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Beef Cattle Nutrient Requirements

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Nutrients Required by Beef Cattle

Designing an effective and efficient grazing and supplementation program requires an understanding of beef cattle nutrient requirements. Nutrition-related input costs account for the largest percentage of cash costs in many Mississippi beef cattle operations, both cow-calf and stocker operations. This large proportion of costs being attributed to cattle nutrition and associated high input cost levels make using nutrient requirement information to fine tune nutritional programs invaluable for producers seeking to improve profitability while successfully achieving production goals.

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

Nutrients required by beef cattle include water, protein, carbohydrates, fats, minerals, and vitamins. Of these nutrients, water is required by beef cattle in the greatest amounts daily. Beef cattle water requirements appear in Mississippi State University Extension Service Publication 2490, “Beef Cattle Water Requirements and Source Management”.

The second greatest daily intake need is energy, which is supplied by carbohydrates, fats, and protein. Energy values include total digestible nutrients (TDN), net energy for maintenance (NE_m), and net energy for gain (NE_g). Mississippi State University Extension Service Publication 2504, “Energy in Beef Cattle Diets” discusses energy needs of beef cattle.

Protein is a key nutrient in beef cattle diet formulations. Crude protein values are reported on many forage analysis reports and feed tags. The role of protein in beef cattle diets is presented in Mississippi State University Extension Service Publication 2499, “Protein in Beef Cattle Diets”.

Minerals and vitamins are required by beef cattle in the smallest quantities of the nutrients listed above but are essential to animal health and productivity. Mineral requirement values are often reported as percentages for macrominerals and as parts per million (ppm) for microminerals (trace minerals). Vitamin requirements are routinely expressed as International Units (IU). Mississippi State University Extension Service Publication 2484, “Mineral and Vitamin Nutrition for Beef Cattle” outlines in detail calcium and phosphorus as well as other mineral and vitamin nutritional requirements of beef cattle.

Dry Matter Intake

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

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

Table 1. Forage Intake Capacity of Beef Cows¹

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

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

Nutrient Requirement Tables

Data provided in nutrient requirement tables can assist producers in determining specific beef cattle nutrient requirements. The values listed in these tables serve as a general guide for matching forage and feeding programs to cattle nutrient needs and for planning nutritional programs, but actual cattle performance may not exactly follow nutrient requirement tables.

Actual nutrient requirements vary depending on many animal and environmental factors. For instance, differences in animal genetics are often realized as individual animal variation on similar nutritional programs. Tabular values are intended for healthy, unstressed cattle in good body condition. Additional nutrients are needed for thin cattle

to improve body condition. Higher maintenance energy requirements are also applicable to cattle subjected to stresses such as weather extremes or added physical exertion.

Dry matter intake values are estimates determined using published prediction equations. These predictions assume that adequate protein is supplied in the diet for maximum rumen fermentation. If the diet is deficient in protein, the dry matter intake values will overestimate actual cattle consumption. In addition, management factors such as limiting forage availability or inadequate feed trough space resulting in cattle being “bossed out of the trough” can affect intake and distort cattle performance on what would otherwise be a well-designed nutritional program.

Producers should closely monitor body condition and weight in mature cattle and growth rates of growing cattle to determine if additional or fewer nutrients are needed to meet production targets. It also helps identify situations where it would be beneficial to further subdivide grazing or feeding groups. Routine animal performance monitoring facilitates making timely adjustments to cattle diets to achieve desired performance results.

Putting nutrient requirement information to use can be used in many practical ways on Mississippi beef cattle operations. Sorting cattle by nutritional requirements and managing each group according to their specific nutritional needs can significantly reduce wasteful expenditures. Realizing the nutritional value of forage programs and how nutrients from forages match up with cattle needs can help to both improve forage management and utilization and also to accurately develop supplementation programs for forage-based production systems.

The Mississippi State University Extension Service offers a comprehensive set of beef cattle nutrient requirement tables. It is available on the MSUcares website at the following address: msucares.com/livestock/beef/beefpubs.html along with the publications on specific nutrients mentioned previously. For more information on beef cattle nutrient requirements or related topics, contact a local office of the Mississippi State University Extension Service.