBG \times (0.23 \times EBW^{0.61}) = 1.355 \times (0.23 \times 450.1^{0.61}) = 12.95 \text{ mg/day}$

Total net requirements = Maintenance + Gain = $11.91 + 12.95 = 24.86 \text{ mg/day}$

Dietary requirements = Total net requirements/retention coefficient = $24.86/0.784 = 31.71 \text{ mg/day}$

q) Molybdenum requirements

Maintenance: $3.27 \times BW = 3.27 \times 520 = 1700 \mu\text{g} = 1.70 \text{ mg/day}$

Average daily gain: $EBG \times (0.0035 \times EBW^{0.4063}) = 1.355 \times (0.0035 \times 450.1^{0.41}) = 0.06 \text{ mg/day}$

Total net requirements = Maintenance + Gain = $1.70 + 0.06 = 1.76 \text{ mg/day}$

Dietary requirements = Total net requirements/ retention coefficient = $1.76/0.497 = 3.54 \text{ mg/day}$

r) Water intake

For the estimation of water intake, the maximum temperature (T_{MAX}) and the relative humidity (RH) equal to 25.7°C and 65.0% , respectively, were considered.

$$- I_{\text{WATER}} = 9.449 + 0.190 \times BW^{0.75} + 0.271 \times T_{\text{MAX}} - 0.259 \times \text{RH} + 0.489 \times \text{DMI}$$

$$- I_{\text{WATER}} = 9.449 + 0.190 \times 520^{0.75} + 0.271 \times 25.7 - 0.259 \times 65.0 + 0.489 \times 10.62$$

$$- I_{\text{WATER}} = 25.5 \text{ L/day}$$

s) Essential amino acid requirements

Metabolizable arginine requirements for gain: $((30.8 \times EBW^{-0.1631})/k) \times EBG \rightarrow ((30.8 \times 450.1^{-0.1631})/0.56) \times 1.355 \rightarrow 27.52 \text{ g/day}$

Metabolizable histidine requirements for gain: $((3.69 \times EBW^{0.0556})/k) \times EBG \rightarrow ((3.69 \times 450.1^{0.0556})/0.62) \times 1.355 \rightarrow 11.33 \text{ g/day}$

Metabolizable isoleucine requirements for gain: $((9.56 \times EBW^{-0.0631})/k) \times EBG \rightarrow ((9.56 \times 450.1^{-0.0631})/0.30) \times 1.355 \rightarrow 29.37 \text{ g/day}$

Metabolizable Leucine requirements for gain: $((21.5 \times EBW^{-0.0997})/k) \times EBG \rightarrow ((21.5 \times 450.1^{-0.0997})/0.30) \times 1.355 \rightarrow 52.81 \text{ g/day}$

Metabolizable Lysine requirements for gain: $((15.9 \times EBW^{-0.0464})/k) \times EBG \rightarrow ((15.9 \times 450.1^{-0.0464})/0.37) \times 1.355 \rightarrow 43.86 \text{ g/day}$

Metabolizable Methionine requirements for gain: $((5.43 \times EBW^{-0.0803})/k) \times EBG \rightarrow ((5.43 \times 450.1^{-0.0803})/0.58) \times 1.355 \rightarrow 7.77 \text{ g/day}$

Metabolizable Phenylalanine requirements for gain: $((8.98 \times EBW^{-0.0630})/k) \times EBG \rightarrow ((8.98 \times 450.1^{-0.0630})/0.31) \times 1.355 \rightarrow 26.71 \text{ g/day}$

Metabolizable Threonine requirements for gain: $((9.54 \times EBW^{-0.0651})/k) \times EBG \rightarrow ((9.54 \times 450.1^{-0.0651})/0.34) \times 1.355 \rightarrow 25.54 \text{ g/day}$

Metabolizable Tryptophan requirements for gain: $((1.57 \times EBW^{-0.0302})/k) \times EBG \rightarrow ((1.57 \times 450.1^{-0.0302})/0.39) \times 1.355 \rightarrow 4.54 \text{ g/day}$

Metabolizable Valine requirements for gain: $((9.61 \times EBW^{-0.0249})/k) \times EBG \rightarrow ((9.61 \times 450.1^{-0.0249})/0.40) \times 1.355 \rightarrow 27.96 \text{ g/day}$

t) Non-essential amino acid requirements

Metabolizable Alanine requirements for gain: $((34.2 \times EBW^{-0.1885})/k) \times EBG \rightarrow ((34.2 \times 450.1^{-0.1885})/0.35) \times 1.355 \rightarrow 41.86 \text{ g/day}$

Metabolizable Aspartate requirements for gain: $((23.4 \times EBW^{-0.1249})/k) \times EBG \rightarrow ((23.4 \times 450.1^{-0.1249})/0.26) \times 1.355 \rightarrow 56.86 \text{ g/day}$

Metabolizable Cystine requirements for gain: $((1.64 \times EBW^{0.0111})/k) \times EBG \rightarrow ((1.64 \times 450.1^{0.0111})/0.18) \times 1.355 \rightarrow 13.21 \text{ g/day}$

Metabolizable Glutamic acid requirements for gain: $((37.7 \times EBW^{-0.0942})/k) \times EBG \rightarrow ((37.7 \times 450.1^{-0.0942})/0.67) \times 1.355 \rightarrow 42.88 \text{ g/day}$

Metabolizable glycine requirements for gain: $((82.7 \times EBW^{-0.2709})/k) \times EBG \rightarrow ((82.7 \times 450.1^{-0.2709})/0.63) \times 1.355 \rightarrow 33.99 \text{ g/day}$

Metabolizable proline requirements for gain: $((47.7 \times \text{EBW}^{-0.2450})/k) \times \text{EBG} \rightarrow ((47.7 \times 450.1^{-0.2450})/0.43) \times 1.355 \rightarrow 33.65 \text{ g/day}$
 Metabolizable serine requirements for gain: $((16.0 \times \text{EBW}^{-0.1509})/k) \times \text{EBG} \rightarrow ((16.0 \times 450.1^{-0.1509})/0.31) \times 1.355 \rightarrow 27.82 \text{ g/day}$
 Metabolizable tyrosine requirements for gain: $((6.53 \times \text{EBW}^{-0.0526})/k) \times \text{EBG} \rightarrow ((6.53 \times 450.1^{-0.0526})/0.26) \times 1.355 \rightarrow 24.68 \text{ g/day}$

Lactating beef cows

The following information will be considered for calculating the requirements of lactating beef cows: multiparous beef cow, 450 kg body weight, 10th week of lactation, with an average daily gain of 0.2 kg/day

a) Milk yield (MY)

$\text{MY} = 7.996 - 0.101 \times \text{WL} - 7.996 \times \exp^{(-1.447 \times \text{WL})}$
 $\text{MY} = 7.996 - 0.101 \times 10 - 7.996 \times \exp^{(-1.447 \times 10)}$
 $\text{MY} = 6.99 \text{ kg/day}$

b) Dry matter intake

$\text{DMI} = (6.535 - 7.558 \times \exp^{(-0.578 \times \text{WL})} + 0.323 \times \text{WL} + 1.66 \times \text{MY}) \times \text{BW} / 1000$
 $\text{DMI} = (6.535 - 7.558 \times \exp^{(-0.578 \times 10)} + 0.323 \times 10 + 1.66 \times 6.99) \times 450 / 1000$
 $\text{DMI} = 9.60 \text{ kg/day}$

c) Energy requirements

Step 1: EBG calculation

$\text{EBG} = 0.963 \times \text{ADG}^{1.0151} \rightarrow 0.963 \times 0.2^{1.0151} \rightarrow 0.188 \text{ kg/day}$

Step 2: EBW calculation

$\text{SBW} = 0.8915 \times \text{BW}^{1.0151} \rightarrow 0.8915 \times 450^{1.0151} \rightarrow 439.9 \text{ kg}$

$\text{EBW} = 0.8507 \times \text{SBW}^{1.0002} \rightarrow 0.8507 \times 439.9^{1.0002} \rightarrow 374.7 \text{ kg}$

Step 3: NEm calculation

$\text{NEm} = 97.8 \times \text{EBW}^{0.75} \rightarrow 97.8 \times 374.7^{0.75} \rightarrow 8329.4 \text{ kcal/day} \rightarrow 8.33 \text{ Mcal/day}$

Step 4: MEm calculation

$\text{MEm} = 135.0 \times \text{EBW}^{0.75} \rightarrow 135.0 \times 374.7^{0.75} \rightarrow 11497 \text{ kcal/day} \rightarrow 11.5 \text{ Mcal/day}$

Step 5: NEg calculation

$\text{NEg} = 1.0076 \times \text{EBW}^{0.2389} \times \text{EBG} \rightarrow 1.0076 \times 374.7^{0.2389} \times 0.188 \rightarrow 0.78 \text{ Mcal/day}$

Step 6: MEg calculation

$\text{MEg} = \text{NEg}/k_g \rightarrow 0.78/0.44 \rightarrow 1.77 \text{ Mcal/day}$

Step 7: EL_l calculation

$\text{NE}_l = 0.82 \text{ Mcal/kg de Milk} \rightarrow 0.82 \times 6.99 \rightarrow 5.73 \text{ Mcal/day}$

Step 8: ME_l calculation

$\text{ME}_l = \text{EL}_l/k_l \rightarrow 5.73/0.72 \rightarrow 7.96 \text{ Mcal/day}$

Step 9: Met calculation

$\text{MEt} = \text{MEm} + \text{MEg} + \text{ME}_l \rightarrow 11.5 + 1.77 + 7.96 \rightarrow 21.23 \text{ Mcal/day}$

Step 10: DE calculation

$\text{DE} = (((\text{MEt}/\text{DMI}) + 0.3032)/0.9455) \times \text{DMI} \rightarrow (((21.23/9.6) + 0.3032)/0.9455) \times 9.6 \rightarrow 25.53 \text{ Mcal/day}$

Step 11: TDN calculation

$\text{TDN} = \text{DE}/4.4 \rightarrow 25.53/4.4 = 5.80 \text{ kg/day}$

Step 12: % TDN calculation

$\text{TDN (\%)} = \text{TDN} \times 100/\text{DMI} \rightarrow 5.80 \times 100/9.6 \rightarrow 60.4\%$

d) Protein requirements

Step 1: MPm calculation

$$\text{MPm} = 3.9 \times \text{SBW}^{0.75} \rightarrow 3.9 \times 439.9^{0.75} \rightarrow 374.6 \text{ g/day}$$

Step 2: MPg calculation

$$\text{NPg} = 0.3764 \times \text{EBW}^{-0.1839} \times \text{EBG} \rightarrow 0.3764 \times 374.7^{-0.1839} \times 0.188 \rightarrow 0.0238 \text{ kg/day} \rightarrow 23.8 \text{ g/day}$$

$$\text{MPg} = \text{NPg}/k \rightarrow 23.8/0.474 \rightarrow 50.2 \text{ g/day}$$

Step 3: MP_l calculation

$$\text{MP}_l = 50.5 \text{ g/kg Milk} \rightarrow 50.5 \times 6.99 \rightarrow 353 \text{ g/day}$$

Step 4: MP total calculation

$$\text{MPt} = \text{MPm} + \text{MPg} + \text{MP}_l \rightarrow 374.6 + 50.2 + 353 \rightarrow 778.8 \text{ g/day}$$

Step 5: RDP calculation

$$\text{MCP} = -53.07 + 304.89 \times \text{CPI} + 90.79 \times \text{TDNI} - 3.13 \times \text{TDNI}^2 \rightarrow -53.07 + 304.89 \times 1.115 + 90.79 \times 5.8 - 3.13 \times 5.8^2 \rightarrow 708.2 \text{ g/day}$$

$$\text{RDP} = \text{MCP} = 708.2 \text{ g/day}$$

Step 6: RUP calculation

$$\text{RUP} = (\text{MPt} - (\text{MCP} \times 0.64))/0.80 \rightarrow (778.8 - (708.2 \times 0.64))/0.80 \rightarrow 406.9 \text{ g/day}$$

Step 7: CP calculation

$$\text{CP} = \text{RDP} + \text{RUP} \rightarrow 708.2 + 406.9 \rightarrow 1115 \text{ g/day}$$

Step 8: % CP calculation

$$\text{CP} (\%) = \text{CP} \times 100/\text{DMI} \rightarrow 1.115/9.6 \times 100 \rightarrow 11.6\%$$

e) Calcium requirements

$$\text{Maintenance} = 11.7 \times 450/1000 = 5.27 \text{ g/day}$$

$$\text{Gain} = \text{EBG} \times (147 \times \text{EBW}^{-0.50}) = 0.188 \times (147 \times 374.7^{-0.50}) = 1.42 \text{ g/day}$$

$$\text{Lactation} = 1.1 \text{ g/kg Milk} = 1.1 \times 6.99 = 7.68 \text{ g/day}$$

$$\text{Dietary requirements} = (\text{Net Requirements for Maintenance} + \text{Gain} + \text{lactation}) / \text{retention coefficient} \\ = (5.27 + 1.42 + 7.68) / 0.568 = 25.3 \text{ g/day}$$

f) Phosphorus requirements

$$\text{Maintenance} = 13.5 \times 450/1000 = 6.08 \text{ g/day}$$

$$\text{Gain} = \text{EBG} \times (54.4 \times \text{EBW}^{-0.4484}) = 0.188 \times (54.4 \times 374.7^{-0.4484}) = 0.71 \text{ g/day}$$

$$\text{Lactation} = 0.77 \text{ g/kg Milk} = 0.77 \times 6.99 = 5.38 \text{ g/day}$$

$$\text{Dietary requirements} = (\text{Net Requirements for Maintenance} + \text{Gain} + \text{lactation}) / \text{retention coefficient} \\ = (6.08 + 0.72 + 5.38) / 0.678 = 17.95 \text{ g/day}$$

$$\text{Relação Ca:P} = 25.3/17.96 = 1.41$$

g) Magnesium requirements

$$\text{Maintenance} = 5.9 \times 450/1000 = 2.66 \text{ g/day}$$

$$\text{Gain} = \text{EBG} \times (1.4 \times \text{EBW}^{-0.3227}) = 0.188 \times (1.4 \times 374.7^{-0.3227}) = 0.039 \text{ g/day}$$

$$\text{Lactation} = 0.07 \text{ g/kg Milk} = 0.07 \times 6.99 = 0.49 \text{ g/day}$$

$$\text{Dietary requirements} = (\text{Net Requirements for Maintenance} + \text{Gain} + \text{lactation}) / \text{retention coefficient} \\ = (2.66 + 0.039 + 0.49) / 0.355 = 8.97 \text{ g/day}$$

h) Sodium requirements

$$\text{Maintenance} = 6.3 \times 450/1000 = 2.84 \text{ g/day}$$

$$\text{Gain} = \text{EBG} \times (1.4 \times \text{EBW}^{-0.0575}) = 0.188 \times (1.4 \times 374.7^{-0.0575}) = 0.186 \text{ g/day}$$

$$\text{Lactation} = 0.2 \text{ g/kg Milk} = 0.2 \times 6.99 = 1.39 \text{ g/day}$$

$$\text{Dietary requirements} = (\text{Net Requirements for Maintenance} + \text{Gain} + \text{lactation}) / \text{retention coefficient} \\ = (2.84 + 0.186 + 1.39) / 0.371 = 11.9 \text{ g/day}$$

i) Potassium requirements

$$\text{Maintenance} = 23.5 \times 450/1000 = 10.58 \text{ g/day}$$

$$\text{Gain} = \text{EBG} \times (3.1 \times \text{EBW}^{-0.2142}) = 0.188 \times (3.1 \times 374.7^{-0.2142}) = 0.164 \text{ g/day}$$

$$\text{Lactation} = 0.7 \text{ g/kg Milk} = 0.7 \times 6.99 = 4.89 \text{ g/day}$$

Dietary requirements = (Net Requirements for Maintenance + Gain + lactation) / retention coefficient
 = $(10.58 + 0.164 + 4.89) / 0.484 = 32.3$ g/day

j) Sulfur requirements

Maintenance = $10.4 \times 450/1000 = 4.68$ g/day

Gain = $EBG \times (0.03 \times EBW^{0.89}) = 0.188 \times (0.03 \times 374.7^{0.89}) = 1.10$ g/day

Lactation = 0.3 g/kg Milk = $0.3 \times 6.99 = 2.10$ g/day

Dietary requirements = (Net Requirements for Maintenance + Gain + lactation) / retention coefficient
 = $(4.68 + 1.11 + 2.09) / 0.773 = 10.2$ g/day

k) Cobalt requirements

Maintenance = $13.5 \times 450/1000 = 6.08$ mg/day

Gain = $EBG \times (0.045 \times EBW^{0.023}) = 0.188 \times (0.045 \times 374.7^{0.023}) = 0.007$ mg/day

Lactation = 0.23 mg/kg Milk = $0.23 \times 6.99 = 1.608$ mg/day

Dietary requirements = (Net Requirements for Maintenance + Gain + lactation) / retention coefficient
 = $(6.08 + 0.007 + 1.608) / 0.868 = 8.86$ mg/day

l) Copper requirements

Maintenance = $95.6 \times 450/1000 = 43.02$ mg/day

Gain = $EBG \times (1.25 \times EBW^{0.33}) = 0.188 \times (1.25 \times 374.7^{0.33}) = 1.66$ mg/day

Lactation = 1.99 mg/kg Milk = $1.99 \times 6.99 = 13.9$ mg/day

Dietary requirements = (Net Requirements for Maintenance + Gain + lactation) / retention coefficient
 = $(43.02 + 1.66 + 13.9) / 0.735 = 79.7$ mg/day

m) Chromium requirements

Maintenance = $22.9 \times 450/1000 = 10.31$ mg/day

Gain = $EBG \times (0.23 \times EBW^{0.61}) = 0.188 \times (0.23 \times 374.7^{0.61}) = 1.61$ mg/day

Lactation = 3.2 mg/kg Milk = $3.2 \times 6.99 = 22.37$ mg/day

Dietary requirements = (Net Requirements for Maintenance + Gain + lactation) / retention coefficient
 = $(10.31 + 1.61 + 22.37) / 0.784 = 43.7$ mg/day

n) Iron requirements

Maintenance = $2942 \times 450/1000 = 1324$ mg/day

Gain = $EBG \times (10.4 \times EBW^{0.24}) = 0.188 \times (10.4 \times 374.7^{0.24}) = 8.1$ mg/day

Lactation = 29.9 mg/kg Milk = $29.9 \times 6.99 = 208.9$ mg/day

Dietary requirements = (Net Requirements for Maintenance + Gain + lactation) / retention coefficient
 = $(1324 + 8.1 + 208.9) / 0.734 = 2099$ mg/day

o) Manganese requirements

Maintenance = $184.9 \times 450/1000 = 83.21$ mg/day

Gain = $EBG \times (0.07 \times EBW^{0.80}) = 0.188 \times (0.07 \times 374.7^{0.80}) = 1.50$ mg/day

Lactation = 1.41 mg/kg Milk = $1.41 \times 6.99 = 9.85$ mg/day

Dietary requirements = (Net Requirements for Maintenance + Gain + lactation) / retention coefficient
 = $(83.21 + 1.50 + 9.85) / 0.439 = 215.4$ mg/day

p) Zinc requirements

Maintenance = $334.4 \times 450/1000 = 150.5$ mg/day

Gain = $EBG \times (1.16 \times EBW^{0.86}) = 0.188 \times (1.16 \times 374.7^{0.86}) = 35.64$ mg/day

Lactation = 35.4 mg/kg Milk = $35.4 \times 6.99 = 247.44$ mg/day

Dietary requirements = (Net Requirements for Maintenance + Gain + lactation) / retention coefficient
 = $(150.5 + 35.64 + 247.44) / 0.668 = 649$ mg/day

Suckling beef calves

The following informations were considered for calculating the requirements of lactating calves of 150 kg body weight at 10 weeks of age, with an average daily gain of 0.8 kg/day.

a) Dry matter intake

$$\begin{aligned} \text{DMI Milk} &= \text{MY} \times \% \text{ MS Milk} = 6.99 \times 0.139 = 0.97 \text{ kg/day} \\ \text{DMI solids} &= 0.353 - 0.532 \times \text{DMI Milk} + 0.01065 \times \text{BW} + 0.3497 \times \text{ADG} \\ \text{DMI solids} &= 0.353 - 0.532 \times 0.97 + 0.01065 \times 150 + 0.3497 \times 0.80 = 1.71 \text{ kg/day} \\ \text{DMI total} &= \text{DMI solid} + \text{DMI Milk} = 1.71 + 0.97 = 2.68 \text{ kg/day} \\ \text{DMI Milk\%} &= (\text{DMI Milk} / \text{DMI total}) \times 100 = (0.97 / 2.68) \times 100 = 36.19\% \\ \text{DMI solids\%} &= (\text{DMI solids} / \text{DMI total}) \times 100 = (1.71 / 2.68) \times 100 = 63.81\% \\ \text{SBW} &= \text{BW} \\ \text{EBW} &= 0.962 \times \text{SBW} = 0.962 \times 150 = 144.3 \text{ kg} \\ \text{EBG} &= 0.958 \times \text{ADG} = 0.958 \times 0.80 = 0.77 \text{ kg/day} \end{aligned}$$

b) Energy requirements

$$\begin{aligned} \text{NE}_m &= 70.3 \times \text{EBW}^{0.75} = 70.3 \times 144.3^{0.75} = 2.93 \text{ Mcal/day} \\ \text{ME}_m &= 118.6 \times \text{EBW}^{0.75} = 118.6 \times 144.3^{0.75} = 4.94 \text{ Mcal/day} \\ \text{NE}_g &= 0.0932 \times \text{EBW}^{0.75} \times \text{EBG}^{0.9157} = 0.0932 \times 144.3^{0.75} \times 0.77^{0.9157} = 3.04 \text{ Mcal/day} \\ \text{kg} &= (\text{DMI Milk\%} \times 0.69 + \text{DMI solids\%} \times 0.57) / 100 = 36.19 \times 0.69 + 63.81 \times 0.57 = 0.613 \\ \text{ME}_g &= \text{NE}_g / \text{kg} = 3.04 / 0.613 = 4.96 \text{ Mcal/day} \\ \text{ME}_t &= \text{ME}_m + \text{ME}_g = 4.94 + 4.96 = 9.90 \text{ Mcal/day} \\ \text{DE} &= \text{ME}_t / 0.96 = 9.90 / 0.96 = 10.31 \text{ Mcal/day} \\ \text{TDN} &= \text{DE} / 4.4 = 10.31 / 4.4 = 2.34 \text{ kg/day} \\ \text{TDN \%} &= (\text{TDN} / \text{DMI total}) \times 100 = (2.34 / 2.68) \times 100 = 87.26\% \end{aligned}$$

c) Protein requirements

$$\begin{aligned} \text{MP}_m &= 3.9 \times \text{SBW}^{0.75} = 3.9 \times 150^{0.75} = 167.2 \text{ g/day} \\ \text{NP}_g &= 0.1397 \times \text{EBW}^{0.0351} \times \text{EBG} = 0.1397 \times 144.3^{0.0351} \times 0.77 = 0.1275 \text{ kg/day} = 127.5 \text{ g/day} \\ k &= 84.665 - 0.1179 \times \text{EQEBW} = 84.665 - 0.1179 \times 144.3 = 67.7\% \\ \text{MP}_g &= \text{NP}_g / k = 127.5 / 0.677 = 188.4 \text{ g/day} \\ \text{MP}_t &= \text{MP}_m + \text{MP}_g = 167.2 + 188.4 = 355.6 \text{ g/day} \\ \text{CPI Milk} &= \text{MY} \times 0.0356 = 6.99 \times 0.0356 = 0.249 \text{ kg} \\ \text{TDNI Milk} &= \text{MY} \times 0.18 = 6.99 \times 0.18 = 1.258 \text{ kg} \\ \text{MCP} &= -53.07 + 304.9 \times (\text{CPI} - \text{CPI Milk}) + 90.8 \times (\text{TDNI} - \text{TDNI Milk}) - 3.13 \times (\text{TDNI} - \text{TDNI Milk})^2 \\ \text{MCP} &= -53.07 + 304.9 \times (0.466 - 0.249) + 90.8 \times (2.34 - 1.258) - 3.13 \times (2.34 - 1.258)^2 = 107.7 \text{ g/day} \\ \text{RDP} &= \text{MCP} = 107.7 \text{ g/day} \\ \text{RUP} &= (\text{MP}_t - (\text{RDP} \times 0.64)) / 0.80 = (355.6 - (107.7 \times 0.64)) / 0.80 = 358.3 \text{ g/day} \\ \text{CP} &= \text{RDP} + \text{RUP} = 107.7 + 358.3 = 466 \text{ g/day} \\ \text{CP \%} &= (\text{CP} / \text{DMI total}) \times 100 = (0.466 / 2.68) \times 100 = 17.38\% \end{aligned}$$

d) Minerals requirements**Calcium**

$$\begin{aligned} \text{- Net Requirements for Maintenance} &: 11.7 \times 150 / 1000 = 1.76 \text{ g/day} \\ \text{- Net Requirements for Gain} &= \text{EBG} \times (54.8 \times \text{EBW}^{-0.3981}) = 0.77 \times (54.8 \times 144^{-0.3981}) = 5.83 \text{ g/day} \\ \text{- Dietary requirements} &= (\text{Net Requirements for Maintenance} + \text{Gain}) / \text{retention coefficient} = (1.76 + 5.83) / 0.568 = 13.4 \text{ g/day} \end{aligned}$$

Phosphorus

$$\begin{aligned} \text{- Net Requirements for Maintenance} &: 13.5 \times 150 / 1000 = 2.03 \text{ g/day} \\ \text{- Net Requirements for Gain} &= \text{EBG} \times (8.6 \times \text{EBW}^{-0.0371}) = 0.77 \times (8.6 \times 144^{-0.0371}) = 5.51 \text{ g/day} \end{aligned}$$

- Dietary requirements = (Net Requirements for Maintenance + Gain) / retention coefficient = $(2.03 + 5.51) / 0.678 = 11.1$ g/day
- Relação Ca:P = $13.4/11.1 = 1.20$

Magnesium

- Net Requirements for Maintenance: $5.9 \times 150/1000 = 0.89$ g/day
- Net Requirements for Gain = $EBG \times (0.4 \times EBW^{-0.0173}) = 0.77 \times (0.4 \times 144^{-0.0173}) = 0.24$ g/day
- Dietary requirements = (Net Requirements for Maintenance + Gain) / retention coefficient = $(0.89 + 0.24) / 0.355 = 3.18$ g/day

Sodium

- Net Requirements for Maintenance: $6.3 \times 150/1000 = 0.95$ g/day
- Net Requirements for Gain = $EBG \times (1.2 \times EBW^{-0.0209}) = 0.77 \times (1.2 \times 144^{-0.0209}) = 0.83$ g/day
- Dietary requirements = (Net Requirements for Maintenance + Gain) / retention coefficient = $(0.95 + 0.83) / 0.371 = 4.79$ g/day

Potassium

- Net Requirements for Maintenance: $23.5 \times 150/1000 = 3.53$ g/day
- Net Requirements for Gain = $EBG \times (1.5 \times EBW^{-0.0636}) = 0.77 \times (1.5 \times 144^{-0.0636}) = 0.84$ g/day
- Dietary requirements = (Net Requirements for Maintenance + Gain) / retention coefficient = $(3.53 + 0.84) / 0.484 = 9.03$ g/day

TABLES FOR GROWING AND FINISHING BEEF CATTLE

Tables 17.3 to 17.12 present the daily nutritional requirements for growing and finishing beef cattle. The values used for generating the data in these tables included average body weight from 210 to 630 kg and average daily gain from 0.3 to 1.8 kg/day. The nutritional requirement values can be directly used for formulating diets according to the performance levels presented.

It is important to note that the values of amino acid requirements for weight gain of light animals, with body weights of 210 and 270 kg, are not presented in the Tables. This is because the database used to generate the equations did not include these specific weights. Therefore, the use of the models based on these Tables for light animals should not be recommended.

In addition, it is important to note that metabolizable amino acid requirements for maintenance are not included in the amino acid requirement tables. The amino acid requirements for maintenance will be a focus for updates in the next editions of BR-CORTE.

It is emphasized that there is a thesis (Silva et al., 2002. Net amino acid requirements for weight gain of bulls Nellore. *Revista Brasileira de Zootecnia*, 31, 765-775.) published with data on the requirements of metabolizable essential amino acids for maintenance obtained with Nellore cattle.

However, we present in Table 17.12d, the net amino acid requirements calculated using the amino acid composition values of endogenous protein (NRC, 2021: p.79) multiplied by the net protein requirements for maintenance (BR-CORTE, 2023). Considering the difficulty in obtaining data on the utilization efficiency of metabolizable amino acids for maintenance, BR-CORTE (2023) did not calculate the requirements of metabolizable amino acids for maintenance.

Therefore, the committee decided to expect for new information on zebu before making its recommendation on the nutritional requirements of metabolizable amino acids for maintenance.

Table 17.3a - Nutritional requirements of **ZEBU** beef cattle, **BULLS** in **FEEDLOT** system

Average BW kg	ADG kg	DMI kg	Intake of water ¹ , L		Energy			Protein					
			Summer	Winter	ME, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP,%	RDP, % CP	RUP, % CP
210	0.3	3.5	9.0	10.8	8.2	2.2	63.5	249	130	380	10.8	65.6	34.4
	0.8	5.0	9.8	11.5	11.6	3.1	63.3	370	183	553	11.1	66.9	33.1
	1.3	6.0	10.3	12.0	15.1	4.1	68.0	486	240	727	12.1	66.9	33.1
	1.8	6.6	10.5	12.3	18.8	5.0	76.1	596	303	900	13.7	66.3	33.7
270	0.3	4.5	11.7	13.4	9.7	2.7	59.5	303	146	449	10.1	67.4	32.6
	0.8	5.9	12.4	14.1	13.5	3.7	61.9	431	204	635	10.7	67.9	32.1
	1.3	6.9	12.9	14.6	17.4	4.7	67.6	555	267	822	11.8	67.5	32.5
	1.8	7.5	13.2	14.9	21.5	5.7	76.1	671	337	1008	13.4	66.6	33.4
330	0.3	5.4	14.2	15.9	11.1	3.1	57.0	353	163	516	9.6	68.3	31.7
	0.8	6.8	14.9	16.6	15.2	4.2	60.9	490	230	719	10.5	68.1	31.9
	1.3	7.8	15.4	17.1	19.6	5.3	67.3	620	302	922	11.8	67.3	32.7
	1.8	8.4	15.7	17.4	24.1	6.4	76.1	743	382	1125	13.4	66.1	33.9
390	0.3	6.2	16.6	18.3	12.4	3.4	55.4	399	179	578	9.3	69.0	31.0
	0.8	7.7	17.3	19.0	17.0	4.6	60.3	542	250	793	10.3	68.4	31.6
	1.3	8.7	17.8	19.5	21.7	5.9	67.2	678	329	1007	11.6	67.3	32.7
	1.8	9.3	18.1	19.8	26.6	7.1	76.2	804	416	1220	13.2	65.9	34.1
450	0.3	7.1	18.9	20.6	13.7	3.8	54.2	439	189	628	8.9	70.0	30.0
	0.8	8.5	19.6	21.3	18.6	5.1	59.8	584	255	839	9.8	69.6	30.4
	1.3	9.5	20.1	21.8	23.7	6.4	67.1	719	329	1048	11.0	68.6	31.4
	1.8	10.1	20.4	22.1	29.0	7.7	76.4	844	412	1256	12.4	67.2	32.8
510	0.3	7.9	21.1	22.8	15.0	4.2	53.2	478	198	677	8.6	70.7	29.3
	0.8	9.3	21.8	23.5	20.2	5.5	59.4	623	260	883	9.5	70.6	29.4
	1.3	10.3	22.3	24.0	25.7	6.9	67.1	758	330	1088	10.5	69.6	30.4
	1.8	10.9	22.6	24.3	31.4	8.3	76.5	880	411	1291	11.8	68.2	31.8
570	0.3	8.6	23.2	25.0	16.2	4.5	52.5	515	209	724	8.4	71.1	28.9
	0.8	10.1	24.0	25.7	21.8	6.0	59.1	660	266	926	9.2	71.3	28.7
	1.3	11.1	24.4	26.2	27.6	7.5	67.1	793	333	1126	10.1	70.4	29.6
	1.8	11.7	24.7	26.5	33.7	9.0	76.6	913	411	1324	11.3	68.9	31.1
630	0.3	9.4	25.3	27.1	17.4	4.9	51.9	550	219	769	8.2	71.5	28.5
	0.8	10.9	26.0	27.8	23.3	6.4	58.9	695	273	967	8.9	71.8	28.2
	1.3	11.9	26.5	28.3	29.5	8.0	67.1	826	337	1163	9.8	71.0	29.0
	1.8	12.4	26.8	28.6	36.0	9.6	76.8	942	414	1356	10.9	69.5	30.5

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME = metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein. ¹Winter = 22°C of maximum temperature and 65% of relative humidity; Summer = 29°C of maximum temperature and 79% of relative humidity.

Table 17.3b - Minerals requirements for **ZEBU** beef cattle, **BULLS** in a **FEEDLOT** system

Average BW kg	ADG kg	Macrominerals, g							Microminerals, mg							
		Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Mo	Se	Zn
210	0.3	9.84	6.69	1.47	3.78	4.47	11.24	3.93	29.98	3.28	8.09	855.64	91.29	1.40	2.04	147.39
	0.8	19.26	10.96	1.76	4.28	6.02	13.01	5.81	34.52	3.30	11.43	879.40	96.15	1.43	2.78	219.52
	1.3	28.77	15.28	1.88	4.79	7.58	14.81	7.71	39.11	3.32	14.81	903.40	101.05	1.46	3.53	292.38
	1.8	38.34	19.63	1.95	5.30	9.15	16.61	9.63	43.73	3.35	18.20	927.55	105.99	1.48	4.28	365.67
270	0.3	10.41	7.66	1.36	4.78	5.42	14.18	5.02	38.02	4.21	10.18	1097.02	117.22	1.80	2.49	187.95
	0.8	18.68	11.55	1.62	5.28	6.85	16.02	7.39	42.97	4.23	14.09	1122.30	123.19	1.83	3.22	278.03
	1.3	27.04	15.49	1.75	5.79	8.30	17.87	9.79	47.97	4.26	18.04	1147.84	129.22	1.86	3.95	369.04
	1.8	35.45	19.45	1.82	6.30	9.75	19.73	12.19	53.00	4.28	22.01	1173.54	135.29	1.89	4.69	460.58
330	0.3	11.17	8.69	1.29	5.78	6.39	17.12	6.11	46.03	5.15	12.24	1338.27	143.12	2.19	2.94	228.24
	0.8	18.63	12.31	1.51	6.28	7.74	19.00	8.96	51.33	5.17	16.67	1364.83	150.16	2.23	3.66	335.82
	1.3	26.17	15.96	1.64	6.79	9.10	20.90	11.83	56.68	5.19	21.15	1391.67	157.27	2.26	4.38	444.51
	1.8	33.75	19.63	1.72	7.30	10.46	22.81	14.73	62.06	5.21	25.66	1418.66	164.43	2.30	5.11	553.84
390	0.3	12.05	9.76	1.23	6.78	7.37	20.06	7.19	54.01	6.08	14.28	1579.41	169.00	2.59	3.39	268.32
	0.8	18.89	13.16	1.44	7.28	8.65	21.98	10.51	59.62	6.10	19.20	1607.09	177.08	2.62	4.10	393.04
	1.3	25.81	16.59	1.56	7.79	9.94	23.92	13.86	65.28	6.12	24.18	1635.06	185.24	2.66	4.82	519.03
	1.8	32.77	20.05	1.63	8.31	11.24	25.87	17.23	70.98	6.14	29.19	1663.20	193.45	2.70	5.54	645.77
450	0.3	13.00	10.85	1.20	7.78	8.36	22.99	8.27	61.98	7.01	16.30	1820.48	194.86	2.98	3.85	308.22
	0.8	19.36	14.07	1.38	8.28	9.58	24.95	12.05	67.87	7.03	21.69	1849.16	203.95	3.02	4.55	449.77
	1.3	25.79	17.33	1.49	8.79	10.82	26.92	15.88	73.81	7.06	27.13	1878.14	213.13	3.06	5.26	592.76
	1.8	32.25	20.61	1.57	9.31	12.06	28.91	19.72	79.79	7.08	32.61	1907.28	222.37	3.10	5.97	736.61
510	0.3	14.00	11.96	1.17	8.77	9.35	25.93	9.35	69.93	7.94	18.31	2061.50	220.71	3.38	4.30	347.97
	0.8	19.97	15.04	1.33	9.28	10.53	27.91	13.59	76.08	7.97	24.14	2091.08	230.78	3.42	5.00	506.09
	1.3	25.99	18.15	1.43	9.79	11.71	29.92	17.88	82.28	7.99	30.03	2120.96	240.96	3.46	5.70	665.83
	1.8	32.05	21.27	1.51	10.31	12.91	31.93	22.19	88.52	8.01	35.95	2151.02	251.20	3.51	6.40	826.52
570	0.3	11.74	11.35	1.03	9.77	10.35	28.86	10.42	77.88	8.88	20.31	2302.48	246.55	3.78	4.76	387.58
	0.8	11.74	11.35	1.03	10.28	11.48	30.87	15.12	84.25	8.90	26.56	2332.88	257.59	3.82	5.45	562.06
	1.3	11.74	11.35	1.03	10.79	12.63	32.90	19.86	90.70	8.92	32.88	2363.59	268.74	3.86	6.14	738.32
	1.8	11.74	11.35	1.03	11.30	13.78	34.95	24.64	97.18	8.94	39.23	2394.49	279.96	3.91	6.84	915.63
630	0.3	12.98	12.54	1.03	10.77	11.34	31.78	11.49	85.81	9.81	22.30	2543.41	272.37	4.17	5.21	427.09
	0.8	12.98	12.54	1.03	11.28	12.45	33.82	16.64	92.41	9.83	28.96	2574.58	284.36	4.22	5.90	617.71
	1.3	12.98	12.54	1.03	11.79	13.56	35.88	21.84	99.07	9.85	35.68	2606.06	296.47	4.26	6.59	810.29
	1.8	12.98	12.54	1.03	12.30	14.68	37.95	27.07	105.78	9.88	42.44	2637.73	308.66	4.31	7.28	1004.01

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.3c - Metabolizable amino acids requirements for **ZEBU** beef cattle, **BULLS** in a **FEEDLOT** system

Average BW kg	ADG kg	Essentials, g										Non-Essentials, g							
		Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr
330	0.3	6.22	2.31	6.33	11.58	9.38	1.69	5.76	5.51	0.96	5.92	9.57	12.62	8.08	9.38	8.08	7.90	6.25	5.30
	0.8	16.83	6.25	17.14	31.35	25.40	4.57	15.59	14.92	2.61	16.03	25.90	34.16	21.86	25.39	21.86	21.38	16.92	14.33
	1.3	27.54	10.24	28.06	51.33	41.57	7.48	25.52	24.43	4.27	26.24	42.40	55.91	35.79	41.57	35.79	35.00	27.69	23.46
	1.8	38.33	14.24	39.04	71.42	57.84	10.41	35.51	33.99	5.94	36.51	59.00	77.80	49.79	57.84	49.79	48.70	38.53	32.64
390	0.3	6.05	2.33	6.26	11.39	9.31	1.67	5.70	5.45	0.96	5.90	9.27	12.35	7.71	9.23	7.71	7.57	6.09	5.25
	0.8	16.36	6.31	16.95	30.82	25.19	4.51	15.42	14.76	2.59	15.96	25.08	33.43	20.87	24.99	20.87	20.50	16.48	14.20
	1.3	26.78	10.33	27.75	50.45	41.24	7.38	25.24	24.15	4.24	26.13	41.05	54.73	34.16	40.90	34.16	33.56	26.98	23.25
	1.8	37.27	14.38	38.62	70.20	57.39	10.27	35.12	33.61	5.91	36.35	57.12	76.15	47.53	56.91	47.53	46.69	37.54	32.35
450	0.3	5.90	2.35	6.21	11.22	9.25	1.65	5.65	5.40	0.95	5.88	9.01	12.13	7.41	9.10	7.41	7.31	5.96	5.21
	0.8	15.97	6.37	16.80	30.37	25.02	4.45	15.28	14.61	2.58	15.90	24.39	32.82	20.05	24.64	20.05	19.77	16.12	14.09
	1.3	26.15	10.42	27.50	49.72	40.96	7.29	25.01	23.92	4.23	26.03	39.93	53.73	32.82	40.34	32.82	32.37	26.39	23.07
	1.8	36.38	14.50	38.26	69.18	56.99	10.15	34.80	33.29	5.88	36.22	55.56	74.76	45.67	56.13	45.67	45.04	36.72	32.10
510	0.3	5.78	2.37	6.16	11.08	9.19	1.63	5.60	5.35	0.95	5.86	8.80	11.93	7.15	8.99	7.15	7.08	5.84	5.17
	0.8	15.64	6.41	16.66	29.98	24.87	4.41	15.16	14.49	2.57	15.85	23.81	32.30	19.36	24.34	19.36	19.16	15.81	14.00
	1.3	25.60	10.49	27.27	49.08	40.72	7.22	24.81	23.72	4.21	25.95	38.97	52.87	31.70	39.85	31.70	31.36	25.88	22.92
	1.8	35.63	14.60	37.95	68.30	56.66	10.04	34.52	33.01	5.86	36.10	54.23	73.57	44.11	55.45	44.11	43.64	36.01	31.89
570	0.3	5.67	2.38	6.11	10.95	9.14	1.61	5.56	5.32	0.95	5.84	8.61	11.76	6.94	8.90	6.94	6.88	5.74	5.14
	0.8	15.35	6.45	16.54	29.64	24.74	4.37	15.05	14.39	2.56	15.81	23.30	31.84	18.77	24.08	18.77	18.63	15.54	13.91
	1.3	25.13	10.56	27.08	48.53	40.50	7.15	24.63	23.55	4.20	25.87	38.14	52.12	30.73	39.42	30.73	30.50	25.44	22.78
	1.8	34.97	14.70	37.68	67.52	56.36	9.95	34.27	32.77	5.84	36.00	53.07	72.52	42.76	54.86	42.76	42.43	35.39	31.69
630	0.3	5.58	2.40	6.07	10.84	9.10	1.60	5.52	5.28	0.94	5.83	8.44	11.61	6.75	8.81	6.75	6.71	5.65	5.11
	0.8	15.10	6.49	16.43	29.34	24.62	4.33	14.95	14.29	2.55	15.77	22.85	31.43	18.26	23.85	18.26	18.17	15.30	13.84
	1.3	24.71	10.62	26.90	48.03	40.31	7.09	24.47	23.39	4.18	25.81	37.41	51.46	29.89	39.04	29.89	29.74	25.05	22.65
	1.8	34.39	14.78	37.43	66.83	56.09	9.87	34.05	32.55	5.82	35.91	52.05	71.60	41.58	54.33	41.58	41.38	34.85	31.52

*BW = body weight; ADG = average daily gain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine.

Table 17.4a - Nutritional requirements of **ZEBU** beef cattle, **STEERS** in **FEEDLOT** system

Average BW kg	ADG kg	DMI kg	Intake of water ¹ , L		Energy			Protein					
			Summer	Winter	ME, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
210	0.3	3.5	9.0	10.8	8.3	2.2	64.0	252	132	385	11.0	65.6	34.4
	0.8	5.0	9.8	11.5	12.0	3.2	65.1	381	186	566	11.4	67.2	32.8
	1.3	6.0	10.3	12.0	15.8	4.2	70.7	503	245	748	12.5	67.3	32.7
	1.8	6.6	10.5	12.3	19.8	5.2	79.8	619	310	929	14.2	66.7	33.3
270	0.3	4.5	11.7	13.4	9.9	2.7	60.4	308	149	457	10.3	67.4	32.6
	0.8	5.9	12.4	14.1	14.0	3.8	64.2	448	211	658	11.1	68.0	32.0
	1.3	6.9	12.9	14.6	18.4	4.9	70.9	580	279	859	12.4	67.5	32.5
	1.8	7.5	13.2	14.9	22.9	6.0	80.5	704	355	1059	14.1	66.5	33.5
330	0.3	5.4	14.2	15.9	11.4	3.1	58.3	362	169	531	9.9	68.2	31.8
	0.8	6.8	14.9	16.6	16.0	4.3	63.6	514	245	759	11.1	67.7	32.3
	1.3	7.8	15.4	17.1	20.9	5.6	71.2	657	329	986	12.6	66.7	33.3
	1.8	8.4	15.7	17.4	25.9	6.8	81.2	791	421	1212	14.4	65.3	34.7
390	0.3	6.2	16.6	18.3	12.8	3.5	56.9	405	171	576	9.3	70.3	29.7
	0.8	7.7	17.3	19.0	17.9	4.9	63.3	554	231	786	10.2	70.6	29.4
	1.3	8.7	17.8	19.5	23.3	6.2	71.5	694	300	995	11.4	69.8	30.2
	1.8	9.3	18.1	19.8	28.8	7.6	81.9	822	379	1202	13.0	68.4	31.6
450	0.3	7.1	18.9	20.6	14.3	3.9	55.9	447	179	626	8.9	71.4	28.6
	0.8	8.5	19.6	21.3	19.8	5.4	63.1	598	233	831	9.7	72.0	28.0
	1.3	9.5	20.1	21.8	25.6	6.9	71.8	737	296	1034	10.8	71.3	28.7
	1.8	10.1	20.4	22.1	31.6	8.3	82.5	863	372	1234	12.2	69.9	30.1
510	0.3	7.9	21.1	22.8	15.6	4.3	55.2	487	187	674	8.6	72.3	27.7
	0.8	9.3	21.8	23.5	21.6	5.9	63.0	639	235	874	9.4	73.1	26.9
	1.3	10.3	22.3	24.0	27.9	7.5	72.2	777	294	1071	10.4	72.5	27.5
	1.8	10.9	22.6	24.3	34.4	9.1	83.1	898	367	1265	11.6	71.0	29.0
570	0.3	8.6	23.2	25.0	17.0	4.7	54.6	525	195	721	8.4	72.9	27.1
	0.8	10.1	24.0	25.7	23.4	6.4	63.0	677	238	915	9.1	74.0	26.0
	1.3	11.1	24.4	26.2	30.1	8.1	72.5	813	294	1107	10.0	73.4	26.6
	1.8	11.7	24.7	26.5	37.1	9.8	83.6	930	365	1295	11.1	71.8	28.2
630	0.3	9.4	25.3	27.1	18.3	5.1	54.2	562	205	766	8.2	73.3	26.7
	0.8	10.9	26.0	27.8	25.2	6.8	63.0	713	243	955	8.8	74.6	25.4
	1.3	11.9	26.5	28.3	32.3	8.6	72.7	846	296	1141	9.6	74.1	25.9
	1.8	12.4	26.8	28.6	39.8	10.5	84.1	958	365	1323	10.6	72.4	27.6

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME = metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein. ¹Winter = 22°C of maximum temperature and 65% of relative humidity; Summer = 29°C of maximum temperature and 79% of relative humidity.

Table 17.4b - Minerals requirements for **ZEBU** beef cattle **STEERS**, in a **FEEDLOT** system

Average BW kg	ADG kg	Macrominerals, g							Microminerals, mg							
		Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Mo	Se	Zn
210	0.3	9.88	6.70	1.47	3.78	4.48	11.24	3.92	29.97	3.28	8.08	855.60	91.27	1.40	2.04	146.95
	0.8	19.35	10.99	1.76	4.28	6.03	13.01	5.78	34.49	3.30	11.39	879.29	96.07	1.43	2.78	218.33
	1.3	28.92	15.33	1.89	4.79	7.60	14.80	7.66	39.07	3.32	14.74	903.23	100.93	1.46	3.53	290.44
	1.8	38.54	19.69	1.96	5.30	9.17	16.60	9.55	43.67	3.35	18.11	927.30	105.82	1.48	4.28	362.98
270	0.3	10.41	7.66	1.36	4.78	5.42	14.18	5.02	38.02	4.21	10.18	1097.02	117.22	1.80	2.49	187.95
	0.8	18.68	11.55	1.62	5.28	6.85	16.02	7.39	42.97	4.23	14.09	1122.30	123.19	1.83	3.22	278.03
	1.3	27.04	15.49	1.75	5.79	8.30	17.87	9.79	47.97	4.26	18.04	1147.84	129.22	1.86	3.95	369.04
	1.8	35.45	19.45	1.82	6.30	9.75	19.73	12.19	53.00	4.28	22.01	1173.54	135.29	1.89	4.69	460.58
330	0.3	11.15	8.68	1.28	5.78	6.39	17.13	6.12	46.04	5.15	12.25	1338.30	143.15	2.19	2.94	228.77
	0.8	18.58	12.29	1.51	6.28	7.73	19.01	9.00	51.35	5.17	16.72	1364.93	150.25	2.23	3.66	337.25
	1.3	26.08	15.93	1.64	6.79	9.09	20.91	11.90	56.72	5.19	21.22	1391.83	157.41	2.26	4.38	446.84
	1.8	33.62	19.59	1.72	7.30	10.45	22.82	14.82	62.12	5.21	25.76	1418.89	164.63	2.30	5.11	557.08
390	0.3	12.01	9.74	1.23	6.78	7.37	20.06	7.22	54.03	6.08	14.31	1579.48	169.06	2.59	3.39	269.44
	0.8	18.80	13.12	1.43	7.28	8.64	21.99	10.59	59.67	6.10	19.29	1607.28	177.26	2.63	4.10	396.07
	1.3	25.65	16.53	1.55	7.79	9.92	23.93	14.00	65.37	6.12	24.32	1635.37	185.54	2.66	4.82	523.99
	1.8	32.55	19.97	1.63	8.31	11.21	25.88	17.43	71.10	6.14	29.38	1663.62	193.87	2.70	5.53	652.68
450	0.3	12.95	10.83	1.20	7.78	8.35	23.00	8.32	62.01	7.01	16.35	1820.58	194.97	2.98	3.85	309.99
	0.8	19.24	14.03	1.37	8.28	9.57	24.96	12.19	67.94	7.03	21.82	1849.43	204.24	3.02	4.55	454.56
	1.3	25.58	17.26	1.48	8.79	10.79	26.94	16.09	73.94	7.06	27.35	1878.58	213.60	3.06	5.25	600.61
	1.8	31.97	20.50	1.56	9.31	12.02	28.93	20.02	79.97	7.08	32.90	1907.90	223.02	3.10	5.96	747.54
510	0.3	13.95	10.15	1.37	8.77	9.34	25.93	9.42	69.97	7.94	18.38	2061.63	220.85	3.38	4.30	350.44
	0.8	19.82	10.15	1.95	9.28	10.51	27.92	13.78	76.17	7.97	24.32	2091.43	231.18	3.42	4.99	512.78
	1.3	25.76	10.15	2.54	9.79	11.69	29.93	18.18	82.44	7.99	30.31	2121.53	241.61	3.46	5.69	676.78
	1.8	31.73	10.15	3.12	10.31	12.87	31.96	22.61	88.75	8.01	36.35	2151.81	252.10	3.51	6.40	841.76
570	0.3	11.74	11.35	1.03	9.77	10.34	28.86	10.51	77.92	8.88	20.39	2302.63	246.73	3.78	4.76	390.80
	0.8	11.74	11.35	1.03	10.28	11.46	30.88	15.36	84.38	8.90	26.78	2333.30	258.10	3.82	5.44	570.75
	1.3	11.74	11.35	1.03	10.79	12.60	32.92	20.26	90.90	8.92	33.24	2364.28	269.58	3.86	6.14	752.54
	1.8	11.74	11.35	1.03	11.31	13.74	34.98	25.19	97.45	8.94	39.73	2395.44	281.13	3.91	6.84	935.42
630	0.3	12.98	12.54	1.03	10.77	11.34	31.79	11.60	85.86	9.81	22.40	2543.59	272.61	4.17	5.21	431.07
	0.8	12.98	12.54	1.03	11.28	12.42	33.84	16.94	92.55	9.83	29.22	2575.06	284.99	4.22	5.89	628.50
	1.3	12.98	12.54	1.03	11.79	13.52	35.91	22.33	99.31	9.85	36.12	2606.85	297.51	4.26	6.58	827.95
	1.8	12.98	12.54	1.03	12.30	14.63	37.99	27.76	106.10	9.88	43.05	2638.84	310.09	4.31	7.28	1028.59

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.4c - Metabolizable amino acids requirements for **ZEBU** beef cattle, **STEERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Essentials, g										Non-Essentials, g								
		Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr	
330	0.3	6.21	2.31	6.33	11.57	9.38	1.69	5.76	5.51	0.96	5.92	9.55	12.61	8.06	9.37	8.06	7.88	6.24	5.29	
	0.8	16.80	6.26	17.13	31.32	25.38	4.57	15.58	14.91	2.61	16.03	25.86	34.12	21.80	25.37	21.80	21.33	16.89	14.33	
	1.3	27.50	10.24	28.04	51.28	41.55	7.47	25.50	24.41	4.27	26.23	42.33	55.85	35.69	41.53	35.69	34.92	27.65	23.45	
	1.8	38.27	14.25	39.01	71.35	57.82	10.40	35.49	33.97	5.94	36.50	58.89	77.71	49.66	57.79	49.66	48.58	38.47	32.63	
390	0.3	6.03	2.34	6.26	11.37	9.30	1.66	5.69	5.45	0.96	5.89	9.24	12.33	7.67	9.22	7.67	7.54	6.07	5.24	
	0.8	16.31	6.32	16.94	30.77	25.17	4.50	15.40	14.74	2.59	15.95	24.99	33.36	20.77	24.94	20.77	20.41	16.44	14.19	
	1.3	26.71	10.34	27.72	50.36	41.21	7.37	25.22	24.13	4.24	26.12	40.91	54.60	33.99	40.83	33.99	33.41	26.91	23.23	
	1.8	37.16	14.39	38.57	70.08	57.34	10.25	35.09	33.57	5.90	36.34	56.93	75.98	47.30	56.82	47.30	46.49	37.44	32.32	
450	0.3	5.88	2.36	6.20	11.19	9.23	1.64	5.64	5.39	0.95	5.87	8.97	12.09	7.36	9.08	7.36	7.26	5.93	5.20	
	0.8	15.91	6.37	16.77	30.30	24.99	4.45	15.25	14.59	2.58	15.89	24.28	32.72	19.92	24.58	19.92	19.65	16.06	14.08	
	1.3	26.04	10.43	27.45	49.60	40.91	7.28	24.97	23.89	4.22	26.02	39.74	53.56	32.61	40.24	32.61	32.17	26.29	23.04	
	1.8	36.24	14.52	38.20	69.01	56.93	10.13	34.75	33.24	5.88	36.20	55.30	74.53	45.37	56.00	45.37	44.77	36.58	32.06	
510	0.3	5.75	2.37	6.14	11.05	9.18	1.62	5.59	5.34	0.95	5.85	8.75	11.89	7.10	8.97	7.10	7.03	5.81	5.16	
	0.8	15.56	6.42	16.63	29.89	24.84	4.40	15.13	14.46	2.57	15.84	23.67	32.18	19.20	24.27	19.20	19.02	15.74	13.98	
	1.3	25.48	10.51	27.22	48.93	40.66	7.20	24.76	23.68	4.21	25.93	38.75	52.67	31.44	39.74	31.44	31.13	25.76	22.88	
	1.8	35.45	14.63	37.88	68.09	56.57	10.02	34.45	32.95	5.85	36.08	53.91	73.29	43.74	55.29	43.74	43.31	35.85	31.83	
570	0.3	5.64	2.39	6.10	10.91	9.13	1.61	5.55	5.30	0.95	5.83	8.55	11.71	6.87	8.87	6.87	6.82	5.71	5.13	
	0.8	15.26	6.46	16.50	29.54	24.70	4.36	15.01	14.35	2.56	15.79	23.14	31.70	18.59	24.00	18.59	18.47	15.46	13.89	
	1.3	24.98	10.58	27.02	48.35	40.43	7.13	24.57	23.49	4.19	25.85	37.88	51.89	30.43	39.29	30.43	30.23	25.30	22.73	
	1.8	34.76	14.73	37.59	67.28	56.26	9.92	34.19	32.69	5.83	35.97	52.71	72.20	42.34	54.67	42.34	42.06	35.20	31.63	
630	0.3	5.54	2.40	6.06	10.80	9.08	1.60	5.51	5.27	0.94	5.82	8.38	11.56	6.67	8.78	6.67	6.65	5.62	5.10	
	0.8	15.00	6.50	16.39	29.22	24.58	4.32	14.91	14.25	2.55	15.75	22.68	31.27	18.06	23.76	18.06	17.98	15.21	13.81	
	1.3	24.55	10.65	26.83	47.84	40.23	7.07	24.41	23.33	4.18	25.78	37.12	51.19	29.56	38.89	29.56	29.44	24.89	22.61	
	1.8	34.16	14.81	37.34	66.56	55.98	9.83	33.96	32.46	5.81	35.87	51.65	71.23	41.13	54.12	41.13	40.96	34.64	31.45	

*BW = body weight; ADG = average daily gain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine.

Table 17.5a - Nutritional requirements of **ZEBU** beef cattle, **HEIFERS** in **FEEDLOT** system

Average BW kg	ADG kg	DMI kg	Intake of water ¹ , L		Energy			Protein					
			Summer	Winter	ME, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
210	0.3	3.5	9.0	10.8	8.4	2.3	64.9	255	133	388	11.1	65.8	34.2
	0.8	5.0	9.8	11.5	12.2	3.3	66.5	388	187	575	11.6	67.5	32.5
	1.3	6.0	10.3	12.0	16.3	4.3	72.5	515	247	762	12.7	67.6	32.4
	1.8	6.6	10.5	12.3	20.4	5.4	82.1	634	314	948	14.5	66.9	33.1
270	0.3	4.5	11.7	13.4	10.0	2.7	61.3	313	150	463	10.4	67.6	32.4
	0.8	5.9	12.4	14.1	14.4	3.9	65.6	458	215	673	11.4	68.0	32.0
	1.3	6.9	12.9	14.6	19.0	5.1	72.9	596	288	883	12.7	67.4	32.6
	1.8	7.5	13.2	14.9	23.7	6.2	83.1	725	368	1092	14.5	66.3	33.7
330	0.3	5.4	14.2	15.9	11.6	3.2	59.2	368	172	541	10.1	68.1	31.9
	0.8	6.8	14.9	16.6	16.5	4.5	65.2	528	256	785	11.5	67.3	32.7
	1.3	7.8	15.4	17.1	21.6	5.8	73.4	679	349	1028	13.1	66.1	33.9
	1.8	8.4	15.7	17.4	26.8	7.1	84.0	819	450	1270	15.1	64.5	35.5
390	0.3	6.2	16.6	18.3	13.1	3.6	57.8	408	166	575	9.2	71.0	29.0
	0.8	7.7	17.3	19.0	18.5	5.0	65.0	561	221	782	10.2	71.7	28.3
	1.3	8.7	17.8	19.5	24.1	6.4	73.8	703	286	988	11.3	71.1	28.9
	1.8	9.3	18.1	19.8	29.9	7.9	84.8	831	361	1192	12.9	69.7	30.3
450	0.3	7.1	18.9	20.6	14.5	4.0	56.9	451	173	625	8.9	72.2	27.8
	0.8	8.5	19.6	21.3	20.4	5.5	64.8	605	222	827	9.7	73.2	26.8
	1.3	9.5	20.1	21.8	26.6	7.1	74.2	746	281	1026	10.8	72.7	27.3
	1.8	10.1	20.4	22.1	32.9	8.7	85.6	871	352	1223	12.1	71.2	28.8
510	0.3	7.9	21.1	22.8	16.0	4.4	56.2	492	181	673	8.6	73.1	26.9
	0.8	9.3	21.8	23.5	22.3	6.0	64.8	646	223	869	9.3	74.3	25.7
	1.3	10.3	22.3	24.0	29.0	7.7	74.6	785	278	1063	10.3	73.9	26.1
	1.8	10.9	22.6	24.3	35.9	9.4	86.3	906	347	1253	11.5	72.3	27.7
570	0.3	8.6	23.2	25.0	17.4	4.8	55.6	530	189	719	8.3	73.7	26.3
	0.8	10.1	24.0	25.7	24.2	6.5	64.8	685	226	910	9.0	75.2	24.8
	1.3	11.1	24.4	26.2	31.3	8.3	75.0	821	276	1097	9.9	74.8	25.2
	1.8	11.7	24.7	26.5	38.7	10.2	87.0	937	344	1281	11.0	73.1	26.9
630	0.3	9.4	25.3	27.1	18.7	5.2	55.2	567	198	765	8.1	74.1	25.9
	0.8	10.9	26.0	27.8	26.0	7.0	64.8	721	229	950	8.7	75.9	24.1
	1.3	11.9	26.5	28.3	33.6	9.0	75.4	854	277	1131	9.5	75.5	24.5
	1.8	12.4	26.8	28.6	41.6	10.9	87.6	963	344	1307	10.5	73.7	26.3

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME = metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein. ¹Winter = 22°C of maximum temperature and 65% of relative humidity; Summer = 29°C of maximum temperature and 79% of relative humidity.

Table 17.5b - Minerals requirements for **ZEBU** beef cattle, **HEIFERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Macrominerals, g							Microminerals, mg							
		Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Mo	Se	Zn
210	0.3	9.85	6.69	1.47	3.78	4.47	11.24	3.93	29.98	3.28	8.09	855.63	91.29	1.40	2.04	147.32
	0.8	19.27	10.97	1.76	4.28	6.02	13.01	5.81	34.52	3.30	11.43	879.38	96.14	1.43	2.78	219.32
	1.3	28.79	15.29	1.88	4.79	7.58	14.81	7.70	39.10	3.32	14.80	903.37	101.03	1.46	3.53	292.06
	1.8	38.37	19.64	1.95	5.30	9.16	16.61	9.61	43.72	3.35	18.19	927.51	105.96	1.48	4.28	365.24
270	0.3	10.38	7.65	1.36	4.78	5.42	14.19	5.04	38.03	4.21	10.19	1097.06	117.25	1.80	2.49	188.48
	0.8	18.61	11.53	1.61	5.28	6.85	16.02	7.43	43.00	4.23	14.13	1122.42	123.28	1.83	3.21	279.47
	1.3	26.92	15.45	1.74	5.79	8.29	17.88	9.85	48.02	4.26	18.11	1148.03	129.36	1.86	3.95	371.39
	1.8	35.28	19.39	1.82	6.30	9.74	19.74	12.28	53.07	4.28	22.11	1173.79	135.49	1.89	4.69	463.86
330	0.3	11.12	8.67	1.28	5.78	6.39	17.13	6.14	46.05	5.15	12.27	1338.35	143.19	2.19	2.94	229.47
	0.8	18.50	12.26	1.51	6.28	7.72	19.01	9.05	51.39	5.17	16.77	1365.06	150.36	2.23	3.66	339.16
	1.3	25.95	15.88	1.63	6.79	9.07	20.92	11.98	56.78	5.19	21.31	1392.04	157.61	2.26	4.38	449.96
	1.8	33.45	19.53	1.71	7.30	10.43	22.83	14.94	62.20	5.21	25.88	1419.18	164.89	2.30	5.11	561.43
390	0.3	11.98	9.74	1.23	6.78	7.36	20.06	7.25	54.05	6.08	14.33	1579.53	169.12	2.59	3.39	270.33
	0.8	18.72	13.10	1.43	7.28	8.63	21.99	10.66	59.71	6.10	19.36	1607.43	177.40	2.63	4.10	398.47
	1.3	25.53	16.49	1.55	7.79	9.91	23.94	14.11	65.44	6.12	24.43	1635.61	185.77	2.66	4.81	527.93
	1.8	32.38	19.91	1.63	8.31	11.19	25.90	17.58	71.19	6.14	29.53	1663.96	194.20	2.70	5.53	658.16
450	0.3	12.92	10.82	1.19	7.78	8.35	23.00	8.35	62.03	7.01	16.38	1820.64	195.03	2.98	3.85	311.07
	0.8	19.16	14.00	1.37	8.28	9.56	24.96	12.27	67.99	7.03	21.90	1849.60	204.41	3.02	4.55	457.48
	1.3	25.46	17.21	1.48	8.79	10.78	26.95	16.23	74.01	7.06	27.47	1878.84	213.88	3.06	5.25	605.39
	1.8	31.80	20.44	1.56	9.31	12.01	28.94	20.21	80.07	7.08	33.08	1908.26	223.42	3.10	5.96	754.18
510	0.3	13.92	10.15	1.37	8.77	9.34	25.93	9.45	69.99	7.94	18.41	2061.70	220.93	3.38	4.30	351.71
	0.8	19.75	10.15	1.94	9.28	10.50	27.93	13.87	76.22	7.97	24.40	2091.60	231.38	3.42	4.99	516.22
	1.3	25.64	10.15	2.52	9.79	11.67	29.94	18.34	82.52	7.99	30.46	2121.82	241.94	3.47	5.69	682.41
	1.8	31.56	10.15	3.11	10.31	12.85	31.97	22.83	88.86	8.01	36.55	2152.21	252.57	3.51	6.40	849.60
570	0.3	11.74	11.35	1.03	9.77	10.33	28.86	10.55	77.94	8.88	20.43	2302.70	246.82	3.78	4.76	392.27
	0.8	11.74	11.35	1.03	10.28	11.45	30.89	15.47	84.43	8.90	26.88	2333.49	258.33	3.82	5.44	574.73
	1.3	11.74	11.35	1.03	10.79	12.58	32.93	20.44	90.98	8.92	33.40	2364.59	269.96	3.87	6.14	759.06
	1.8	11.74	11.35	1.03	11.31	13.72	34.99	25.44	97.58	8.94	39.96	2395.87	281.66	3.91	6.83	944.49
630	0.3	12.98	12.54	1.03	10.77	11.33	31.79	11.65	85.88	9.81	22.44	2543.67	272.70	4.17	5.21	432.75
	0.8	12.98	12.54	1.03	11.28	12.42	33.84	17.07	92.61	9.83	29.33	2575.26	285.26	4.22	5.89	633.03
	1.3	12.98	12.54	1.03	11.79	13.51	35.92	22.54	99.40	9.85	36.30	2607.18	297.94	4.27	6.58	835.37
	1.8	12.98	12.54	1.03	12.31	14.61	38.00	28.05	106.24	9.88	43.30	2639.29	310.70	4.31	7.27	1038.91

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.5c - Metabolizable amino acids requirements for **ZEBU** beef cattle, **HEIFERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Essentials, g										Non-Essentials, g							
		Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr
330	0.3	6.19	2.31	6.32	11.56	9.37	1.69	5.75	5.51	0.96	5.92	9.53	12.58	8.03	9.36	8.03	7.86	6.23	5.29
	0.8	16.77	6.26	17.11	31.28	25.37	4.56	15.57	14.90	2.60	16.02	25.79	34.06	21.73	25.34	21.73	21.26	16.86	14.32
	1.3	27.44	10.25	28.02	51.21	41.53	7.47	25.48	24.39	4.26	26.22	42.22	55.76	35.57	41.48	35.57	34.81	27.60	23.43
	1.8	38.19	14.26	38.98	71.26	57.78	10.39	35.46	33.94	5.93	36.49	58.75	77.58	49.49	57.72	49.49	48.43	38.40	32.61
390	0.3	6.01	2.34	6.25	11.35	9.30	1.66	5.69	5.44	0.96	5.89	9.21	12.30	7.64	9.20	7.64	7.52	6.06	5.24
	0.8	16.28	6.32	16.92	30.72	25.16	4.50	15.39	14.73	2.59	15.95	24.93	33.30	20.69	24.91	20.69	20.34	16.40	14.18
	1.3	26.65	10.35	27.70	50.29	41.18	7.36	25.19	24.10	4.24	26.11	40.81	54.51	33.87	40.78	33.87	33.30	26.85	23.21
	1.8	37.08	14.41	38.54	69.98	57.30	10.24	35.05	33.54	5.90	36.33	56.78	75.85	47.12	56.74	47.12	46.33	37.36	32.30
450	0.3	5.86	2.36	6.19	11.18	9.23	1.64	5.63	5.39	0.95	5.87	8.95	12.07	7.33	9.07	7.33	7.24	5.92	5.20
	0.8	15.87	6.38	16.76	30.25	24.98	4.44	15.24	14.58	2.58	15.89	24.21	32.66	19.84	24.55	19.84	19.58	16.03	14.06
	1.3	25.98	10.44	27.43	49.52	40.89	7.27	24.95	23.86	4.22	26.01	39.63	53.47	32.48	40.19	32.48	32.06	26.23	23.02
	1.8	36.15	14.53	38.17	68.91	56.89	10.11	34.71	33.20	5.87	36.19	55.15	74.39	45.19	55.92	45.19	44.61	36.50	32.04
510	0.3	5.74	2.37	6.14	11.03	9.17	1.62	5.58	5.34	0.95	5.85	8.72	11.87	7.07	8.96	7.07	7.00	5.80	5.16
	0.8	15.52	6.43	16.61	29.85	24.82	4.39	15.11	14.45	2.57	15.83	23.60	32.11	19.12	24.24	19.12	18.94	15.70	13.96
	1.3	25.41	10.52	27.20	48.86	40.63	7.19	24.74	23.65	4.20	25.92	38.63	52.57	31.30	39.68	31.30	31.01	25.70	22.86
	1.8	35.36	14.64	37.84	67.98	56.53	10.00	34.42	32.91	5.85	36.06	53.76	73.15	43.56	55.21	43.56	43.15	35.76	31.81
570	0.3	5.62	2.39	6.09	10.90	9.12	1.61	5.54	5.30	0.95	5.83	8.52	11.69	6.84	8.85	6.84	6.80	5.70	5.13
	0.8	15.22	6.47	16.49	29.49	24.68	4.35	15.00	14.34	2.56	15.79	23.07	31.63	18.51	23.97	18.51	18.39	15.42	13.88
	1.3	24.92	10.59	26.99	48.28	40.40	7.12	24.55	23.47	4.19	25.84	37.77	51.78	30.30	39.23	30.30	30.11	25.24	22.72
	1.8	34.67	14.74	37.55	67.17	56.22	9.91	34.16	32.66	5.83	35.96	52.55	72.05	42.16	54.59	42.16	41.89	35.12	31.61
630	0.3	5.53	2.41	6.05	10.78	9.07	1.59	5.50	5.26	0.94	5.82	8.35	11.53	6.64	8.76	6.64	6.62	5.60	5.10
	0.8	14.96	6.51	16.38	29.17	24.56	4.31	14.89	14.24	2.55	15.74	22.60	31.21	17.97	23.72	17.97	17.91	15.17	13.80
	1.3	24.48	10.66	26.81	47.76	40.20	7.06	24.38	23.30	4.17	25.77	37.00	51.09	29.42	38.83	29.42	29.32	24.83	22.59
	1.8	34.07	14.83	37.30	66.45	55.94	9.82	33.93	32.43	5.81	35.86	51.49	71.08	40.94	54.03	40.94	40.80	34.55	31.43

*BW = body weight; ADG = average daily gain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine.

Table 17.6a - Nutritional requirements of **CROSSBRED** beef cattle, **BULLS** in **FEEDLOT** system

Average BW kg	ADG kg	DMI kg	Intake of water ¹ , L		Energy			Protein					
			Summer	Winter	ME, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
210	0.3	4.0	9.3	11.0	8.1	2.2	55.7	251	128	378	9.4	66.2	33.8
	0.8	5.6	10.1	11.8	11.5	3.2	56.2	370	178	548	9.7	67.5	32.5
	1.3	6.9	10.7	12.4	14.9	4.1	59.1	485	233	718	10.4	67.5	32.5
	1.8	7.9	11.2	12.9	18.5	5.0	63.4	594	293	888	11.2	66.9	33.1
270	0.3	4.8	11.8	13.6	9.6	2.7	55.7	302	143	446	9.3	67.8	32.2
	0.8	6.4	12.6	14.3	13.3	3.7	57.6	429	198	627	9.8	68.4	31.6
	1.3	7.7	13.3	15.0	17.2	4.7	61.2	551	258	808	10.5	68.1	31.9
	1.8	8.6	13.7	15.5	21.2	5.7	66.1	665	324	989	11.4	67.3	32.7
330	0.3	5.5	14.2	16.0	11.0	3.1	55.8	351	160	511	9.3	68.6	31.4
	0.8	7.1	15.0	16.7	15.1	4.2	58.7	485	221	707	10.0	68.7	31.3
	1.3	8.4	15.6	17.4	19.4	5.3	63.0	613	289	902	10.8	68.0	32.0
	1.8	9.3	16.1	17.9	23.7	6.4	68.3	733	363	1096	11.7	66.9	33.1
390	0.3	6.1	16.5	18.3	12.4	3.4	55.8	398	181	579	9.4	68.7	31.3
	0.8	7.7	17.3	19.0	16.8	4.6	59.6	542	254	796	10.3	68.1	31.9
	1.3	9.0	17.9	19.7	21.5	5.8	64.5	678	335	1013	11.2	66.9	33.1
	1.8	10.0	18.4	20.1	26.2	7.0	70.3	806	424	1229	12.3	65.5	34.5
450	0.3	6.8	18.7	20.5	13.7	3.8	55.9	438	191	629	9.3	69.6	30.4
	0.8	8.4	19.5	21.2	18.5	5.1	60.4	583	259	843	10.1	69.2	30.8
	1.3	9.7	20.1	21.9	23.5	6.4	65.7	719	336	1055	10.9	68.2	31.8
	1.8	10.7	20.6	22.4	28.7	7.7	71.9	845	421	1266	11.9	66.7	33.3
510	0.3	7.4	20.9	22.6	15.0	4.1	56.0	476	201	678	9.2	70.3	29.7
	0.8	9.0	21.6	23.4	20.1	5.5	61.1	622	265	887	9.9	70.1	29.9
	1.3	10.3	22.3	24.0	25.5	6.9	66.9	757	338	1095	10.6	69.2	30.8
	1.8	11.3	22.8	24.5	31.0	8.3	73.4	881	420	1301	11.5	67.7	32.3
570	0.3	8.0	22.9	24.7	16.3	4.5	56.1	513	212	725	9.1	70.7	29.3
	0.8	9.6	23.7	25.4	21.7	5.9	61.7	658	272	930	9.7	70.8	29.2
	1.3	10.9	24.3	26.1	27.4	7.4	67.8	793	341	1134	10.4	69.9	30.1
	1.8	11.9	24.8	26.5	33.3	8.9	74.7	913	422	1335	11.2	68.4	31.6
630	0.3	8.6	24.9	26.7	17.5	4.8	56.2	547	223	770	9.0	71.0	29.0
	0.8	10.2	25.7	27.5	23.3	6.3	62.2	693	279	972	9.5	71.3	28.7
	1.3	11.5	26.4	28.1	29.3	7.9	68.7	825	346	1171	10.2	70.5	29.5
	1.8	12.5	26.8	28.6	35.6	9.5	75.9	943	425	1367	11.0	68.9	31.1

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME = metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein. ¹Winter = 22°C of maximum temperature and 65% of relative humidity; Summer = 29°C of maximum temperature and 79% of relative humidity.

Table 17.6b - Minerals requirements for **CROSSBRED** beef cattle, **BULLS** in a **FEEDLOT** system

Average BW kg	ADG kg	Macrominerals, g							Microminerals, mg							
		Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Mo	Se	Zn
210	0.3	10.65	7.11	1.50	3.74	4.69	11.24	3.91	29.96	3.28	8.07	855.58	91.25	1.40	2.04	146.72
	0.8	21.45	12.10	1.77	4.16	6.60	13.02	5.76	34.48	3.30	11.37	879.23	96.03	1.43	2.78	217.69
	1.3	32.36	17.15	1.89	4.59	8.53	14.82	7.63	39.04	3.32	14.71	903.13	100.86	1.46	3.53	289.39
	1.8	43.33	22.23	1.95	5.01	10.48	16.63	9.51	43.63	3.35	18.06	927.17	105.72	1.48	4.28	361.52
270	0.3	11.38	8.12	1.40	4.72	5.69	14.24	5.00	38.01	4.21	10.16	1096.97	117.18	1.79	2.49	187.31
	0.8	21.30	12.79	1.67	5.12	7.57	16.18	7.34	42.93	4.23	14.04	1122.17	123.08	1.83	3.22	276.31
	1.3	31.33	17.52	1.79	5.52	9.48	18.14	9.71	47.91	4.26	17.95	1147.62	129.04	1.86	3.95	366.21
	1.8	41.42	22.27	1.86	5.92	11.39	20.11	12.09	52.91	4.28	21.89	1173.23	135.04	1.89	4.69	456.66
330	0.3	12.24	9.17	1.33	5.71	6.69	17.24	6.09	46.02	5.15	12.22	1338.23	143.08	2.19	2.94	227.68
	0.8	21.52	13.61	1.58	6.08	8.56	19.31	8.91	51.30	5.17	16.63	1364.72	150.07	2.23	3.66	334.30
	1.3	30.89	18.09	1.71	6.46	10.44	21.40	11.76	56.63	5.19	21.08	1391.49	157.12	2.26	4.38	442.01
	1.8	40.32	22.60	1.78	6.85	12.33	23.51	14.63	62.00	5.21	25.56	1418.42	164.22	2.30	5.11	550.36
390	0.3	13.18	10.25	1.28	6.69	7.70	20.22	7.18	54.00	6.08	14.27	1579.38	168.97	2.59	3.39	267.86
	0.8	21.95	14.50	1.51	7.06	9.54	22.41	10.48	59.60	6.10	19.17	1607.02	177.00	2.62	4.10	391.78
	1.3	30.82	18.79	1.64	7.42	11.41	24.63	13.81	65.25	6.12	24.12	1634.93	185.11	2.66	4.82	516.97
	1.8	39.73	23.11	1.72	7.79	13.28	26.85	17.16	70.93	6.15	29.11	1663.02	193.28	2.70	5.54	642.91
450	0.3	14.17	11.36	1.25	7.68	8.71	23.20	8.26	61.97	7.01	16.29	1820.47	194.84	2.98	3.85	307.88
	0.8	22.54	15.45	1.46	8.03	10.54	25.50	12.03	67.85	7.03	21.67	1849.11	203.89	3.02	4.55	448.85
	1.3	30.98	19.58	1.58	8.38	12.38	27.82	15.83	73.79	7.06	27.09	1878.05	213.04	3.06	5.26	591.25
	1.8	39.48	23.74	1.66	8.74	14.24	30.16	19.66	79.76	7.08	32.55	1907.16	222.24	3.10	5.97	734.51
510	0.3	15.21	12.48	1.22	8.67	9.72	26.17	9.34	69.93	7.94	18.31	2061.49	220.70	3.38	4.30	347.77
	0.8	23.23	16.44	1.41	9.01	11.53	28.57	13.57	76.07	7.97	24.13	2091.05	230.75	3.42	5.00	505.55
	1.3	31.33	20.44	1.53	9.35	13.37	30.99	17.85	82.27	7.99	30.01	2120.92	240.91	3.46	5.70	664.95
	1.8	39.48	24.46	1.61	9.70	15.21	33.42	22.15	88.50	8.01	35.92	2150.96	251.13	3.50	6.41	825.30
570	0.3	11.74	11.35	1.03	9.67	10.73	29.13	10.42	77.88	8.88	20.31	2302.47	246.54	3.78	4.76	387.54
	0.8	11.74	11.35	1.03	9.99	12.53	31.62	15.12	84.25	8.90	26.56	2332.87	257.58	3.82	5.45	561.95
	1.3	11.74	11.35	1.03	10.33	14.35	34.14	19.86	90.70	8.92	32.87	2363.58	268.73	3.86	6.14	738.13
	1.8	11.74	11.35	1.03	10.66	16.18	36.67	24.63	97.18	8.94	39.22	2394.48	279.95	3.91	6.84	915.37
630	0.3	12.98	12.54	1.03	10.66	11.75	32.10	11.50	85.81	9.81	22.31	2543.42	272.38	4.17	5.21	427.22
	0.8	12.98	12.54	1.03	10.98	13.54	34.67	16.65	92.41	9.83	28.97	2574.59	284.38	4.22	5.90	618.07
	1.3	12.98	12.54	1.03	11.30	15.34	37.27	21.86	99.08	9.85	35.69	2606.08	296.51	4.26	6.59	810.87
	1.8	12.98	12.54	1.03	11.63	17.16	39.89	27.09	105.79	9.88	42.46	2637.77	308.70	4.31	7.28	1004.82

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.6c - Metabolizable amino acids requirements for **CROSSBRED** beef cattle, **BULLS** in a **FEEDLOT** system

Average BW kg	ADG kg	Essentials, g										Non-Essentials, g							
		Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr
330	0.3	6.23	2.31	6.34	11.60	9.39	1.69	5.76	5.52	0.96	5.92	9.59	12.64	8.10	9.39	8.10	7.92	6.26	5.30
	0.8	16.86	6.25	17.15	31.39	25.41	4.57	15.60	14.93	2.61	16.03	25.95	34.20	21.92	25.42	21.92	21.44	16.94	14.34
	1.3	27.59	10.23	28.07	51.38	41.59	7.49	25.53	24.44	4.27	26.25	42.49	55.99	35.89	41.61	35.89	35.09	27.73	23.47
	1.8	38.39	14.24	39.06	71.49	57.87	10.42	35.53	34.01	5.94	36.52	59.12	77.90	49.94	57.90	49.94	48.82	38.59	32.66
390	0.3	6.05	2.33	6.27	11.40	9.31	1.67	5.70	5.45	0.96	5.90	9.28	12.36	7.73	9.24	7.73	7.59	6.10	5.25
	0.8	16.38	6.31	16.96	30.84	25.20	4.51	15.43	14.76	2.59	15.96	25.11	33.46	20.91	25.00	20.91	20.54	16.50	14.21
	1.3	26.82	10.33	27.77	50.49	41.26	7.38	25.25	24.17	4.25	26.13	41.11	54.78	34.23	40.93	34.23	33.62	27.01	23.26
	1.8	37.31	14.37	38.63	70.25	57.40	10.27	35.14	33.63	5.91	36.36	57.20	76.22	47.62	56.95	47.62	46.78	37.58	32.36
450	0.3	5.91	2.35	6.21	11.23	9.25	1.65	5.65	5.40	0.95	5.88	9.02	12.13	7.42	9.11	7.42	7.31	5.96	5.21
	0.8	15.99	6.36	16.80	30.39	25.03	4.46	15.28	14.62	2.58	15.90	24.41	32.84	20.08	24.65	20.08	19.80	16.13	14.10
	1.3	26.17	10.42	27.50	49.74	40.97	7.29	25.02	23.93	4.23	26.03	39.96	53.76	32.87	40.35	32.87	32.41	26.41	23.08
	1.8	36.41	14.49	38.27	69.21	57.01	10.15	34.81	33.30	5.88	36.23	55.61	74.80	45.73	56.15	45.73	45.09	36.74	32.11
510	0.3	5.78	2.37	6.16	11.08	9.19	1.63	5.60	5.36	0.95	5.86	8.80	11.94	7.16	9.00	7.16	7.08	5.84	5.17
	0.8	15.65	6.41	16.66	29.99	24.88	4.41	15.16	14.50	2.57	15.85	23.82	32.31	19.38	24.35	19.38	19.17	15.82	14.00
	1.3	25.61	10.49	27.28	49.10	40.72	7.22	24.81	23.73	4.21	25.95	38.99	52.89	31.72	39.86	31.72	31.38	25.89	22.92
	1.8	35.64	14.60	37.96	68.31	56.66	10.04	34.52	33.02	5.86	36.11	54.25	73.59	44.14	55.46	44.14	43.67	36.02	31.89
570	0.3	5.67	2.38	6.11	10.95	9.14	1.61	5.56	5.32	0.95	5.84	8.61	11.77	6.94	8.90	6.94	6.88	5.74	5.14
	0.8	15.35	6.45	16.54	29.65	24.74	4.37	15.05	14.39	2.56	15.81	23.30	31.84	18.78	24.08	18.78	18.63	15.54	13.91
	1.3	25.13	10.56	27.08	48.53	40.50	7.15	24.63	23.55	4.20	25.87	38.14	52.12	30.73	39.43	30.73	30.50	25.44	22.78
	1.8	34.97	14.70	37.68	67.53	56.36	9.95	34.27	32.77	5.84	36.00	53.07	72.53	42.76	54.86	42.76	42.44	35.40	31.69
630	0.3	5.58	2.40	6.07	10.84	9.10	1.60	5.52	5.28	0.94	5.83	8.44	11.61	6.74	8.81	6.74	6.71	5.65	5.11
	0.8	15.09	6.49	16.43	29.34	24.62	4.33	14.95	14.29	2.55	15.77	22.85	31.43	18.25	23.85	18.25	18.16	15.30	13.84
	1.3	24.71	10.62	26.90	48.03	40.31	7.09	24.47	23.39	4.18	25.81	37.40	51.45	29.87	39.04	29.87	29.73	25.04	22.65
	1.8	34.38	14.78	37.43	66.82	56.08	9.87	34.05	32.54	5.82	35.91	52.03	71.58	41.57	54.32	41.57	41.36	34.84	31.52

*BW = body weight; ADG = average daily gain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine.

Table 17.7a - Nutritional requirements of **CROSSBRED** beef cattle, **STEERS** in **FEEDLOT** system

Average BW kg	ADG kg	DMI kg	Intake of water ¹ , L		Energy			Protein					
			Summer	Winter	ME, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
210	0.3	4.0	9.3	11.0	8.2	2.3	56.3	254	128	382	9.5	66.4	33.6
	0.8	5.6	10.1	11.8	11.8	3.3	57.7	379	179	558	9.9	68.0	32.0
	1.3	6.9	10.7	12.4	15.6	4.2	61.2	500	235	735	10.6	68.0	32.0
	1.8	7.9	11.2	12.9	19.4	5.2	66.1	614	297	911	11.5	67.4	32.6
270	0.3	4.8	11.8	13.6	9.8	2.7	56.6	307	145	452	9.5	68.0	32.0
	0.8	6.4	12.6	14.3	13.8	3.8	59.4	442	202	644	10.1	68.7	31.3
	1.3	7.7	13.3	15.0	18.0	4.9	63.8	571	265	835	10.9	68.3	31.7
	1.8	8.6	13.7	15.5	22.3	6.0	69.3	692	335	1026	11.9	67.4	32.6
330	0.3	5.5	14.2	16.0	11.3	3.1	56.8	358	163	521	9.5	68.7	31.3
	0.8	7.1	15.0	16.7	15.7	4.3	60.8	503	230	733	10.4	68.6	31.4
	1.3	8.4	15.6	17.4	20.4	5.5	65.9	640	304	944	11.3	67.8	32.2
	1.8	9.3	16.1	17.9	25.2	6.7	72.0	768	386	1155	12.4	66.5	33.5
390	0.3	6.1	16.5	18.3	12.7	3.5	57.0	403	175	577	9.4	69.7	30.3
	0.8	7.7	17.3	19.0	17.6	4.8	61.9	551	240	791	10.2	69.7	30.3
	1.3	9.0	17.9	19.7	22.7	6.1	67.7	691	313	1004	11.1	68.8	31.2
	1.8	10.0	18.4	20.1	27.9	7.4	74.3	820	395	1215	12.1	67.5	32.5
450	0.3	6.8	18.7	20.5	14.1	3.9	57.2	444	184	627	9.2	70.7	29.3
	0.8	8.4	19.5	21.2	19.4	5.3	62.9	594	243	836	10.0	71.0	29.0
	1.3	9.7	20.1	21.9	24.9	6.7	69.3	733	311	1044	10.8	70.2	29.8
	1.8	10.7	20.6	22.4	30.6	8.1	76.4	859	390	1249	11.7	68.8	31.2
510	0.3	7.4	20.9	22.6	15.4	4.3	57.4	482	193	676	9.1	71.4	28.6
	0.8	9.0	21.6	23.4	21.2	5.7	63.8	633	247	880	9.8	72.0	28.0
	1.3	10.3	22.3	24.0	27.1	7.3	70.6	771	311	1082	10.5	71.3	28.7
	1.8	11.3	22.8	24.5	33.2	8.8	78.2	895	387	1282	11.4	69.8	30.2
570	0.3	8.0	22.9	24.7	16.8	4.6	57.6	519	203	722	9.0	71.9	28.1
	0.8	9.6	23.7	25.4	22.9	6.2	64.5	671	252	922	9.6	72.7	27.3
	1.3	10.9	24.3	26.1	29.3	7.8	71.8	807	312	1119	10.3	72.1	27.9
	1.8	11.9	24.8	26.5	35.8	9.5	79.8	927	387	1313	11.1	70.6	29.4
630	0.3	8.6	24.9	26.7	18.1	5.0	57.8	555	213	768	8.9	72.2	27.8
	0.8	10.2	25.7	27.5	24.6	6.6	65.2	706	257	963	9.4	73.3	26.7
	1.3	11.5	26.4	28.1	31.3	8.4	72.9	840	315	1155	10.1	72.7	27.3
	1.8	12.5	26.8	28.6	38.3	10.1	81.2	955	388	1343	10.8	71.1	28.9

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME = metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein. ¹Winter = 22°C of maximum temperature and 65% of relative humidity; Summer = 29°C of maximum temperature and 79% of relative humidity.

Table 17.7b - Minerals requirements for **CROSSBRED** beef cattle, **STEERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Macrominerals, g							Microminerals, mg							
		Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Mo	Se	Zn
210	0.3	10.65	7.11	1.50	3.74	4.69	11.24	3.91	29.96	3.28	8.07	855.59	91.26	1.40	2.04	146.81
	0.8	21.44	12.10	1.77	4.16	6.60	13.02	5.77	34.48	3.30	11.38	879.25	96.05	1.43	2.78	217.93
	1.3	32.34	17.14	1.89	4.59	8.53	14.82	7.64	39.05	3.32	14.72	903.16	100.89	1.46	3.53	289.79
	1.8	43.30	22.21	1.95	5.01	10.47	16.64	9.53	43.64	3.35	18.08	927.22	105.76	1.48	4.28	362.07
270	0.3	11.36	8.11	1.40	4.72	5.69	14.25	5.01	38.01	4.21	10.17	1097.00	117.20	1.79	2.49	187.64
	0.8	21.27	12.78	1.66	5.11	7.57	16.19	7.37	42.95	4.23	14.06	1122.24	123.14	1.83	3.22	277.19
	1.3	31.27	17.50	1.79	5.51	9.47	18.15	9.75	47.94	4.26	18.00	1147.73	129.13	1.86	3.95	367.66
	1.8	41.33	22.24	1.86	5.92	11.39	20.13	12.14	52.96	4.28	21.95	1173.38	135.17	1.89	4.69	458.66
330	0.3	12.22	9.16	1.33	5.70	6.69	17.24	6.11	46.03	5.15	12.24	1338.27	143.12	2.19	2.94	228.27
	0.8	21.46	13.59	1.58	6.08	8.55	19.32	8.96	51.33	5.17	16.68	1364.84	150.16	2.23	3.66	335.90
	1.3	30.81	18.06	1.71	6.46	10.43	21.42	11.84	56.68	5.19	21.16	1391.68	157.28	2.26	4.38	444.64
	1.8	40.20	22.56	1.78	6.84	12.32	23.54	14.73	62.06	5.21	25.67	1418.68	164.44	2.30	5.11	554.02
390	0.3	13.15	10.25	1.28	6.69	7.70	20.23	7.20	54.02	6.08	14.29	1579.44	169.02	2.59	3.39	268.74
	0.8	21.89	14.48	1.51	7.05	9.54	22.43	10.54	59.64	6.10	19.24	1607.17	177.15	2.62	4.10	394.19
	1.3	30.71	18.75	1.64	7.42	11.40	24.65	13.91	65.32	6.12	24.23	1635.18	185.35	2.66	4.82	520.91
	1.8	39.59	23.06	1.72	7.78	13.27	26.89	17.31	71.03	6.14	29.26	1663.36	193.61	2.70	5.54	648.39
450	0.3	14.14	11.35	1.25	7.68	8.71	23.20	8.30	61.99	7.01	16.33	1820.53	194.91	2.98	3.85	309.08
	0.8	22.46	15.42	1.46	8.03	10.54	25.52	12.12	67.90	7.03	21.75	1849.30	204.09	3.02	4.55	452.10
	1.3	30.87	19.54	1.58	8.38	12.38	27.85	15.98	73.87	7.06	27.24	1878.35	213.36	3.06	5.26	596.59
	1.8	39.32	23.68	1.66	8.73	14.23	30.20	19.87	79.88	7.08	32.75	1907.58	222.69	3.10	5.97	741.94
510	0.3	15.18	12.46	1.22	8.67	9.72	26.18	9.38	69.95	7.94	18.35	2061.57	220.79	3.38	4.30	349.31
	0.8	23.15	16.41	1.41	9.01	11.53	28.59	13.69	76.13	7.97	24.24	2091.27	231.00	3.42	5.00	509.71
	1.3	31.20	20.39	1.53	9.35	13.36	31.03	18.04	82.37	7.99	30.18	2121.27	241.31	3.46	5.70	671.76
	1.8	39.30	24.39	1.61	9.69	15.20	33.48	22.42	88.64	8.01	36.17	2151.45	251.69	3.51	6.40	834.78
570	0.3	11.74	11.35	1.03	9.67	10.73	29.14	10.47	77.90	8.88	20.36	2302.57	246.65	3.78	4.76	389.43
	0.8	11.74	11.35	1.03	9.99	12.53	31.65	15.26	84.32	8.90	26.69	2333.12	257.88	3.82	5.45	567.05
	1.3	11.74	11.35	1.03	10.32	14.35	34.18	20.09	90.81	8.92	33.08	2363.99	269.22	3.86	6.14	746.49
	1.8	11.74	11.35	1.03	10.66	16.17	36.73	24.95	97.34	8.94	39.52	2395.04	280.63	3.91	6.84	927.00
630	0.3	12.98	12.54	1.03	10.66	11.75	32.11	11.56	85.84	9.81	22.36	2543.52	272.51	4.17	5.21	429.47
	0.8	12.98	12.54	1.03	10.98	13.53	34.70	16.82	92.49	9.83	29.12	2574.87	284.74	4.22	5.90	624.15
	1.3	12.98	12.54	1.03	11.30	15.34	37.32	22.14	99.21	9.85	35.94	2606.54	297.09	4.26	6.59	820.83
	1.8	12.98	12.54	1.03	11.62	17.15	39.96	27.48	105.97	9.88	42.81	2638.39	309.52	4.31	7.28	1018.68

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.7c - Metabolizable amino acids requirements for **CROSSBRED** beef cattle, **STEERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Essentials, g										Non-Essentials, g							
		Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr
330	0.3	6.22	2.31	6.33	11.58	9.38	1.69	5.76	5.51	0.96	5.92	9.57	12.62	8.08	9.38	8.08	7.90	6.25	5.30
	0.8	16.83	6.25	17.14	31.35	25.40	4.57	15.59	14.92	2.61	16.03	25.90	34.15	21.86	25.39	21.86	21.38	16.91	14.33
	1.3	27.54	10.24	28.05	51.32	41.57	7.48	25.52	24.43	4.27	26.24	42.40	55.91	35.78	41.57	35.78	34.99	27.69	23.46
	1.8	38.32	14.24	39.04	71.41	57.84	10.41	35.51	33.99	5.94	36.51	59.00	77.79	49.79	57.84	49.79	48.69	38.53	32.64
390	0.3	6.04	2.33	6.26	11.38	9.31	1.66	5.70	5.45	0.96	5.90	9.25	12.34	7.70	9.23	7.70	7.56	6.08	5.25
	0.8	16.34	6.32	16.95	30.80	25.19	4.50	15.41	14.75	2.59	15.96	25.05	33.40	20.83	24.97	20.83	20.47	16.47	14.20
	1.3	26.75	10.34	27.74	50.42	41.23	7.37	25.23	24.14	4.24	26.12	41.00	54.68	34.10	40.87	34.10	33.50	26.95	23.24
	1.8	37.23	14.39	38.60	70.16	57.37	10.26	35.11	33.59	5.91	36.35	57.05	76.08	47.44	56.87	47.44	46.61	37.50	32.34
450	0.3	5.89	2.35	6.20	11.21	9.24	1.64	5.64	5.40	0.95	5.87	8.99	12.11	7.38	9.09	7.38	7.28	5.95	5.20
	0.8	15.94	6.37	16.78	30.34	25.01	4.45	15.27	14.60	2.58	15.90	24.34	32.77	19.99	24.61	19.99	19.71	16.09	14.08
	1.3	26.10	10.43	27.48	49.66	40.94	7.28	24.99	23.91	4.22	26.02	39.84	53.65	32.72	40.29	32.72	32.27	26.34	23.06
	1.8	36.31	14.51	38.23	69.10	56.96	10.14	34.77	33.26	5.88	36.21	55.43	74.65	45.52	56.06	45.52	44.90	36.65	32.08
510	0.3	5.76	2.37	6.15	11.06	9.18	1.63	5.59	5.35	0.95	5.85	8.77	11.91	7.12	8.98	7.12	7.05	5.83	5.17
	0.8	15.60	6.42	16.64	29.94	24.85	4.40	15.14	14.48	2.57	15.84	23.73	32.23	19.28	24.31	19.28	19.08	15.77	13.99
	1.3	25.53	10.50	27.25	49.00	40.69	7.21	24.78	23.70	4.21	25.94	38.85	52.76	31.55	39.79	31.55	31.23	25.82	22.90
	1.8	35.53	14.62	37.91	68.18	56.61	10.03	34.48	32.98	5.85	36.09	54.06	73.41	43.91	55.36	43.91	43.46	35.92	31.86
570	0.3	5.65	2.39	6.10	10.93	9.13	1.61	5.55	5.31	0.95	5.84	8.57	11.73	6.90	8.88	6.90	6.85	5.72	5.14
	0.8	15.30	6.46	16.52	29.58	24.72	4.36	15.03	14.37	2.56	15.80	23.21	31.76	18.67	24.04	18.67	18.53	15.49	13.90
	1.3	25.05	10.57	27.04	48.43	40.46	7.14	24.60	23.52	4.19	25.86	37.99	51.99	30.56	39.35	30.56	30.34	25.36	22.75
	1.8	34.85	14.71	37.63	67.38	56.30	9.93	34.23	32.72	5.83	35.98	52.86	72.34	42.52	54.75	42.52	42.22	35.28	31.66
630	0.3	5.56	2.40	6.06	10.82	9.09	1.60	5.51	5.27	0.94	5.82	8.40	11.58	6.70	8.79	6.70	6.67	5.63	5.11
	0.8	15.04	6.50	16.41	29.27	24.60	4.32	14.93	14.27	2.55	15.76	22.75	31.34	18.14	23.80	18.14	18.06	15.24	13.82
	1.3	24.61	10.64	26.86	47.91	40.26	7.08	24.43	23.35	4.18	25.79	37.23	51.30	29.69	38.95	29.69	29.56	24.95	22.63
	1.8	34.25	14.80	37.38	66.67	56.02	9.85	34.00	32.50	5.81	35.89	51.81	71.38	41.31	54.20	41.31	41.13	34.72	31.48

*BW = body weight; ADG = average daily gain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine.

Table 17.8a - Nutritional requirements of **CROSSBRED** beef cattle, **HEIFERS** in **FEEDLOT** system

Average BW kg	ADG kg	DMI kg	Intake of water ¹ , L		Energy			Protein					
			Summer	Winter	ME, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
210	0.3	4.0	9.3	11.0	8.4	2.3	57.4	259	129	387	9.6	66.8	33.2
	0.8	5.6	10.1	11.8	12.3	3.4	59.7	392	181	572	10.2	68.4	31.6
	1.3	6.9	10.7	12.4	16.3	4.4	63.9	518	239	757	10.9	68.5	31.5
	1.8	7.9	11.2	12.9	20.4	5.5	69.4	638	303	941	11.9	67.8	32.2
270	0.3	4.8	11.8	13.6	10.0	2.8	57.8	314	147	461	9.6	68.2	31.8
	0.8	6.4	12.6	14.3	14.4	3.9	61.7	459	208	667	10.5	68.8	31.2
	1.3	7.7	13.3	15.0	19.0	5.1	66.9	596	277	873	11.4	68.3	31.7
	1.8	8.6	13.7	15.5	23.7	6.3	73.1	725	353	1078	12.5	67.2	32.8
330	0.3	5.5	14.2	16.0	11.6	3.2	58.2	368	168	536	9.8	68.6	31.4
	0.8	7.1	15.0	16.7	16.5	4.5	63.4	526	246	773	10.9	68.1	31.9
	1.3	8.4	15.6	17.4	21.6	5.8	69.4	676	332	1008	12.1	67.0	33.0
	1.8	9.3	16.1	17.9	26.8	7.1	76.3	814	428	1242	13.3	65.5	34.5
390	0.3	6.1	16.5	18.3	13.1	3.6	58.5	408	167	575	9.4	70.9	29.1
	0.8	7.7	17.3	19.0	18.5	5.0	64.7	562	222	785	10.1	71.7	28.3
	1.3	9.0	17.9	19.7	24.1	6.5	71.5	705	288	993	11.0	71.0	29.0
	1.8	10.0	18.4	20.1	29.9	7.9	79.0	835	364	1198	12.0	69.7	30.3
450	0.3	6.8	18.7	20.5	14.5	4.0	58.8	450	175	625	9.2	72.0	28.0
	0.8	8.4	19.5	21.2	20.4	5.5	65.9	606	224	829	9.9	73.0	27.0
	1.3	9.7	20.1	21.9	26.6	7.1	73.3	748	284	1031	10.7	72.5	27.5
	1.8	10.7	20.6	22.4	32.9	8.7	81.4	874	356	1230	11.5	71.0	29.0
510	0.3	7.4	20.9	22.6	16.0	4.4	59.1	490	184	673	9.1	72.7	27.3
	0.8	9.0	21.6	23.4	22.3	6.0	66.9	646	226	872	9.7	74.1	25.9
	1.3	10.3	22.3	24.0	28.9	7.7	74.9	786	282	1068	10.4	73.6	26.4
	1.8	11.3	22.8	24.5	35.8	9.4	83.5	909	352	1260	11.2	72.1	27.9
570	0.3	8.0	22.9	24.7	17.3	4.8	59.3	527	193	720	9.0	73.2	26.8
	0.8	9.6	23.7	25.4	24.2	6.5	67.8	684	230	913	9.5	74.9	25.1
	1.3	10.9	24.3	26.1	31.3	8.3	76.3	822	281	1103	10.1	74.5	25.5
	1.8	11.9	24.8	26.5	38.6	10.1	85.4	939	350	1289	10.8	72.8	27.2
630	0.3	8.6	24.9	26.7	18.7	5.1	59.6	563	202	765	8.9	73.6	26.4
	0.8	10.2	25.7	27.5	26.0	7.0	68.5	719	234	953	9.4	75.4	24.6
	1.3	11.5	26.4	28.1	33.6	8.9	77.6	854	283	1137	9.9	75.1	24.9
	1.8	12.5	26.8	28.6	41.4	10.9	87.1	965	351	1316	10.6	73.3	26.7

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME = metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein. ¹Winter = 22°C of maximum temperature and 65% of relative humidity; Summer = 29°C of maximum temperature and 79% of relative humidity.

Table 17.8b - Minerals requirements for **CROSSBRED** beef cattle, **HEIFERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Macrominerals, g							Microminerals, mg							
		Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Mo	Se	Zn
210	0.3	10.62	7.10	1.50	3.74	4.69	11.25	3.93	29.97	3.28	8.09	855.63	91.29	1.40	2.04	147.26
	0.8	21.37	12.07	1.77	4.16	6.60	13.03	5.80	34.51	3.30	11.42	879.37	96.13	1.43	2.78	219.16
	1.3	32.22	17.10	1.88	4.58	8.53	14.84	7.70	39.10	3.32	14.79	903.35	101.02	1.46	3.53	291.79
	1.8	43.14	22.16	1.95	5.01	10.47	16.66	9.60	43.71	3.35	18.17	927.48	105.93	1.48	4.28	364.86
270	0.3	11.34	8.10	1.40	4.72	5.69	14.25	5.03	38.03	4.21	10.19	1097.05	117.24	1.80	2.49	188.33
	0.8	21.19	12.75	1.66	5.11	7.57	16.20	7.42	42.99	4.23	14.12	1122.38	123.25	1.83	3.21	279.06
	1.3	31.15	17.45	1.78	5.51	9.47	18.18	9.83	48.00	4.26	18.09	1147.97	129.32	1.86	3.95	370.71
	1.8	41.16	22.18	1.86	5.91	11.38	20.16	12.26	53.05	4.28	22.09	1173.72	135.43	1.89	4.69	462.91
330	0.3	12.19	9.15	1.33	5.70	6.69	17.25	6.14	46.05	5.15	12.27	1338.33	143.18	2.19	2.94	229.22
	0.8	21.38	13.56	1.58	6.08	8.55	19.34	9.03	51.37	5.17	16.75	1365.01	150.32	2.23	3.66	338.46
	1.3	30.67	18.01	1.70	6.46	10.43	21.45	11.95	56.76	5.19	21.28	1391.96	157.54	2.26	4.38	448.82
	1.8	40.02	22.49	1.78	6.84	12.32	23.58	14.89	62.17	5.21	25.84	1419.08	164.79	2.30	5.11	559.84
390	0.3	13.12	10.23	1.28	6.69	7.70	20.23	7.24	54.04	6.08	14.32	1579.51	169.10	2.59	3.39	269.96
	0.8	21.80	14.45	1.51	7.05	9.54	22.45	10.63	59.70	6.10	19.33	1607.37	177.34	2.63	4.10	397.47
	1.3	30.57	18.70	1.63	7.41	11.40	24.69	14.06	65.41	6.12	24.38	1635.51	185.68	2.66	4.81	526.28
	1.8	39.40	22.98	1.71	7.78	13.26	26.94	17.51	71.16	6.14	29.47	1663.82	194.06	2.70	5.53	655.86
450	0.3	14.11	11.34	1.24	7.68	8.71	23.21	8.34	62.02	7.01	16.37	1820.62	195.00	2.98	3.85	310.57
	0.8	22.38	15.39	1.45	8.03	10.53	25.54	12.23	67.97	7.03	21.86	1849.52	204.33	3.02	4.55	456.14
	1.3	30.73	19.48	1.58	8.38	12.37	27.89	16.16	73.98	7.06	27.41	1878.72	213.75	3.06	5.25	603.20
	1.8	39.13	23.60	1.66	8.73	14.22	30.26	20.12	80.02	7.08	33.00	1908.10	223.23	3.10	5.96	751.13
510	0.3	15.14	12.45	1.22	8.67	9.72	26.19	9.43	69.98	7.94	18.39	2061.66	220.89	3.38	4.30	351.09
	0.8	23.06	16.37	1.41	9.01	11.53	28.62	13.82	76.20	7.97	24.36	2091.52	231.28	3.42	4.99	514.53
	1.3	31.06	20.33	1.53	9.35	13.35	31.07	18.26	82.48	7.99	30.39	2121.68	241.78	3.46	5.69	679.65
	1.8	39.10	24.31	1.61	9.69	15.19	33.54	22.72	88.81	8.01	36.45	2152.02	252.34	3.51	6.40	845.75
570	0.3	11.74	11.35	1.03	9.66	10.73	29.15	10.53	77.93	8.88	20.41	2302.66	246.78	3.78	4.76	391.51
	0.8	11.74	11.35	1.03	9.99	12.53	31.68	15.41	84.40	8.90	26.83	2333.39	258.21	3.82	5.44	572.68
	1.3	11.74	11.35	1.03	10.32	14.34	34.23	20.35	90.94	8.92	33.32	2364.43	269.76	3.86	6.14	755.70
	1.8	11.74	11.35	1.03	10.65	16.17	36.79	25.31	97.51	8.94	39.84	2395.65	281.38	3.91	6.84	939.81
630	0.3	12.98	12.54	1.03	10.66	11.74	32.12	11.63	85.87	9.81	22.42	2543.63	272.65	4.17	5.21	431.85
	0.8	12.98	12.54	1.03	10.97	13.53	34.73	17.00	92.58	9.83	29.27	2575.15	285.11	4.22	5.89	630.60
	1.3	12.98	12.54	1.03	11.29	15.33	37.37	22.43	99.35	9.85	36.20	2607.01	297.71	4.26	6.58	831.39
	1.8	12.98	12.54	1.03	11.62	17.14	40.03	27.89	106.16	9.88	43.17	2639.05	310.37	4.31	7.27	1033.37

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.8c - Metabolizable amino acids requirements for **CROSSBRED** beef cattle, **HEIFERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Essentials, g										Non-Essentials, g							
		Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr
330	0.3	6.20	2.31	6.33	11.56	9.38	1.69	5.75	5.51	0.96	5.92	9.54	12.59	8.04	9.37	8.04	7.87	6.23	5.29
	0.8	16.78	6.26	17.12	31.30	25.37	4.56	15.57	14.90	2.61	16.02	25.82	34.08	21.76	25.35	21.76	21.29	16.87	14.32
	1.3	27.46	10.25	28.02	51.23	41.54	7.47	25.49	24.40	4.26	26.23	42.26	55.79	35.61	41.50	35.61	34.85	27.62	23.44
	1.8	38.22	14.26	38.99	71.29	57.80	10.39	35.47	33.95	5.93	36.49	58.80	77.63	49.55	57.74	49.55	48.49	38.43	32.61
390	0.3	6.02	2.34	6.25	11.36	9.30	1.66	5.69	5.44	0.96	5.89	9.22	12.31	7.66	9.21	7.66	7.53	6.07	5.24
	0.8	16.29	6.32	16.93	30.74	25.16	4.50	15.40	14.73	2.59	15.95	24.96	33.32	20.72	24.92	20.72	20.37	16.42	14.18
	1.3	26.67	10.35	27.71	50.32	41.19	7.36	25.20	24.11	4.24	26.11	40.85	54.55	33.92	40.80	33.92	33.35	26.88	23.22
	1.8	37.11	14.40	38.55	70.02	57.32	10.24	35.07	33.55	5.90	36.33	56.84	75.90	47.20	56.77	47.20	46.40	37.40	32.31
450	0.3	5.87	2.36	6.19	11.19	9.23	1.64	5.63	5.39	0.95	5.87	8.96	12.08	7.34	9.08	7.34	7.25	5.93	5.20
	0.8	15.89	6.38	16.76	30.27	24.98	4.44	15.25	14.58	2.58	15.89	24.24	32.69	19.88	24.57	19.88	19.62	16.04	14.07
	1.3	26.01	10.44	27.44	49.56	40.90	7.27	24.96	23.87	4.22	26.01	39.68	53.51	32.53	40.21	32.53	32.11	26.26	23.03
	1.8	36.19	14.52	38.18	68.96	56.91	10.12	34.73	33.22	5.87	36.19	55.22	74.46	45.27	55.95	45.27	44.68	36.54	32.05
510	0.3	5.74	2.37	6.14	11.04	9.17	1.62	5.59	5.34	0.95	5.85	8.73	11.88	7.08	8.96	7.08	7.01	5.81	5.16
	0.8	15.54	6.42	16.62	29.87	24.83	4.39	15.12	14.46	2.57	15.84	23.63	32.14	19.16	24.26	19.16	18.98	15.72	13.97
	1.3	25.44	10.52	27.21	48.90	40.64	7.19	24.75	23.67	4.20	25.92	38.69	52.62	31.37	39.71	31.37	31.07	25.73	22.87
	1.8	35.40	14.63	37.86	68.04	56.55	10.01	34.44	32.93	5.85	36.07	53.83	73.21	43.65	55.25	43.65	43.23	35.80	31.82
570	0.3	5.63	2.39	6.10	10.91	9.12	1.61	5.54	5.30	0.95	5.83	8.54	11.70	6.85	8.86	6.85	6.81	5.70	5.13
	0.8	15.24	6.47	16.50	29.52	24.69	4.35	15.00	14.34	2.56	15.79	23.11	31.67	18.55	23.98	18.55	18.43	15.44	13.88
	1.3	24.95	10.59	27.00	48.32	40.42	7.12	24.56	23.48	4.19	25.85	37.83	51.84	30.37	39.26	30.37	30.17	25.27	22.73
	1.8	34.72	14.73	37.57	67.23	56.24	9.91	34.18	32.67	5.83	35.96	52.63	72.13	42.26	54.63	42.26	41.98	35.16	31.62
630	0.3	5.53	2.40	6.05	10.79	9.08	1.59	5.51	5.26	0.94	5.82	8.37	11.54	6.66	8.77	6.66	6.63	5.61	5.10
	0.8	14.98	6.51	16.38	29.20	24.57	4.32	14.90	14.24	2.55	15.75	22.64	31.24	18.02	23.74	18.02	17.95	15.19	13.80
	1.3	24.52	10.65	26.82	47.80	40.22	7.06	24.40	23.32	4.18	25.78	37.07	51.14	29.49	38.86	29.49	29.38	24.86	22.60
	1.8	34.11	14.82	37.32	66.51	55.96	9.83	33.95	32.44	5.81	35.87	51.57	71.16	41.04	54.08	41.04	40.89	34.59	31.44

*BW = body weight; ADG = average daily gain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine.

Table 17.9a - Nutritional requirements of **CROSSBRED** dairy cattle, **BULLS** in **FEEDLOT** system

Average BW kg	ADG kg	DMI kg	Intake of water ¹ , L		Energy			Protein					
			Summer	Winter	ME, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
210	0.3	3.0	8.8	10.5	8.3	2.2	72.7	247	129	376	12.4	65.6	34.4
	0.8	4.8	9.7	11.4	11.8	3.2	66.6	369	175	544	11.4	67.9	32.1
	1.3	6.0	10.3	12.0	15.3	4.1	68.6	485	227	712	11.8	68.1	31.9
	1.8	6.8	10.6	12.4	19.0	5.0	74.5	593	285	878	13.0	67.5	32.5
270	0.3	4.0	11.5	13.2	9.8	2.6	66.0	300	143	442	11.1	67.7	32.3
	0.8	5.7	12.3	14.0	13.7	3.7	64.6	429	191	620	10.8	69.2	30.8
	1.3	7.0	12.9	14.6	17.6	4.7	68.1	551	247	797	11.4	69.0	31.0
	1.8	7.7	13.3	15.0	21.7	5.8	74.6	664	310	974	12.6	68.2	31.8
330	0.3	4.9	14.0	15.7	11.2	3.1	62.1	349	157	507	10.3	68.9	31.1
	0.8	6.6	14.8	16.5	15.5	4.2	63.3	485	211	696	10.5	69.7	30.3
	1.3	7.9	15.4	17.1	19.9	5.3	67.8	613	272	885	11.2	69.3	30.7
	1.8	8.7	15.8	17.5	24.3	6.5	74.8	730	342	1072	12.4	68.1	31.9
390	0.3	5.8	16.4	18.1	12.6	3.4	59.5	399	181	580	10.0	68.9	31.1
	0.8	7.5	17.2	18.9	17.2	4.7	62.4	548	253	801	10.7	68.4	31.6
	1.3	8.8	17.8	19.5	22.0	5.9	67.6	686	335	1021	11.7	67.2	32.8
	1.8	9.5	18.2	19.9	26.8	7.1	75.0	814	426	1239	13.0	65.7	34.3
450	0.3	6.6	18.7	20.4	13.9	3.8	57.7	440	190	630	9.5	69.9	30.1
	0.8	8.4	19.5	21.2	18.9	5.2	61.7	590	257	847	10.1	69.6	30.4
	1.3	9.6	20.1	21.8	24.1	6.5	67.5	728	335	1063	11.1	68.5	31.5
	1.8	10.4	20.5	22.2	29.3	7.8	75.2	854	423	1277	12.3	66.9	33.1
510	0.3	7.4	20.9	22.6	15.2	4.2	56.4	479	199	679	9.1	70.6	29.4
	0.8	9.2	21.7	23.4	20.5	5.6	61.2	630	262	892	9.7	70.6	29.4
	1.3	10.4	22.3	24.1	26.1	7.0	67.5	767	337	1104	10.6	69.5	30.5
	1.8	11.2	22.7	24.4	31.7	8.4	75.5	890	423	1313	11.8	67.8	32.2
570	0.3	8.2	23.0	24.8	16.4	4.5	55.3	516	209	725	8.8	71.2	28.8
	0.8	10.0	23.9	25.6	22.1	6.0	60.8	667	268	935	9.4	71.3	28.7
	1.3	11.2	24.5	26.2	28.0	7.6	67.5	803	340	1143	10.2	70.2	29.8
	1.8	12.0	24.9	26.6	34.0	9.1	75.7	923	425	1348	11.3	68.5	31.5
630	0.3	9.0	25.1	26.9	17.7	4.9	54.5	552	219	771	8.6	71.6	28.4
	0.8	10.7	26.0	27.7	23.7	6.5	60.5	702	275	977	9.1	71.8	28.2
	1.3	12.0	26.6	28.3	30.0	8.1	67.5	836	345	1181	9.9	70.8	29.2
	1.8	12.7	27.0	28.7	36.3	9.7	75.9	953	428	1381	10.8	69.0	31.0

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME = metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein. ¹Winter = 22°C of maximum temperature and 65% of relative humidity; Summer = 29°C of maximum temperature and 79% of relative humidity.

Table 17.9b - Minerals requirements for **CROSSBRED** dairy cattle, **BULLS** in a **FEEDLOT** system

Average BW kg	ADG kg	Macrominerals, g							Microminerals, mg							
		Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Mo	Se	Zn
210	0.3	10.65	7.11	1.50	3.74	4.69	11.24	3.91	29.96	3.28	8.07	855.58	91.25	1.40	2.04	146.76
	0.8	21.44	12.10	1.77	4.16	6.60	13.02	5.77	34.48	3.30	11.38	879.24	96.04	1.43	2.78	217.82
	1.3	32.35	17.15	1.89	4.59	8.53	14.82	7.64	39.05	3.32	14.71	903.15	100.88	1.46	3.53	289.60
	1.8	43.31	22.22	1.95	5.01	10.48	16.63	9.52	43.64	3.35	18.07	927.19	105.74	1.48	4.28	361.81
270	0.3	11.38	8.12	1.40	4.72	5.69	14.24	5.00	38.00	4.21	10.16	1096.97	117.18	1.79	2.49	187.30
	0.8	21.31	12.79	1.67	5.12	7.57	16.18	7.34	42.93	4.23	14.03	1122.16	123.08	1.83	3.22	276.26
	1.3	31.33	17.52	1.79	5.52	9.48	18.14	9.71	47.91	4.26	17.95	1147.61	129.04	1.86	3.95	366.14
	1.8	41.42	22.27	1.86	5.92	11.39	20.11	12.08	52.91	4.28	21.89	1173.22	135.04	1.89	4.69	456.55
330	0.3	12.24	9.17	1.33	5.71	6.69	17.24	6.09	46.01	5.15	12.22	1338.22	143.08	2.19	2.94	227.58
	0.8	21.52	13.61	1.58	6.08	8.56	19.31	8.91	51.29	5.17	16.62	1364.71	150.05	2.23	3.66	334.04
	1.3	30.90	18.10	1.71	6.46	10.44	21.40	11.75	56.62	5.19	21.07	1391.47	157.10	2.26	4.38	441.59
	1.8	40.34	22.61	1.78	6.85	12.33	23.50	14.62	61.98	5.21	25.54	1418.38	164.18	2.30	5.11	549.78
390	0.3	13.18	10.26	1.29	6.69	7.70	20.22	7.17	54.00	6.08	14.26	1579.37	168.96	2.59	3.39	267.67
	0.8	21.96	14.51	1.51	7.06	9.54	22.41	10.46	59.59	6.10	19.15	1606.99	176.97	2.62	4.10	391.29
	1.3	30.84	18.80	1.64	7.42	11.41	24.62	13.78	65.23	6.12	24.10	1634.88	185.07	2.66	4.82	516.17
	1.8	39.76	23.12	1.72	7.79	13.28	26.85	17.13	70.91	6.15	29.07	1662.95	193.21	2.70	5.54	641.80
450	0.3	14.18	11.36	1.25	7.68	8.71	23.19	8.25	61.97	7.01	16.29	1820.45	194.82	2.98	3.85	307.60
	0.8	22.55	15.46	1.46	8.03	10.54	25.49	12.01	67.84	7.03	21.65	1849.07	203.85	3.02	4.55	448.10
	1.3	31.01	19.59	1.58	8.39	12.38	27.81	15.80	73.77	7.06	27.06	1877.98	212.97	3.06	5.26	590.04
	1.8	39.52	23.76	1.66	8.74	14.24	30.14	19.62	79.73	7.08	32.51	1907.07	222.14	3.10	5.97	732.82
510	0.3	15.21	12.48	1.22	8.67	9.72	26.17	9.33	69.93	7.94	18.30	2061.47	220.67	3.38	4.30	347.39
	0.8	23.25	16.44	1.41	9.01	11.54	28.56	13.55	76.05	7.97	24.10	2091.00	230.69	3.42	5.00	504.54
	1.3	31.36	20.45	1.53	9.36	13.37	30.98	17.80	82.24	7.99	29.96	2120.83	240.81	3.46	5.70	663.29
	1.8	39.52	24.48	1.61	9.70	15.21	33.41	22.09	88.47	8.01	35.86	2150.84	250.99	3.50	6.41	822.99
570	0.3	11.74	11.35	1.03	9.67	10.73	29.13	10.41	77.87	8.88	20.30	2302.45	246.51	3.78	4.76	387.06
	0.8	11.74	11.35	1.03	10.00	12.54	31.62	15.08	84.23	8.90	26.53	2332.81	257.50	3.82	5.45	560.65
	1.3	11.74	11.35	1.03	10.33	14.35	34.13	19.80	90.67	8.92	32.82	2363.48	268.61	3.86	6.14	736.00
	1.8	11.74	11.35	1.03	10.66	16.18	36.65	24.55	97.13	8.94	39.15	2394.33	279.77	3.91	6.84	912.41
630	0.3	12.98	12.54	1.03	10.66	11.75	32.09	11.48	85.80	9.81	22.29	2543.39	272.35	4.17	5.21	426.63
	0.8	12.98	12.54	1.03	10.98	13.54	34.66	16.61	92.39	9.83	28.93	2574.52	284.29	4.22	5.90	616.47
	1.3	12.98	12.54	1.03	11.30	15.35	37.26	21.78	99.05	9.85	35.63	2605.96	296.35	4.26	6.59	808.25
	1.8	12.98	12.54	1.03	11.63	17.16	39.87	26.99	105.74	9.88	42.37	2637.60	308.49	4.31	7.28	1001.18

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.9c - Metabolizable amino acids requirements for **CROSSBRED** dairy cattle, **BULLS** in a **FEEDLOT** system

Average BW kg	ADG kg	Essentials, g										Non-Essentials, g								
		Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr	
330	0.3	6.23	2.31	6.34	11.60	9.39	1.69	5.76	5.52	0.96	5.92	9.59	12.64	8.10	9.39	8.10	7.92	6.26	5.30	
	0.8	16.86	6.25	17.15	31.39	25.41	4.57	15.60	14.93	2.61	16.03	25.96	34.21	21.93	25.42	21.93	21.44	16.95	14.34	
	1.3	27.60	10.23	28.08	51.39	41.60	7.49	25.54	24.45	4.27	26.25	42.50	56.00	35.90	41.62	35.90	35.10	27.74	23.48	
	1.8	38.40	14.23	39.07	71.50	57.88	10.42	35.53	34.01	5.94	36.52	59.14	77.92	49.96	57.91	49.96	48.85	38.60	32.67	
390	0.3	6.06	2.33	6.27	11.40	9.31	1.67	5.70	5.46	0.96	5.90	9.28	12.37	7.73	9.24	7.73	7.59	6.10	5.25	
	0.8	16.39	6.31	16.97	30.85	25.21	4.51	15.43	14.77	2.59	15.96	25.13	33.47	20.93	25.01	20.93	20.55	16.51	14.21	
	1.3	26.83	10.33	27.77	50.50	41.26	7.38	25.26	24.17	4.25	26.13	41.13	54.80	34.25	40.94	34.25	33.64	27.02	23.26	
	1.8	37.33	14.37	38.64	70.27	57.41	10.27	35.15	33.63	5.91	36.36	57.23	76.25	47.66	56.97	47.66	46.81	37.60	32.37	
450	0.3	5.91	2.35	6.21	11.23	9.25	1.65	5.65	5.40	0.95	5.88	9.03	12.14	7.43	9.11	7.43	7.32	5.96	5.21	
	0.8	16.00	6.36	16.81	30.40	25.03	4.46	15.29	14.62	2.58	15.91	24.43	32.86	20.10	24.66	20.10	19.81	16.14	14.10	
	1.3	26.18	10.41	27.51	49.76	40.98	7.30	25.02	23.94	4.23	26.04	39.99	53.79	32.90	40.37	32.90	32.44	26.42	23.08	
	1.8	36.43	14.49	38.28	69.24	57.02	10.15	34.82	33.31	5.88	36.23	55.65	74.84	45.78	56.17	45.78	45.13	36.77	32.12	
510	0.3	5.79	2.37	6.16	11.09	9.19	1.63	5.60	5.36	0.95	5.86	8.81	11.94	7.17	9.00	7.17	7.09	5.85	5.17	
	0.8	15.66	6.41	16.67	30.01	24.88	4.41	15.16	14.50	2.57	15.85	23.84	32.33	19.40	24.36	19.40	19.19	15.83	14.00	
	1.3	25.63	10.49	27.29	49.12	40.73	7.22	24.82	23.74	4.21	25.95	39.02	52.92	31.76	39.88	31.76	31.42	25.91	22.92	
	1.8	35.67	14.60	37.97	68.35	56.67	10.05	34.53	33.03	5.86	36.11	54.30	73.63	44.19	55.49	44.19	43.72	36.05	31.90	
570	0.3	5.68	2.38	6.11	10.96	9.14	1.61	5.56	5.32	0.95	5.84	8.62	11.77	6.95	8.90	6.95	6.89	5.75	5.14	
	0.8	15.37	6.45	16.55	29.66	24.75	4.37	15.05	14.39	2.56	15.81	23.32	31.86	18.80	24.10	18.80	18.66	15.55	13.92	
	1.3	25.16	10.56	27.09	48.56	40.51	7.15	24.64	23.56	4.20	25.88	38.18	52.16	30.78	39.45	30.78	30.54	25.46	22.78	
	1.8	35.00	14.69	37.69	67.56	56.37	9.95	34.28	32.78	5.84	36.01	53.13	72.58	42.83	54.89	42.83	42.49	35.43	31.70	
630	0.3	5.58	2.40	6.07	10.85	9.10	1.60	5.53	5.28	0.94	5.83	8.45	11.62	6.75	8.82	6.75	6.72	5.66	5.11	
	0.8	15.11	6.49	16.44	29.36	24.63	4.33	14.95	14.29	2.56	15.77	22.87	31.45	18.28	23.86	18.28	18.19	15.31	13.84	
	1.3	24.73	10.62	26.91	48.05	40.32	7.09	24.48	23.40	4.18	25.81	37.44	51.49	29.92	39.06	29.92	29.77	25.06	22.66	
	1.8	34.41	14.78	37.44	66.86	56.10	9.87	34.06	32.56	5.82	35.91	52.10	71.64	41.64	54.35	41.64	41.42	34.87	31.53	

*BW = body weight; ADG = average daily gain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine.

Table 17.10a - Nutritional requirements of **CROSSBRED** dairy cattle, **STEERS** in **FEEDLOT** system

Average BW kg	ADG kg	DMI, kg	Intake of water ¹ , L		Energy			Protein					
			Summer	Winter	ME, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
210	0.3	3.0	8.8	10.5	8.4	2.2	73.5	250	130	379	12.5	65.8	34.2
	0.8	4.8	9.7	11.4	12.1	3.2	68.2	377	175	553	11.6	68.3	31.7
	1.3	6.0	10.3	12.0	15.9	4.3	70.8	498	228	725	12.1	68.6	31.4
	1.8	6.8	10.6	12.4	19.7	5.2	77.3	610	287	897	13.2	68.0	32.0
270	0.3	4.0	11.5	13.2	9.9	2.7	66.9	304	144	448	11.2	67.9	32.1
	0.8	5.7	12.3	14.0	14.1	3.8	66.4	440	193	634	11.1	69.5	30.5
	1.3	7.0	12.9	14.6	18.4	4.9	70.6	568	251	819	11.7	69.3	30.7
	1.8	7.7	13.3	15.0	22.7	6.0	77.9	687	317	1004	13.0	68.4	31.6
330	0.3	4.9	14.0	15.7	11.4	3.1	63.1	355	159	515	10.5	69.1	30.9
	0.8	6.6	14.8	16.5	16.0	4.3	65.3	500	216	717	10.8	69.8	30.2
	1.3	7.9	15.4	17.1	20.8	5.6	70.6	635	283	918	11.6	69.2	30.8
	1.8	8.7	15.8	17.5	25.6	6.8	78.4	760	358	1118	12.9	67.9	32.1
390	0.3	5.8	16.4	18.1	12.9	3.5	60.7	403	175	578	10.0	69.8	30.2
	0.8	7.5	17.2	18.9	17.9	4.9	64.5	556	239	796	10.6	69.9	30.1
	1.3	8.8	17.8	19.5	23.1	6.2	70.7	698	314	1012	11.6	68.9	31.1
	1.8	9.5	18.2	19.9	28.4	7.5	78.9	826	400	1226	12.9	67.4	32.6
450	0.3	6.6	18.7	20.4	14.2	3.9	58.9	445	183	628	9.5	70.9	29.1
	0.8	8.4	19.5	21.2	19.7	5.3	64.0	599	242	842	10.1	71.2	28.8
	1.3	9.6	20.1	21.8	25.3	6.8	70.8	740	313	1053	11.0	70.3	29.7
	1.8	10.4	20.5	22.2	31.1	8.2	79.4	867	395	1262	12.2	68.7	31.3
510	0.3	7.4	20.9	22.6	15.6	4.3	57.7	485	192	677	9.1	71.7	28.3
	0.8	9.2	21.7	23.4	21.5	5.8	63.6	640	246	886	9.7	72.3	27.7
	1.3	10.4	22.3	24.1	27.5	7.4	70.9	779	313	1092	10.5	71.4	28.6
	1.8	11.2	22.7	24.4	33.7	8.9	79.8	903	393	1296	11.6	69.7	30.3
570	0.3	8.2	23.0	24.8	16.9	4.7	56.7	523	201	723	8.8	72.3	27.7
	0.8	10.0	23.9	25.6	23.2	6.3	63.3	678	250	928	9.3	73.0	27.0
	1.3	11.2	24.5	26.2	29.7	8.0	71.0	815	314	1130	10.1	72.2	27.8
	1.8	12.0	24.9	26.6	36.3	9.6	80.2	935	393	1328	11.1	70.4	29.6
630	0.3	9.0	25.1	26.9	18.2	5.0	55.9	559	210	769	8.6	72.7	27.3
	0.8	10.7	26.0	27.7	24.9	6.8	63.1	713	256	969	9.0	73.6	26.4
	1.3	12.0	26.6	28.3	31.8	8.5	71.2	849	317	1166	9.7	72.8	27.2
	1.8	12.7	27.0	28.7	38.8	10.3	80.6	963	396	1359	10.7	70.9	29.1

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME = metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein. ¹Winter = 22°C of maximum temperature and 65% of relative humidity; Summer = 29°C of maximum temperature and 79% of relative humidity.

Table 17.10b - Minerals requirements for **CROSSBRED** dairy cattle, **STEERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Macrominerals, g							Microminerals, mg							
		Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Mo	Se	Zn
210	0.3	10.65	7.11	1.50	3.74	4.69	11.24	3.91	29.96	3.28	8.07	855.59	91.26	1.40	2.04	146.85
	0.8	21.43	12.10	1.77	4.16	6.60	13.02	5.77	34.49	3.30	11.38	879.27	96.06	1.43	2.78	218.06
	1.3	32.32	17.14	1.89	4.59	8.53	14.83	7.65	39.05	3.32	14.73	903.18	100.90	1.46	3.53	290.00
	1.8	43.28	22.21	1.95	5.01	10.47	16.64	9.54	43.65	3.35	18.09	927.24	105.78	1.48	4.28	362.37
270	0.3	11.37	8.11	1.40	4.72	5.69	14.25	5.01	38.01	4.21	10.17	1097.00	117.20	1.79	2.49	187.62
	0.8	21.27	12.78	1.66	5.12	7.57	16.19	7.37	42.95	4.23	14.06	1122.23	123.13	1.83	3.22	277.14
	1.3	31.27	17.50	1.79	5.51	9.47	18.15	9.75	47.94	4.26	17.99	1147.73	129.13	1.86	3.95	367.57
	1.8	41.34	22.24	1.86	5.92	11.39	20.12	12.14	52.95	4.28	21.95	1173.38	135.16	1.89	4.69	458.55
330	0.3	12.22	9.17	1.33	5.70	6.69	17.24	6.11	46.03	5.15	12.24	1338.26	143.11	2.19	2.94	228.17
	0.8	21.47	13.59	1.58	6.08	8.55	19.32	8.95	51.32	5.17	16.67	1364.82	150.15	2.23	3.66	335.64
	1.3	30.82	18.07	1.71	6.46	10.43	21.42	11.83	56.67	5.19	21.15	1391.65	157.25	2.26	4.38	444.21
	1.8	40.22	22.56	1.78	6.84	12.32	23.53	14.72	62.05	5.21	25.65	1418.64	164.40	2.30	5.11	553.42
390	0.3	13.16	10.25	1.28	6.69	7.70	20.22	7.20	54.02	6.08	14.28	1579.43	169.01	2.59	3.39	268.56
	0.8	21.90	14.48	1.51	7.05	9.54	22.42	10.53	59.63	6.10	19.22	1607.13	177.12	2.62	4.10	393.68
	1.3	30.73	18.76	1.64	7.42	11.40	24.65	13.89	65.30	6.12	24.21	1635.13	185.30	2.66	4.82	520.08
	1.8	39.62	23.07	1.72	7.78	13.27	26.88	17.28	71.01	6.14	29.23	1663.29	193.54	2.70	5.54	647.24
450	0.3	14.15	11.35	1.25	7.68	8.71	23.20	8.29	61.99	7.01	16.32	1820.52	194.89	2.98	3.85	308.80
	0.8	22.48	15.43	1.46	8.03	10.54	25.51	12.10	67.89	7.03	21.73	1849.25	204.04	3.02	4.55	451.34
	1.3	30.90	19.55	1.58	8.38	12.38	27.84	15.95	73.85	7.06	27.20	1878.28	213.28	3.06	5.26	595.33
	1.8	39.36	23.69	1.66	8.74	14.23	30.19	19.82	79.85	7.08	32.71	1907.48	222.58	3.10	5.97	740.19
510	0.3	15.18	12.47	1.22	8.67	9.72	26.17	9.37	69.95	7.94	18.34	2061.55	220.76	3.38	4.30	348.92
	0.8	23.17	16.41	1.41	9.01	11.53	28.58	13.66	76.11	7.97	24.21	2091.22	230.94	3.42	5.00	508.66
	1.3	31.23	20.40	1.53	9.35	13.36	31.02	17.99	82.34	7.99	30.14	2121.18	241.21	3.46	5.70	670.04
	1.8	39.35	24.41	1.61	9.69	15.20	33.46	22.35	88.61	8.01	36.11	2151.33	251.55	3.51	6.40	832.38
570	0.3	11.74	11.35	1.03	9.67	10.73	29.14	10.46	77.90	8.88	20.35	2302.54	246.62	3.78	4.76	388.93
	0.8	11.74	11.35	1.03	9.99	12.53	31.64	15.22	84.31	8.90	26.65	2333.06	257.80	3.82	5.45	565.70
	1.3	11.74	11.35	1.03	10.32	14.35	34.17	20.03	90.78	8.92	33.03	2363.88	269.09	3.86	6.14	744.28
	1.8	11.74	11.35	1.03	10.66	16.18	36.71	24.87	97.30	8.94	39.44	2394.89	280.45	3.91	6.84	923.93
630	0.3	12.98	12.54	1.03	10.66	11.75	32.11	11.54	85.83	9.81	22.35	2543.49	272.48	4.17	5.21	428.85
	0.8	12.98	12.54	1.03	10.98	13.53	34.69	16.77	92.47	9.83	29.08	2574.79	284.64	4.22	5.90	622.49
	1.3	12.98	12.54	1.03	11.30	15.34	37.31	22.06	99.18	9.85	35.87	2606.41	296.93	4.26	6.59	818.11
	1.8	12.98	12.54	1.03	11.62	17.16	39.94	27.38	105.92	9.88	42.71	2638.22	309.29	4.31	7.28	1014.90

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.10c - Metabolizable amino acids requirements for **CROSSBRED** dairy cattle, **STEERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Essentials, g										Non-Essentials, g								
		Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr	
330	0.3	6.22	2.31	6.33	11.59	9.38	1.69	5.76	5.51	0.96	5.92	9.57	12.62	8.08	9.38	8.08	7.90	6.25	5.30	
	0.8	16.83	6.25	17.14	31.36	25.40	4.57	15.59	14.92	2.61	16.03	25.91	34.16	21.87	25.40	21.87	21.39	16.92	14.33	
	1.3	27.55	10.24	28.06	51.33	41.57	7.48	25.52	24.43	4.27	26.24	42.41	55.92	35.80	41.57	35.80	35.01	27.70	23.46	
	1.8	38.33	14.24	39.04	71.42	57.85	10.41	35.51	33.99	5.94	36.51	59.02	77.81	49.81	57.85	49.81	48.71	38.54	32.65	
390	0.3	6.04	2.33	6.26	11.38	9.31	1.66	5.70	5.45	0.96	5.90	9.26	12.35	7.70	9.23	7.70	7.57	6.09	5.25	
	0.8	16.35	6.31	16.95	30.81	25.19	4.51	15.42	14.75	2.59	15.96	25.06	33.42	20.85	24.98	20.85	20.48	16.47	14.20	
	1.3	26.77	10.34	27.75	50.43	41.23	7.38	25.24	24.15	4.24	26.12	41.02	54.70	34.12	40.89	34.12	33.53	26.97	23.25	
	1.8	37.24	14.38	38.61	70.18	57.38	10.26	35.12	33.60	5.91	36.35	57.08	76.11	47.48	56.89	47.48	46.65	37.52	32.34	
450	0.3	5.89	2.35	6.20	11.21	9.24	1.64	5.64	5.40	0.95	5.87	9.00	12.12	7.39	9.10	7.39	7.29	5.95	5.21	
	0.8	15.95	6.37	16.79	30.35	25.01	4.45	15.27	14.61	2.58	15.90	24.35	32.79	20.01	24.62	20.01	19.73	16.10	14.09	
	1.3	26.11	10.42	27.48	49.68	40.95	7.29	25.00	23.91	4.23	26.03	39.87	53.67	32.75	40.31	32.75	32.30	26.36	23.06	
	1.8	36.34	14.50	38.24	69.12	56.97	10.14	34.78	33.27	5.88	36.21	55.47	74.68	45.57	56.08	45.57	44.95	36.67	32.09	
510	0.3	5.77	2.37	6.15	11.07	9.19	1.63	5.60	5.35	0.95	5.86	8.78	11.92	7.13	8.98	7.13	7.06	5.83	5.17	
	0.8	15.61	6.42	16.65	29.95	24.86	4.40	15.14	14.48	2.57	15.85	23.75	32.25	19.30	24.32	19.30	19.10	15.78	13.99	
	1.3	25.56	10.50	27.25	49.03	40.69	7.21	24.79	23.71	4.21	25.94	38.88	52.79	31.60	39.81	31.60	31.27	25.83	22.90	
	1.8	35.56	14.61	37.92	68.22	56.62	10.03	34.49	32.99	5.86	36.09	54.10	73.46	43.96	55.39	43.96	43.51	35.95	31.87	
570	0.3	5.66	2.39	6.11	10.94	9.14	1.61	5.55	5.31	0.95	5.84	8.58	11.74	6.91	8.89	6.91	6.86	5.73	5.14	
	0.8	15.31	6.46	16.53	29.60	24.72	4.36	15.03	14.37	2.56	15.80	23.23	31.78	18.70	24.05	18.70	18.56	15.50	13.90	
	1.3	25.07	10.57	27.05	48.45	40.47	7.14	24.61	23.53	4.19	25.86	38.03	52.02	30.60	39.37	30.60	30.38	25.38	22.76	
	1.8	34.88	14.71	37.64	67.42	56.32	9.94	34.24	32.73	5.83	35.99	52.92	72.39	42.58	54.78	42.58	42.27	35.31	31.67	
630	0.3	5.56	2.40	6.07	10.82	9.09	1.60	5.52	5.27	0.94	5.82	8.41	11.59	6.71	8.80	6.71	6.68	5.64	5.11	
	0.8	15.05	6.50	16.42	29.29	24.60	4.33	14.93	14.27	2.55	15.76	22.77	31.36	18.17	23.81	18.17	18.08	15.26	13.83	
	1.3	24.64	10.63	26.87	47.94	40.27	7.08	24.44	23.36	4.18	25.80	37.28	51.34	29.74	38.98	29.74	29.60	24.98	22.63	
	1.8	34.28	14.80	37.39	66.71	56.04	9.85	34.01	32.51	5.82	35.89	51.87	71.43	41.38	54.23	41.38	41.19	34.75	31.49	

*BW = body weight; ADG = average daily gain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine.

Table 17.11a - Nutritional requirements of **CROSSBRED** dairy cattle, **HEIFERS** in **FEEDLOT** system

Average BW kg	ADG kg	DMI kg	Intake of water ¹ , L		Energy			Protein					
			Summer	Winter	ME, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
210	0.3	3.0	8.8	10.5	8.5	2.3	74.4	253	129	382	12.6	66.2	33.8
	0.8	4.8	9.7	11.4	12.3	3.3	69.5	384	175	559	11.7	68.7	31.3
	1.3	6.0	10.3	12.0	16.3	4.4	72.5	507	228	736	12.2	69.0	31.0
	1.8	6.8	10.6	12.4	20.3	5.4	79.3	622	289	911	13.5	68.3	31.7
270	0.3	4.0	11.5	13.2	10.1	2.7	67.9	308	143	452	11.3	68.3	31.7
	0.8	5.7	12.3	14.0	14.4	3.9	67.9	449	195	644	11.2	69.7	30.3
	1.3	7.0	12.9	14.6	18.9	5.1	72.5	581	255	836	12.0	69.5	30.5
	1.8	7.7	13.3	15.0	23.5	6.2	80.2	703	324	1026	13.3	68.5	31.5
330	0.3	4.9	14.0	15.7	11.6	3.2	64.2	361	160	521	10.6	69.3	30.7
	0.8	6.6	14.8	16.5	16.5	4.4	66.9	512	221	733	11.0	69.8	30.2
	1.3	7.9	15.4	17.1	21.5	5.7	72.7	652	292	945	12.0	69.1	30.9
	1.8	8.7	15.8	17.5	26.5	7.0	80.9	781	373	1154	13.3	67.7	32.3
390	0.3	5.8	16.4	18.1	13.1	3.6	61.8	407	170	578	10.0	70.6	29.4
	0.8	7.5	17.2	18.9	18.4	5.0	66.2	563	230	793	10.6	71.0	29.0
	1.3	8.8	17.8	19.5	23.9	6.4	72.9	706	301	1006	11.5	70.1	29.9
	1.8	9.5	18.2	19.9	29.5	7.8	81.6	835	383	1218	12.8	68.6	31.4
450	0.3	6.6	18.7	20.4	14.5	4.0	60.1	450	177	628	9.5	71.7	28.3
	0.8	8.4	19.5	21.2	20.3	5.5	65.8	607	231	838	10.0	72.4	27.6
	1.3	9.6	20.1	21.8	26.3	7.0	73.1	749	298	1046	10.9	71.6	28.4
	1.8	10.4	20.5	22.2	32.3	8.5	82.3	875	377	1252	12.1	69.9	30.1
510	0.3	7.4	20.9	22.6	15.9	4.4	58.8	490	185	676	9.1	72.6	27.4
	0.8	9.2	21.7	23.4	22.2	6.0	65.5	648	234	882	9.6	73.5	26.5
	1.3	10.4	22.3	24.1	28.6	7.6	73.3	788	296	1085	10.4	72.7	27.3
	1.8	11.2	22.7	24.4	35.1	9.3	82.9	911	374	1284	11.5	70.9	29.1
570	0.3	8.2	23.0	24.8	17.3	4.8	57.9	528	194	722	8.8	73.2	26.8
	0.8	10.0	23.9	25.6	24.0	6.5	65.2	686	238	924	9.3	74.3	25.7
	1.3	11.2	24.5	26.2	30.9	8.2	73.6	824	297	1121	10.0	73.5	26.5
	1.8	12.0	24.9	26.6	37.9	10.0	83.4	942	373	1315	11.0	71.6	28.4
630	0.3	9.0	25.1	26.9	18.7	5.1	57.2	565	203	768	8.5	73.6	26.4
	0.8	10.7	26.0	27.7	25.8	7.0	65.1	722	242	964	9.0	74.9	25.1
	1.3	12.0	26.6	28.3	33.1	8.8	73.8	857	299	1157	9.7	74.1	25.9
	1.8	12.7	27.0	28.7	40.6	10.7	83.9	969	375	1344	10.6	72.1	27.9

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME = metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein. ¹Winter = 22°C of maximum temperature and 65% of relative humidity; Summer = 29°C of maximum temperature and 79% of relative humidity.

Table 17.11b - Minerals requirements for **CROSSBRED** dairy cattle, **HEIFERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Macrominerals, g							Microminerals, mg							
		Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Mo	Se	Zn
210	0.3	10.62	7.10	1.50	3.74	4.69	11.25	3.93	29.98	3.28	8.09	855.63	91.29	1.40	2.04	147.31
	0.8	21.36	12.07	1.77	4.16	6.60	13.04	5.81	34.52	3.30	11.42	879.38	96.13	1.43	2.78	219.29
	1.3	32.21	17.10	1.88	4.58	8.53	14.84	7.70	39.10	3.32	14.79	903.37	101.03	1.46	3.53	292.01
	1.8	43.13	22.15	1.95	5.01	10.47	16.66	9.61	43.72	3.35	18.18	927.50	105.95	1.48	4.28	365.16
270	0.3	11.34	8.10	1.40	4.72	5.69	14.25	5.03	38.03	4.21	10.19	1097.05	117.24	1.80	2.49	188.31
	0.8	21.19	12.75	1.66	5.11	7.57	16.20	7.42	42.99	4.23	14.12	1122.38	123.25	1.83	3.21	279.00
	1.3	31.15	17.45	1.78	5.51	9.47	18.18	9.83	48.00	4.26	18.09	1147.97	129.32	1.86	3.95	370.63
	1.8	41.17	22.18	1.86	5.91	11.38	20.16	12.25	53.04	4.28	22.08	1173.71	135.42	1.89	4.69	462.80
330	0.3	12.19	9.15	1.33	5.70	6.69	17.25	6.13	46.04	5.15	12.26	1338.33	143.17	2.19	2.94	229.12
	0.8	21.39	13.56	1.58	6.08	8.55	19.34	9.02	51.37	5.17	16.74	1364.99	150.30	2.23	3.66	338.19
	1.3	30.69	18.02	1.70	6.46	10.43	21.45	11.94	56.75	5.19	21.27	1391.93	157.51	2.26	4.38	448.38
	1.8	40.04	22.50	1.78	6.84	12.32	23.57	14.88	62.16	5.21	25.82	1419.03	164.76	2.30	5.11	559.23
390	0.3	13.13	10.24	1.28	6.69	7.70	20.23	7.23	54.04	6.08	14.32	1579.50	169.08	2.59	3.39	269.76
	0.8	21.82	14.45	1.51	7.05	9.54	22.45	10.62	59.69	6.10	19.31	1607.34	177.31	2.63	4.10	396.95
	1.3	30.60	18.71	1.64	7.41	11.40	24.68	14.04	65.39	6.12	24.36	1635.46	185.62	2.66	4.81	525.43
	1.8	39.43	23.00	1.71	7.78	13.27	26.93	17.48	71.14	6.14	29.43	1663.74	193.99	2.70	5.53	654.68
450	0.3	14.12	11.34	1.25	7.68	8.71	23.21	8.33	62.01	7.01	16.36	1820.60	194.98	2.98	3.85	310.28
	0.8	22.39	15.40	1.45	8.03	10.53	25.53	12.21	67.95	7.03	21.84	1849.48	204.28	3.02	4.55	455.35
	1.3	30.75	19.49	1.58	8.38	12.37	27.88	16.13	73.96	7.06	27.38	1878.65	213.68	3.06	5.25	601.91
	1.8	39.16	23.62	1.66	8.73	14.23	30.24	20.07	80.00	7.08	32.95	1908.00	223.13	3.10	5.96	749.33
510	0.3	10.51	12.45	0.84	8.67	9.72	26.18	9.42	69.97	7.94	18.38	2061.64	220.87	3.38	4.30	350.69
	0.8	10.51	16.38	0.64	9.01	11.53	28.61	13.79	76.18	7.97	24.33	2091.46	231.22	3.42	4.99	513.45
	1.3	10.51	20.34	0.52	9.35	13.36	31.06	18.21	82.46	7.99	30.34	2121.59	241.68	3.46	5.69	677.88
	1.8	10.51	24.33	0.43	9.69	15.19	33.52	22.65	88.77	8.01	36.39	2151.89	252.20	3.51	6.40	843.29
570	0.3	11.74	11.35	1.03	9.66	10.73	29.15	10.52	77.92	8.88	20.40	2302.64	246.75	3.78	4.76	390.99
	0.8	11.74	11.35	1.03	9.99	12.53	31.67	15.38	84.38	8.90	26.80	2333.32	258.13	3.82	5.44	571.29
	1.3	11.74	11.35	1.03	10.32	14.34	34.22	20.28	90.91	8.92	33.26	2364.32	269.63	3.86	6.14	753.42
	1.8	11.74	11.35	1.03	10.65	16.17	36.78	25.22	97.47	8.94	39.76	2395.50	281.20	3.91	6.84	936.65
630	0.3	12.98	12.54	1.03	10.66	11.74	32.12	11.61	85.86	9.81	22.40	2543.60	272.61	4.17	5.21	431.22
	0.8	12.98	12.54	1.03	10.97	13.53	34.72	16.95	92.55	9.83	29.23	2575.08	285.01	4.22	5.89	628.89
	1.3	12.98	12.54	1.03	11.30	15.33	37.36	22.35	99.31	9.85	36.13	2606.88	297.54	4.26	6.58	828.58
	1.8	12.98	12.54	1.03	11.62	17.15	40.01	27.78	106.11	9.88	43.07	2638.87	310.14	4.31	7.28	1029.47

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.11c - Metabolizable amino acids requirements for **CROSSBRED** dairy cattle, **HEIFERS** in a **FEEDLOT** system

Average BW kg	ADG kg	Essentials, g										Non-Essentials, g								
		Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr	
330	0.3	6.20	2.31	6.33	11.57	9.38	1.69	5.75	5.51	0.96	5.92	9.54	12.60	8.04	9.37	8.04	7.87	6.24	5.29	
	0.8	16.78	6.26	17.12	31.30	25.38	4.56	15.57	14.91	2.61	16.02	25.83	34.09	21.77	25.35	21.77	21.30	16.87	14.32	
	1.3	27.47	10.25	28.03	51.24	41.54	7.47	25.49	24.40	4.27	26.23	42.28	55.80	35.63	41.50	35.63	34.86	27.62	23.44	
	1.8	38.23	14.26	39.00	71.30	57.80	10.39	35.47	33.95	5.93	36.50	58.82	77.64	49.58	57.75	49.58	48.51	38.44	32.62	
390	0.3	6.02	2.34	6.26	11.36	9.30	1.66	5.69	5.44	0.96	5.89	9.23	12.32	7.66	9.21	7.66	7.53	6.07	5.24	
	0.8	16.30	6.32	16.93	30.75	25.17	4.50	15.40	14.73	2.59	15.95	24.97	33.34	20.74	24.93	20.74	20.39	16.43	14.19	
	1.3	26.68	10.35	27.71	50.34	41.20	7.36	25.21	24.12	4.24	26.11	40.88	54.57	33.95	40.81	33.95	33.37	26.89	23.22	
	1.8	37.13	14.40	38.56	70.04	57.32	10.25	35.07	33.56	5.90	36.33	56.88	75.93	47.24	56.79	47.24	46.43	37.41	32.31	
450	0.3	5.87	2.36	6.20	11.19	9.23	1.64	5.64	5.39	0.95	5.87	8.96	12.08	7.35	9.08	7.35	7.25	5.93	5.20	
	0.8	15.90	6.38	16.77	30.29	24.99	4.44	15.25	14.59	2.58	15.89	24.26	32.71	19.90	24.58	19.90	19.64	16.05	14.07	
	1.3	26.03	10.44	27.45	49.58	40.91	7.27	24.97	23.88	4.22	26.01	39.71	53.54	32.57	40.23	32.57	32.14	26.27	23.04	
	1.8	36.21	14.52	38.19	68.98	56.92	10.12	34.74	33.23	5.88	36.20	55.26	74.49	45.32	55.98	45.32	44.72	36.56	32.05	
510	0.3	5.75	2.37	6.14	11.04	9.18	1.62	5.59	5.34	0.95	5.85	8.74	11.88	7.09	8.97	7.09	7.02	5.81	5.16	
	0.8	15.56	6.42	16.63	29.88	24.83	4.40	15.12	14.46	2.57	15.84	23.66	32.16	19.19	24.27	19.19	19.00	15.73	13.97	
	1.3	25.46	10.51	27.22	48.92	40.65	7.20	24.76	23.67	4.21	25.93	38.72	52.65	31.41	39.72	31.41	31.10	25.75	22.87	
	1.8	35.43	14.63	37.87	68.07	56.57	10.01	34.45	32.94	5.85	36.07	53.88	73.26	43.71	55.27	43.71	43.28	35.83	31.83	
570	0.3	5.64	2.39	6.10	10.91	9.13	1.61	5.55	5.30	0.95	5.83	8.55	11.71	6.87	8.87	6.87	6.82	5.71	5.13	
	0.8	15.26	6.47	16.50	29.53	24.70	4.35	15.01	14.35	2.56	15.79	23.13	31.69	18.58	24.00	18.58	18.46	15.45	13.89	
	1.3	24.98	10.58	27.01	48.34	40.43	7.13	24.57	23.49	4.19	25.85	37.87	51.87	30.41	39.28	30.41	30.21	25.29	22.73	
	1.8	34.75	14.73	37.59	67.27	56.26	9.92	34.19	32.68	5.83	35.97	52.69	72.18	42.32	54.66	42.32	42.04	35.19	31.63	
630	0.3	5.54	2.40	6.06	10.80	9.08	1.60	5.51	5.27	0.94	5.82	8.38	11.55	6.67	8.78	6.67	6.64	5.62	5.10	
	0.8	14.99	6.50	16.39	29.22	24.58	4.32	14.91	14.25	2.55	15.75	22.67	31.27	18.05	23.76	18.05	17.98	15.20	13.81	
	1.3	24.54	10.65	26.83	47.83	40.23	7.07	24.41	23.33	4.18	25.78	37.11	51.18	29.55	38.89	29.55	29.43	24.89	22.60	
	1.8	34.15	14.81	37.33	66.55	55.98	9.83	33.96	32.46	5.81	35.87	51.64	71.22	41.11	54.11	41.11	40.95	34.63	31.45	

*BW = body weight; ADG = average daily gain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine.

Table 17.12a - Nutritional requirements of **ZEBU** beef cattle, **BULLS** in **PASTURE** system

Average BW kg	ADG kg	DMI, kg	Intake of water ¹ , L		Energy			Protein					
			Summer	Winter	ME, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
210	0.3	3.5	9.0	10.8	8.4	2.3	65.2	261	141	402	11.5	64.8	35.2
	0.8	5.0	9.8	11.5	11.4	3.1	62.6	374	199	573	11.5	65.3	34.7
	1.3	6.0	10.3	12.0	14.6	4.0	66.0	484	260	744	12.4	65.0	35.0
	1.8	6.6	10.5	12.3	17.9	4.8	73.1	589	326	916	14.0	64.4	35.6
270	0.3	4.5	11.7	13.4	9.9	2.7	60.9	315	160	475	10.6	66.4	33.6
	0.8	5.9	12.4	14.1	13.2	3.6	61.0	435	223	658	11.1	66.1	33.9
	1.3	6.9	12.9	14.6	16.7	4.5	65.3	551	291	842	12.1	65.4	34.6
	1.8	7.5	13.2	14.9	20.4	5.5	72.6	662	363	1025	13.6	64.5	35.5
330	0.3	5.4	14.2	15.9	11.4	3.1	58.2	366	179	546	10.2	67.1	32.9
	0.8	6.8	14.9	16.6	14.9	4.1	59.9	493	251	744	10.9	66.2	33.8
	1.3	7.8	15.4	17.1	18.8	5.1	64.8	615	328	943	12.0	65.2	34.8
	1.8	8.4	15.7	17.4	22.8	6.1	72.4	732	410	1141	13.6	64.1	35.9
390	0.3	6.2	16.6	18.3	12.7	3.5	56.4	414	200	614	9.9	67.5	32.5
	0.8	7.7	17.3	19.0	16.6	4.5	59.1	547	280	827	10.8	66.1	33.9
	1.3	8.7	17.8	19.5	20.7	5.6	64.5	675	366	1041	12.0	64.9	35.1
	1.8	9.3	18.1	19.8	25.1	6.7	72.2	797	457	1254	13.5	63.5	36.5
450	0.3	7.1	18.9	20.6	14.0	3.9	55.1	456	212	668	9.5	68.3	31.7
	0.8	8.5	19.6	21.3	18.1	5.0	58.5	589	288	877	10.3	67.1	32.9
	1.3	9.5	20.1	21.8	22.6	6.1	64.2	717	370	1087	11.4	66.0	34.0
	1.8	10.1	20.4	22.1	27.3	7.3	72.1	837	458	1295	12.8	64.6	35.4
510	0.3	7.9	21.1	22.8	15.3	4.2	54.1	496	225	720	9.2	68.8	31.2
	0.8	9.3	21.8	23.5	19.7	5.4	58.0	629	297	926	9.9	67.9	32.1
	1.3	10.3	22.3	24.0	24.4	6.6	64.0	756	375	1130	10.9	66.8	33.2
	1.8	10.9	22.6	24.3	29.4	7.9	72.1	874	460	1334	12.2	65.5	34.5
570	0.3	8.6	23.2	25.0	16.5	4.6	53.3	533	238	771	8.9	69.2	30.8
	0.8	10.1	24.0	25.7	21.2	5.8	57.6	666	306	972	9.6	68.5	31.5
	1.3	11.1	24.4	26.2	26.2	7.1	63.9	791	381	1173	10.5	67.5	32.5
	1.8	11.7	24.7	26.5	31.5	8.4	72.0	907	464	1371	11.7	66.2	33.8
630	0.3	9.4	25.3	27.1	17.7	4.9	52.6	569	251	821	8.7	69.4	30.6
	0.8	10.9	26.0	27.8	22.6	6.2	57.3	701	316	1018	9.4	68.9	31.1
	1.3	11.9	26.5	28.3	27.9	7.6	63.8	825	388	1213	10.2	68.0	32.0
	1.8	12.4	26.8	28.6	33.5	9.0	72.0	938	469	1407	11.3	66.7	33.3

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME = metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein. ¹Winter = 22°C of maximum temperature and 65% of relative humidity; Summer = 29°C of maximum temperature and 79% of relative humidity.

Table 17.12b - Minerals requirements for **ZEBU** beef cattle **BULLS**, in **PASTURE** system

Average BW kg	ADG kg	Macrominerals, g							Microminerals, mg							
		Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Mo	Se	Zn
210	0.3	9.91	6.71	1.48	3.78	4.48	11.23	3.91	29.96	3.28	8.06	855.56	91.24	1.40	2.04	146.52
	0.8	19.44	11.02	1.76	4.28	6.04	13.01	5.75	34.46	3.30	11.35	879.18	96.00	1.43	2.78	217.15
	1.3	29.07	15.38	1.89	4.79	7.61	14.79	7.61	39.02	3.32	14.68	903.05	100.81	1.45	3.53	288.50
	1.8	38.75	19.76	1.96	5.30	9.19	16.59	9.48	43.60	3.35	18.02	927.05	105.65	1.48	4.28	360.28
270	0.3	10.48	7.68	1.36	4.78	5.43	14.18	4.99	37.99	4.21	10.14	1096.92	117.14	1.79	2.49	186.71
	0.8	18.87	11.62	1.62	5.28	6.87	16.01	7.30	42.90	4.23	13.99	1122.04	122.98	1.83	3.22	274.67
	1.3	27.34	15.59	1.75	5.79	8.33	17.85	9.64	47.85	4.26	17.87	1147.41	128.88	1.86	3.95	363.54
	1.8	35.87	19.59	1.83	6.30	9.80	19.71	11.99	52.83	4.28	21.78	1172.93	134.81	1.89	4.69	452.93
330	0.3	11.24	8.71	1.29	5.78	6.40	17.12	6.06	46.00	5.15	12.19	1338.15	143.02	2.19	2.94	226.62
	0.8	18.81	12.37	1.52	6.28	7.76	18.99	8.84	51.24	5.17	16.54	1364.52	149.89	2.23	3.66	331.43
	1.3	26.47	16.06	1.65	6.79	9.13	20.88	11.64	56.54	5.19	20.94	1391.17	156.83	2.26	4.39	437.31
	1.8	34.17	19.78	1.73	7.30	10.51	22.79	14.45	61.87	5.21	25.37	1417.97	163.82	2.29	5.12	543.82
390	0.3	12.11	9.78	1.24	6.78	7.38	20.06	7.14	53.98	6.08	14.22	1579.28	168.87	2.59	3.39	266.30
	0.8	19.07	13.22	1.44	7.28	8.67	21.97	10.36	59.52	6.10	19.05	1606.75	176.75	2.62	4.10	387.57
	1.3	26.10	16.70	1.56	7.79	9.97	23.90	13.62	65.13	6.12	23.93	1634.50	184.70	2.66	4.82	510.07
	1.8	33.18	20.19	1.64	8.30	11.28	25.84	16.89	70.77	6.15	28.84	1662.42	192.70	2.70	5.54	633.31
450	0.3	13.06	10.87	1.20	7.78	8.37	22.99	8.20	61.94	7.01	16.24	1820.35	194.71	2.98	3.85	305.79
	0.8	19.53	14.14	1.38	8.28	9.60	24.94	11.87	67.76	7.03	21.51	1848.79	203.56	3.02	4.55	443.20
	1.3	26.07	17.43	1.50	8.79	10.85	26.90	15.58	73.64	7.06	26.84	1877.52	212.49	3.06	5.26	582.01
	1.8	32.65	20.75	1.57	9.30	12.10	28.88	19.31	79.55	7.08	32.20	1906.43	221.47	3.10	5.98	721.65
510	0.3	14.06	11.98	1.17	8.77	9.36	25.92	9.27	69.89	7.94	18.24	2061.35	220.54	3.38	4.30	345.13
	0.8	20.14	15.10	1.33	9.28	10.55	27.90	13.38	75.96	7.97	23.94	2090.68	230.33	3.42	5.00	498.40
	1.3	26.27	18.25	1.44	9.79	11.75	29.89	17.53	82.09	7.99	29.70	2120.30	240.22	3.46	5.70	653.25
	1.8	32.45	21.42	1.51	10.30	12.96	31.90	21.70	88.26	8.01	35.49	2150.10	250.16	3.50	6.41	809.01
570	0.3	11.74	11.35	1.03	9.77	10.35	28.85	10.33	77.83	8.88	20.23	2302.32	246.35	3.78	4.76	384.32
	0.8	11.74	11.35	1.03	10.28	11.50	30.85	14.87	84.13	8.90	26.34	2332.44	257.07	3.82	5.45	553.23
	1.3	11.74	11.35	1.03	10.79	12.66	32.88	19.46	90.49	8.92	32.51	2362.88	267.89	3.86	6.15	723.87
	1.8	11.74	11.35	1.03	11.30	13.83	34.91	24.08	96.89	8.94	38.71	2393.50	278.78	3.90	6.85	895.52
630	0.3	12.98	12.54	1.03	10.77	11.35	31.78	11.39	85.76	9.81	22.21	2543.24	272.16	4.17	5.21	423.40
	0.8	12.98	12.54	1.03	11.28	12.47	33.81	16.36	92.27	9.83	28.71	2574.11	283.78	4.22	5.90	607.73
	1.3	12.98	12.54	1.03	11.79	13.59	35.85	21.38	98.85	9.85	35.27	2605.30	295.52	4.26	6.59	793.95
	1.8	12.98	12.54	1.03	12.30	14.73	37.92	26.44	105.47	9.88	41.88	2636.68	307.33	4.31	7.29	981.28

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.12c - Metabolizable amino acids requirements for **ZEBU** beef cattle, **BULLS** in **PASTURE** system

Average BW kg	ADG kg	Essentials, g										Non-Essentials, g								
		Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr	
330	0.3	6.25	2.31	6.34	11.62	9.40	1.69	5.77	5.52	0.96	5.93	9.63	12.67	8.14	9.41	8.14	7.96	6.28	5.30	
	0.8	16.91	6.24	17.17	31.45	25.43	4.58	15.62	14.95	2.61	16.04	26.05	34.29	22.04	25.47	22.04	21.54	16.99	14.36	
	1.3	27.68	10.22	28.11	51.48	41.63	7.50	25.57	24.47	4.27	26.26	42.65	56.13	36.08	41.69	36.08	35.26	27.82	23.50	
	1.8	38.52	14.22	39.11	71.63	57.93	10.43	35.57	34.05	5.94	36.54	59.34	78.09	50.21	58.00	50.21	49.06	38.71	32.70	
390	0.3	6.08	2.33	6.28	11.43	9.32	1.67	5.71	5.46	0.96	5.90	9.32	12.40	7.78	9.26	7.78	7.63	6.12	5.26	
	0.8	16.45	6.30	16.99	30.92	25.23	4.52	15.45	14.79	2.60	15.97	25.23	33.57	21.05	25.06	21.05	20.66	16.56	14.23	
	1.3	26.93	10.32	27.81	50.62	41.30	7.40	25.30	24.21	4.25	26.15	41.30	54.95	34.46	41.03	34.46	33.83	27.11	23.29	
	1.8	37.47	14.35	38.70	70.43	57.47	10.29	35.20	33.68	5.91	36.38	57.47	76.46	47.95	57.08	47.95	47.07	37.73	32.41	
450	0.3	5.94	2.35	6.22	11.26	9.26	1.65	5.66	5.41	0.95	5.88	9.07	12.18	7.48	9.13	7.48	7.37	5.99	5.22	
	0.8	16.06	6.35	16.83	30.48	25.06	4.47	15.31	14.65	2.58	15.92	24.55	32.96	20.24	24.72	20.24	19.94	16.20	14.12	
	1.3	26.30	10.40	27.56	49.89	41.03	7.31	25.06	23.98	4.23	26.05	40.19	53.96	33.13	40.47	33.13	32.64	26.53	23.11	
	1.8	36.59	14.47	38.34	69.42	57.09	10.17	34.88	33.36	5.89	36.25	55.92	75.08	46.10	56.31	46.10	45.42	36.91	32.16	
510	0.3	5.81	2.36	6.17	11.12	9.21	1.63	5.61	5.37	0.95	5.86	8.86	11.99	7.23	9.03	7.23	7.14	5.87	5.18	
	0.8	15.73	6.40	16.70	30.09	24.92	4.42	15.19	14.53	2.57	15.87	23.97	32.44	19.55	24.43	19.55	19.33	15.90	14.03	
	1.3	25.76	10.47	27.34	49.26	40.79	7.24	24.86	23.78	4.21	25.97	39.24	53.11	32.01	39.99	32.01	31.64	26.02	22.96	
	1.8	35.84	14.57	38.04	68.54	56.75	10.07	34.60	33.09	5.86	36.14	54.60	73.90	44.54	55.64	44.54	44.03	36.21	31.95	
570	0.3	5.71	2.38	6.13	10.99	9.16	1.62	5.57	5.33	0.95	5.85	8.67	11.82	7.01	8.93	7.01	6.95	5.77	5.15	
	0.8	15.45	6.44	16.58	29.76	24.79	4.38	15.08	14.42	2.57	15.82	23.46	31.99	18.97	24.17	18.97	18.80	15.63	13.94	
	1.3	25.29	10.54	27.14	48.71	40.57	7.17	24.69	23.61	4.20	25.90	38.41	52.37	31.05	39.56	31.05	30.78	25.58	22.82	
	1.8	35.18	14.66	37.77	67.78	56.45	9.98	34.35	32.85	5.84	36.04	53.45	72.87	43.20	55.05	43.20	42.83	35.60	31.76	
630	0.3	5.61	2.39	6.09	10.88	9.11	1.61	5.54	5.29	0.95	5.83	8.51	11.67	6.82	8.85	6.82	6.78	5.69	5.12	
	0.8	15.19	6.47	16.48	29.46	24.67	4.35	14.99	14.33	2.56	15.78	23.02	31.59	18.45	23.94	18.45	18.34	15.39	13.87	
	1.3	24.87	10.60	26.97	48.22	40.38	7.11	24.53	23.45	4.19	25.83	37.68	51.71	30.20	39.19	30.20	30.02	25.19	22.70	
	1.8	34.61	14.75	37.53	67.09	56.19	9.90	34.13	32.63	5.83	35.94	52.43	71.95	42.03	54.53	42.03	41.77	35.06	31.59	

*BW = body weight; ADG = average daily gain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine.

Table 17.12d – Net **AMINO ACIDS** requirements for **MAINTENANCE** for beef cattle

Average BW kg	MPm	NPm	Essentials, g										Non-Essentials, g							
			Arg	His	Ile	Leu	Lys	Met	Phe	Thr	Trp	Val	Ala	Asp	Cys	Glu	Gly	Pro	Ser	Tyr
330	273.1	129.4	5.97	3.75	5.29	9.93	8.06	1.63	5.15	6.71	3.52	6.85	6.07	6.15	3.34	14.64	6.61	12.67	6.78	4.69
390	310.1	147.0	6.78	4.26	6.01	11.27	9.16	1.85	5.85	7.61	4.00	7.78	6.89	6.98	3.79	16.63	7.51	14.39	7.70	5.32
450	345.8	163.9	7.56	4.75	6.70	12.57	10.21	2.07	6.52	8.49	4.46	8.67	7.69	7.79	4.23	18.54	8.38	16.05	8.59	5.93
510	380.4	180.3	8.31	5.23	7.37	13.83	11.23	2.27	7.18	9.34	4.91	9.54	8.46	8.56	4.65	20.39	9.21	17.65	9.45	6.53
570	414.0	196.2	9.05	5.69	8.03	15.05	12.23	2.47	7.81	10.17	5.34	10.38	9.20	9.32	5.06	22.19	10.03	19.21	10.28	7.10
630	446.8	211.8	9.76	6.14	8.66	16.24	13.19	2.67	8.43	10.97	5.76	11.20	9.93	10.06	5.46	23.95	10.82	20.73	11.10	7.67

*BW = body weight; MPm = metabolizable protein for maintenance; NPm = net protein to maintain; Arg = Arginine; His = histidine; Ile = isoleucine; Leu = leucine; Lys = lysine; Met = methionine; Phe = phenylalanine; Thr = threonine; Trp = tryptophan; Val = valine; Ala = alanine; Asp = aspartic acid; Cys = cystine; Glu = glutamic acid; Gly = glycine; Pro = proline; Ser = serine; Tyr = tyrosine

TABLES FOR LACTATING BEEF COWS AND THEIR CALVES

In Tables 17.13 to 17.16 are described the nutritional requirements for lactating beef cows and their calves according to the equations proposed in chapter 12. For cows, values for body weight, average daily gain and lactation week ranging from 400 to 500 kg, 0.10 to 0.20 kg/day and 2 to 18 weeks, respectively, were included. It should be noted that the values for multiparous and primiparous cows are presented in different Tables. The average composition of the milk considered was: 3.56% CP, 4.56% lactose and 4.76% fat.

The Tables for lactating calves were developed considering animals with average body weight, milk production of the dam and average daily gain ranging from 100 at 250 kg, 5 at 11 kg and 0.2 at 0.8 kg/day, respectively. Similar to what was presented in the previous section, the nutritional requirements described can be used directly for formulating diets according to category and performance levels.

The Tables of example calculations of calf requirements are important new tools in formulating diets for these animals. However, it is important to note that certain information regarding the requirements of calves with low or medium weight gain (0.2, 0.4 and 0.6 kg/day) and that are suckled by cows with higher milk production (7 and 9 kg) were removed from the Tables. This exclusion was made because these values did not represent biologically plausible examples. Appropriate selection of data is critical to ensure reliability of the Tables and to provide practical and realistic information for calf nutrition.

Table 17.13a - Nutritional requirements of lactating **PRIMIPAROUS COWS**

Average BW, kg	Week of lactation	Milk production, Kg	DMI, kg	ADG, kg	Energy			Protein					
					Met, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
400	2	6.21	6.0	0.10	18.4	4.9	80.6	612	362	974	16.1	62.8	37.2
				0.20	19.3	5.1	84.1	636	375	1011	16.7	62.9	37.1
	6	6.00	7.3	0.10	18.2	4.9	67.4	610	351	961	13.2	63.5	36.5
				0.20	19.1	5.1	70.3	634	364	998	13.7	63.5	36.5
	10	5.71	7.7	0.10	17.9	4.9	63.1	601	340	941	12.2	63.9	36.1
				0.20	18.7	5.1	65.9	625	353	978	12.7	63.9	36.1
	14	5.42	8.0	0.10	17.5	4.8	59.8	591	329	920	11.5	64.2	35.8
				0.20	18.4	5.0	62.5	615	342	958	11.9	64.2	35.8
	18	5.14	8.3	0.10	17.2	4.7	56.8	582	319	900	10.8	64.6	35.4
				0.20	18.1	5.0	59.3	606	332	938	11.2	64.6	35.4
450	2	6.21	6.8	0.10	19.4	5.2	76.0	644	376	1020	15.0	63.1	36.9
				0.20	20.3	5.4	79.2	667	389	1056	15.5	63.2	36.8
	6	6.00	8.2	0.10	19.2	5.2	63.7	642	364	1006	12.3	63.8	36.2
				0.20	20.1	5.4	66.3	666	377	1043	12.7	63.8	36.2
	10	5.71	8.6	0.10	18.9	5.2	59.8	633	353	987	11.4	64.2	35.8
				0.20	19.8	5.4	62.2	657	366	1023	11.8	64.2	35.8
	14	5.42	9.0	0.10	18.6	5.1	56.7	624	342	967	10.7	64.6	35.4
				0.20	19.4	5.3	59.1	648	355	1003	11.1	64.6	35.4
	18	5.14	9.4	0.10	18.2	5.1	53.9	615	331	947	10.1	65.0	35.0
				0.20	19.1	5.3	56.2	639	344	983	10.5	65.0	35.0
500	2	6.21	7.6	0.10	20.4	5.5	72.3	674	391	1064	14.1	63.3	36.7
				0.20	21.3	5.7	75.2	697	403	1100	14.6	63.4	36.6
	6	6.00	9.1	0.10	20.2	5.5	60.6	673	378	1051	11.6	64.0	36.0
				0.20	21.1	5.7	63.1	696	391	1087	11.9	64.1	35.9
	10	5.71	9.6	0.10	19.9	5.5	57.0	665	367	1031	10.7	64.4	35.6
				0.20	20.8	5.7	59.3	688	379	1067	11.1	64.5	35.5
	14	5.42	10.0	0.10	19.5	5.4	54.1	656	356	1011	10.1	64.8	35.2
				0.20	20.5	5.6	56.3	679	368	1047	10.4	64.9	35.1
	18	5.14	10.4	0.10	19.2	5.4	51.5	647	344	991	9.5	65.3	34.7
				0.20	20.1	5.6	53.6	670	357	1027	9.8	65.3	34.7

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; ME_t = total metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein.

Table 17.13b - Minerals requirements for lactating **PRIMIPAROUS COWS**

Average BW, kg	Week of lactation	Milk production, Kg	ADG kg	Macrominerals, g							Microminerals, mg						
				Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Zn	
400	2	6.21	0.10	21.6	15.6	1.4	7.9	10.4	28.6	8.4	69.9	7.9	38.0	1863	190	553	
			0.20	22.9	16.1	1.4	8.0	10.6	28.7	9.1	71.0	7.9	38.9	1871	192	577	
	6	6.00	0.10	21.2	15.3	1.4	7.9	10.3	28.3	8.3	69.3	7.8	37.1	1855	189	542	
			0.20	22.5	15.9	1.4	7.9	10.5	28.4	9.0	70.4	7.8	38.1	1862	191	566	
	10	5.71	0.10	20.6	15.0	1.4	7.8	10.1	27.9	8.2	68.6	7.7	35.9	1843	188	527	
			0.20	22.0	15.6	1.4	7.9	10.4	28.0	8.9	69.7	7.7	36.9	1850	190	551	
	14	5.42	0.10	20.1	14.7	1.4	7.8	10.0	27.4	8.1	67.8	7.7	34.8	1831	187	511	
			0.20	21.4	15.2	1.4	7.8	10.2	27.6	8.8	68.9	7.7	35.7	1839	189	536	
	18	5.14	0.10	19.5	14.3	1.4	7.7	9.8	27.0	8.0	67.0	7.6	33.6	1820	187	496	
			0.20	20.9	14.9	1.4	7.8	10.1	27.2	8.7	68.1	7.6	34.5	1827	188	521	
450	2	6.21	0.10	22.5	16.5	1.4	8.8	11.2	31.0	9.2	76.5	8.6	39.5	2064	211	581	
			0.20	23.8	17.1	1.4	8.8	11.5	31.2	9.9	77.6	8.7	40.5	2071	213	608	
	6	6.00	0.10	22.1	16.3	1.4	8.7	11.1	30.7	9.1	75.9	8.6	38.6	2055	210	570	
			0.20	23.4	16.8	1.4	8.8	11.4	30.9	9.8	77.0	8.6	39.7	2063	212	597	
	10	5.71	0.10	21.6	16.0	1.4	8.7	11.0	30.3	9.0	75.1	8.5	37.5	2044	210	554	
			0.20	22.8	16.5	1.4	8.7	11.2	30.4	9.7	76.3	8.5	38.5	2051	211	581	
	14	5.42	0.10	21.0	15.6	1.3	8.6	10.8	29.9	8.9	74.3	8.4	36.3	2032	209	539	
			0.20	22.3	16.2	1.4	8.7	11.1	30.0	9.6	75.5	8.4	37.3	2039	210	566	
	18	5.14	0.10	20.5	15.3	1.3	8.5	10.7	29.4	8.8	73.6	8.4	35.1	2020	208	524	
			0.20	21.7	15.8	1.4	8.6	10.9	29.6	9.5	74.7	8.4	36.2	2028	209	551	
500	2	6.21	0.10	23.5	17.5	1.3	9.6	12.1	33.4	9.9	83.0	9.4	41.0	2264	232	608	
			0.20	24.7	18.0	1.4	9.6	12.3	33.6	10.7	84.2	9.4	42.1	2272	234	638	
	6	6.00	0.10	23.1	17.3	1.3	9.5	12.0	33.1	9.8	82.4	9.4	40.2	2256	232	597	
			0.20	24.3	17.8	1.4	9.6	12.2	33.3	10.6	83.6	9.4	41.3	2264	234	627	
	10	5.71	0.10	22.5	16.9	1.3	9.5	11.8	32.7	9.7	81.7	9.3	39.0	2244	231	582	
			0.20	23.7	17.4	1.4	9.5	12.1	32.9	10.5	82.8	9.3	40.1	2252	233	611	
	14	5.42	0.10	22.0	16.6	1.3	9.4	11.7	32.3	9.6	80.9	9.2	37.8	2233	230	567	
			0.20	23.2	17.1	1.4	9.5	11.9	32.5	10.4	82.1	9.2	38.9	2240	232	596	
	18	5.14	0.10	21.4	16.3	1.3	9.4	11.5	31.9	9.5	80.1	9.1	36.6	2221	229	551	
			0.20	22.6	16.8	1.3	9.4	11.8	32.0	10.3	81.3	9.1	37.8	2229	231	581	

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.14a - Nutritional requirements of lactating **MULTIPAROUS COWS**

Average BW, kg	Week of lactation	Milk production, Kg	DMI, kg	ADG, kg	Energy			Protein					
					MEt, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, % CP	RUP, % CP
400	2	7.35	6.8	0.10	19.7	5.2	77.0	659	397	1056	15.5	62.4	37.6
				0.20	20.6	5.4	80.1	682	411	1093	16.1	62.4	37.6
	6	7.39	8.2	0.10	19.8	5.4	65.3	666	393	1060	12.9	62.9	37.1
				0.20	20.6	5.6	67.8	689	407	1097	13.4	62.9	37.1
	10	6.99	8.5	0.10	19.3	5.3	61.7	653	379	1031	12.1	63.3	36.7
				0.20	20.2	5.5	64.2	676	392	1068	12.5	63.3	36.7
	14	6.58	8.8	0.10	18.9	5.2	58.9	639	364	1003	11.4	63.7	36.3
				0.20	19.7	5.4	61.2	662	378	1040	11.8	63.7	36.3
	18	6.18	9.0	0.10	18.4	5.1	56.2	625	350	975	10.8	64.1	35.9
				0.20	19.3	5.3	58.5	648	364	1012	11.2	64.1	35.9
450	2	7.35	7.7	0.10	20.7	5.5	72.5	690	411	1101	14.4	62.6	37.4
				0.20	21.6	5.8	75.3	713	425	1138	14.9	62.7	37.3
	6	7.39	9.2	0.10	20.8	5.7	61.5	698	407	1105	12.0	63.2	36.8
				0.20	21.7	5.9	63.8	721	421	1142	12.4	63.1	36.9
	10	6.99	9.6	0.10	20.3	5.6	58.2	685	392	1077	11.2	63.6	36.4
				0.20	21.2	5.8	60.4	708	406	1114	11.6	63.6	36.4
	14	6.58	9.9	0.10	19.9	5.5	55.6	671	378	1049	10.6	64.0	36.0
				0.20	20.8	5.7	57.8	694	391	1085	11.0	64.0	36.0
	18	6.18	10.2	0.10	19.4	5.4	53.2	658	363	1021	10.0	64.4	35.6
				0.20	20.3	5.6	55.3	681	376	1057	10.4	64.4	35.6
500	2	7.35	8.5	0.10	21.7	5.8	68.7	720	426	1146	13.5	62.8	37.2
				0.20	22.6	6.1	71.3	743	439	1182	13.9	62.9	37.1
	6	7.39	10.3	0.10	21.8	6.0	58.3	729	421	1150	11.2	63.4	36.6
				0.20	22.7	6.2	60.5	751	434	1186	11.6	63.4	36.6
	10	6.99	10.7	0.10	21.3	5.9	55.3	716	406	1122	10.5	63.8	36.2
				0.20	22.2	6.1	57.4	738	419	1158	10.8	63.8	36.2
	14	6.58	11.0	0.10	20.9	5.8	52.9	702	391	1094	10.0	64.2	35.8
				0.20	21.8	6.0	54.9	725	404	1129	10.3	64.2	35.8
	18	6.18	11.3	0.10	20.4	5.7	50.7	689	377	1066	9.4	64.7	35.3
				0.20	21.3	5.9	52.6	712	389	1101	9.7	64.6	35.4

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; MEt = total metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein.

Table 17.14b - Minerals requirements of lactating **MULTIPAROUS COWS**

Average BW, kg	Week of lactation	Milk production, Kg	ADG kg	Macrominerals, g							Microminerals, mg						
				Ca	P	Ca:P	Mg	Na	K	S	Cu	Co	Cr	Fe	Mn	Zn	
400	2	7.35	0.10	23.8	16.9	1.4	8.2	11.0	30.2	8.9	73.0	8.2	42.6	1910	194	614	
			0.20	25.1	17.4	1.4	8.2	11.3	30.4	9.5	74.1	8.2	43.6	1917	195	638	
	6	7.39	0.10	23.9	16.9	1.4	8.2	11.0	30.3	8.9	73.1	8.2	42.8	1911	194	616	
			0.20	25.2	17.5	1.4	8.2	11.3	30.5	9.5	74.2	8.2	43.7	1919	195	640	
	10	6.99	0.10	23.1	16.5	1.4	8.1	10.8	29.7	8.7	72.0	8.1	41.1	1895	192	594	
			0.20	24.4	17.0	1.4	8.1	11.1	29.9	9.4	73.1	8.1	42.1	1902	194	619	
	14	6.58	0.10	22.3	16.0	1.4	8.0	10.6	29.1	8.6	70.9	8.0	39.5	1879	191	573	
			0.20	23.7	16.6	1.4	8.1	10.8	29.3	9.2	72.0	8.0	40.5	1886	193	597	
	18	6.18	0.10	21.5	15.5	1.4	7.9	10.4	28.5	8.4	69.8	7.9	37.8	1862	190	551	
			0.20	22.9	16.1	1.4	8.0	10.6	28.7	9.1	70.9	7.9	38.8	1869	191	576	
450	2	7.35	0.10	24.7	17.8	1.4	9.0	11.9	32.6	9.6	79.6	9.0	44.2	2110	215	641	
			0.20	26.0	18.4	1.4	9.0	12.1	32.8	10.3	80.7	9.0	45.2	2118	217	668	
	6	7.39	0.10	24.8	17.9	1.4	9.0	11.9	32.7	9.6	79.7	9.0	44.3	2112	215	643	
			0.20	26.1	18.4	1.4	9.0	12.1	32.9	10.3	80.8	9.0	45.4	2120	217	670	
	10	6.99	0.10	24.0	17.4	1.4	8.9	11.7	32.1	9.5	78.6	8.9	42.7	2096	214	622	
			0.20	25.3	18.0	1.4	9.0	11.9	32.3	10.2	79.7	8.9	43.7	2103	215	649	
	14	6.58	0.10	23.3	17.0	1.4	8.8	11.4	31.5	9.3	77.5	8.7	41.0	2079	212	600	
			0.20	24.5	17.5	1.4	8.9	11.7	31.7	10.0	78.6	8.8	42.1	2087	214	627	
	18	6.18	0.10	22.5	16.5	1.4	8.8	11.2	31.0	9.2	76.4	8.6	39.4	2063	211	579	
			0.20	23.7	17.0	1.4	8.8	11.5	31.1	9.9	77.5	8.6	40.4	2070	213	606	
500	2	7.35	0.10	25.7	18.8	1.4	9.8	12.7	35.1	10.4	86.1	9.7	45.7	2311	236	669	
			0.20	26.9	19.3	1.4	9.9	13.0	35.2	11.1	87.3	9.7	46.8	2319	238	698	
	6	7.39	0.10	25.8	18.8	1.4	9.8	12.7	35.1	10.4	86.2	9.7	45.8	2313	236	671	
			0.20	27.0	19.4	1.4	9.9	13.0	35.3	11.2	87.4	9.7	46.9	2320	238	700	
	10	6.99	0.10	25.0	18.4	1.4	9.7	12.5	34.5	10.2	85.1	9.6	44.2	2296	235	649	
			0.20	26.2	18.9	1.4	9.8	12.8	34.7	11.0	86.3	9.6	45.3	2304	237	679	
	14	6.58	0.10	24.2	17.9	1.4	9.7	12.3	34.0	10.1	84.0	9.5	42.6	2280	234	628	
			0.20	25.4	18.4	1.4	9.7	12.5	34.1	10.8	85.2	9.5	43.7	2287	235	658	
	18	6.18	0.10	23.4	17.5	1.3	9.6	12.1	33.4	9.9	82.9	9.4	40.9	2263	232	607	
			0.20	24.6	18.0	1.4	9.6	12.3	33.5	10.7	84.1	9.4	42.0	2271	234	636	

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium; S = sulfur; Cu = copper; Co = cobalt; Cr = chromium; Fe = iron; Mn = manganese; Mo = molybdenum; Se = selenium; Zn = zinc.

Table 17.15a - Nutritional requirements for suckling beef **CALVES** at **100** and **150 kg BW**

Average BW, kg	Milk Production, Kg	ADG kg	DMI milk, kg	DMI solids, kg	DMI total, kg	Energy			Protein					
						MEt, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, %CP	RUP, %CP
100	5.0	0.2	0.70	1.12	1.81	4.7	1.1	60.9	25	188	213	11.7	11.6	88.4
		0.4	0.70	1.19	1.88	5.6	1.3	70.1	51	221	271	14.4	18.6	81.4
		0.6	0.70	1.26	1.95	6.5	1.5	78.3	75	254	330	16.9	22.9	77.1
		0.8	0.70	1.33	2.02	7.3	1.7	85.6	100	289	388	19.2	25.7	74.3
	7.0	0.4	0.97	1.04	2.01	5.5	1.3	65.1	6	256	263	13.0	2.3	97.7
		0.6	0.97	1.11	2.08	6.4	1.5	72.7	31	290	321	15.4	9.5	90.5
		0.8	0.97	1.18	2.15	7.2	1.7	79.6	54	325	379	17.6	14.3	85.7
	9.0	0.8	1.25	1.03	2.28	7.2	1.7	74.4	9	361	370	16.2	2.5	97.5
150	5.0	0.2	0.70	1.65	2.35	6.3	1.5	64.1	30	244	274	11.7	10.9	89.1
		0.4	0.70	1.72	2.42	7.6	1.8	74.5	76	266	342	14.2	22.3	77.7
		0.6	0.70	1.79	2.49	8.8	2.1	83.9	121	289	410	16.5	29.5	70.5
		0.8	0.70	1.86	2.56	10.0	2.4	92.5	164	313	477	18.7	34.4	65.6
	7.0	0.4	0.97	1.57	2.55	7.6	1.8	70.3	19	312	330	13.0	5.7	94.3
		0.6	0.97	1.64	2.62	8.7	2.1	79.1	64	335	398	15.2	16.0	84.0
		0.8	0.97	1.71	2.69	9.9	2.3	87.2	108	358	466	17.4	23.1	76.9
	9.0	0.6	1.25	1.49	2.75	8.7	2.1	74.8	6	381	387	14.1	1.6	98.4
		0.8	1.25	1.56	2.82	9.8	2.3	82.5	50	404	455	16.1	11.0	89.0

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; MEt = total metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein.

Tables of nutritional requirements for beef cattle

Table 17.15b - Minerals requirements for suckling beef CALVES at 100 and 150 kg BW

Average BW, kg	Milk production, Kg	ADG, kg	Macrominerals, g						
			Ca	P	Ca:P	Mg	Na	K	
100	5.0	0.4	5.1	4.0	1.3	1.8	2.3	5.3	
		0.6	8.1	6.1	1.3	2.0	2.8	5.8	
		0.8	11.1	8.1	1.4	2.2	3.4	6.2	
		1.0	14.1	10.2	1.4	2.4	3.9	6.7	
	7.0	0.6	8.1	6.1	1.3	2.0	2.8	5.8	
		0.8	11.1	8.1	1.4	2.2	3.4	6.2	
		1.0	14.1	10.2	1.4	2.4	3.9	6.7	
	9.0	1.0	14.1	10.2	1.4	2.4	3.9	6.7	
	150	5.0	0.4	5.6	5.0	1.1	2.7	3.1	7.8
			0.6	8.2	7.0	1.2	2.8	3.7	8.2
0.8			10.8	9.0	1.2	3.0	4.2	8.7	
1.0			13.3	11.1	1.2	3.2	4.8	9.1	
7.0		0.6	8.2	7.0	1.2	2.8	3.7	8.2	
		0.8	10.8	9.0	1.2	3.0	4.2	8.7	
		1.0	13.3	11.1	1.2	3.2	4.8	9.1	
9.0		0.8	10.8	9.0	1.2	3.0	4.2	8.7	
		1.0	13.3	11.1	1.2	3.2	4.8	9.1	

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium.

Table 17.16a - Nutritional requirements for suckling beef CALVES at 200 and 250 kg BW

Average BW, kg	Milk production, Kg	ADG kg	DMI milk, kg	DMI solids, kg	DMI kg	Energy			Protein					
						MEt, Mcal	TDN, kg	TDN, %	RDP, g	RUP, g	CP, g	CP, %	RDP, %CP	RUP, %CP
200	5.0	0.2	0.70	2.18	2.88	7.9	1.9	65.0	82	259	341	11.8	24.0	76.0
		0.4	0.70	2.25	2.95	9.5	2.2	76.0	136	280	416	14.1	32.6	67.4
		0.6	0.70	2.32	3.02	11.0	2.6	86.1	320	198	518	17.2	61.7	38.3
		0.8	0.70	2.39	3.09	12.4	2.9	95.4	238	328	567	18.3	42.0	58.0
	7.0	0.2	0.97	2.04	3.01	7.9	1.9	61.9	25	304	329	10.9	7.6	92.4
		0.4	0.97	2.11	3.08	9.4	2.2	72.4	80	326	405	13.2	19.6	80.4
		0.6	0.97	2.18	3.15	10.9	2.6	82.0	213	284	497	15.8	42.9	57.1
		0.8	0.97	2.25	3.22	12.4	2.9	90.9	183	373	556	17.3	32.9	67.1
	9.0	0.4	1.25	1.96	3.21	9.4	2.2	69.1	22	371	394	12.3	5.7	94.3
		0.6	1.25	2.03	3.28	10.8	2.6	78.3	75	394	469	14.3	16.1	83.9
		0.8	1.25	2.10	3.35	12.3	2.9	86.7	127	418	544	16.3	23.3	76.7
	11.0	0.6	1.53	1.88	3.41	10.8	2.6	74.8	18	440	458	13.4	3.9	96.1
		0.8	1.53	1.95	3.48	12.2	2.9	82.9	70	463	533	15.3	13.1	86.9
250	5.0	0.2	0.70	2.72	3.41	9.4	2.2	64.9	130	275	405	11.9	32.1	67.9
		0.4	0.70	2.79	3.48	11.2	2.7	76.3	192	297	489	14.0	39.2	60.8
		0.6	0.70	2.86	3.55	13.0	3.1	86.8	250	322	573	16.1	43.7	56.3
		0.8	0.70	2.93	3.62	14.8	3.5	96.6	307	349	656	18.1	46.8	53.2
	7.0	0.2	0.97	2.57	3.54	9.3	2.2	62.3	74	319	393	11.1	18.8	81.2
		0.4	0.97	2.64	3.61	11.2	2.6	73.2	136	342	478	13.2	28.5	71.5
		0.6	0.97	2.71	3.68	12.9	3.1	83.2	196	366	562	15.3	34.9	65.1
		0.8	0.97	2.78	3.75	14.7	3.5	92.6	253	392	645	17.2	39.2	60.8
	9.0	0.2	1.25	2.42	3.67	9.3	2.2	59.9	17	365	382	10.4	4.5	95.5
		0.4	1.25	2.49	3.74	11.1	2.6	70.4	80	386	467	12.5	17.2	82.8
		0.6	1.25	2.56	3.81	12.9	3.0	79.9	140	410	551	14.4	25.5	74.5
		0.8	1.25	2.63	3.88	14.6	3.4	88.9	198	436	634	16.3	31.3	68.7
	11.0	0.4	1.53	2.34	3.87	11.1	2.6	67.7	23	432	455	11.8	5.1	94.9
		0.6	1.53	2.41	3.94	12.8	3.0	76.9	84	455	539	13.7	15.6	84.4
		0.8	1.53	2.48	4.01	14.5	3.4	85.5	143	481	623	15.5	22.9	77.1

*BW = body weight; ADG = average daily gain; DMI = dry matter intake; MEt = total metabolizable energy; TDN = total digestible nutrients; CP = crude protein; RDP = rumen degradable protein; RUP = rumen undegradable protein.

Table 17.16b - Minerals requirements for suckling beef CALVES at 200 and 250 kg BW

Average BW, kg	Milk production, Kg	ADG, kg	Macrominerals, g					
			Ca	P	Ca:P	Mg	Na	K
200	5.0	0.2	6.4	0.1	56.3	3.5	4.0	10.1
		0.4	8.7	0.1	58.8	3.7	4.5	10.6
		0.6	11.0	0.2	61.0	3.8	5.1	11.1
		0.8	13.2	0.2	63.0	4.0	5.6	11.5
	7.0	0.2	6.4	0.1	62.6	3.5	4.0	10.2
		0.4	8.7	0.1	65.2	3.7	4.5	10.6
		0.6	11.0	0.2	67.5	3.8	5.1	11.1
		0.8	13.2	0.2	69.5	4.0	5.6	11.5
	9.0	0.4	8.7	0.1	71.6	3.7	4.5	10.6
		0.6	11.0	0.1	73.9	3.8	5.1	11.1
		0.8	13.2	0.2	76.0	4.0	5.6	11.5
	11.0	0.6	11.0	0.1	80.4	3.8	5.1	11.1
		0.8	13.2	0.2	82.5	4.0	5.6	11.5
250	5.0	0.2	7.2	0.1	79.2	4.3	4.8	12.7
		0.4	9.3	0.1	80.9	4.5	5.3	13.1
		0.6	11.4	0.1	82.6	4.7	5.9	13.5
		0.8	13.5	0.2	84.2	4.8	6.5	13.9
	7.0	0.2	7.2	0.1	85.3	4.3	4.8	12.7
		0.4	9.3	0.1	87.1	4.5	5.3	13.1
		0.6	11.4	0.1	88.8	4.7	5.9	13.5
		0.8	13.5	0.1	90.4	4.8	6.5	13.9
	9.0	0.2	7.2	0.1	91.5	4.3	4.8	12.7
		0.4	9.3	0.1	93.2	4.5	5.3	13.1
		0.6	11.4	0.1	94.9	4.7	5.9	13.5
		0.8	13.5	0.1	96.6	4.8	6.5	13.9
	11.0	0.4	9.3	0.1	99.4	4.5	5.3	13.1
		0.6	11.4	0.1	101.1	4.7	5.9	13.5
		0.8	13.5	0.1	102.7	4.8	6.5	13.9

*BW = body weight; ADG = average daily gain; Ca = calcium; P = phosphorus; Ca:P = ratio calcium/phosphorus; Mg = magnesium; Na = sodium; K = potassium.