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FACTORS AND FEEDS FOR SUPPLEMENTING BEEF COWS

Stephen P. Hammack, Ph.D.[1], Ronald J. Gill, Ph.D.[2], and Rick Machen, Ph.D.[3]

A beef cow requires energy, protein, minerals, and vitamins in her diet. What determines nutrient requirements? What determines if supplementation is warranted?

A female performs several functions, including body maintenance, activity, weight gain, reproduction, and milk production, which all require nutrients. The amount of nutrients required depends on body size, environmental conditions, how far an animal travels, any desired weight change, stage of gestation, and milk production level. Beef cows are maintained primarily by grazing forages on pasture and rangeland. Nutritional value (i.e., quality) and quantity of available forage determines if nutrients need to be supplemented to optimize performance. During most of the year, warm-season forages could be deficient in some minerals. So, most situations should include at least year-round provision of mineral supplement. Vitamin A, which is typically deficient in dry, dormant, or weathered forages, should be provided if suspected to be deficient for more than 30 days. Since deficiencies can be corrected relatively inexpensively, compared to protein and energy, mineral and vitamin supplementation should be a high priority.

After addressing mineral and vitamin needs, protein and energy should be considered. Forage protein and energy content vary seasonally. Dormant, warm-season forages typically become deficient in protein during mid-summer and winter, and often are energy deficient in winter. Energy deficiency also can be a function of limited availability of forage, rather than inadequate content of energy.

[1] Professor and Extension Beef Cattle Specialist-Emeritus, Texas A&M AgriLife Extension
[2] Professor and Extension Livestock Specialist; Associate Department Head for Extension, Texas A&M AgriLife Extension
[3] Former Texas A&M AgriLife Extension Livestock Specialist and Professor – King Ranch Institute for Ranch Management

FACTORS AFFECTING SUPPLEMENTATION

Six primary factors affect the type and amount of supplement that a beef cow may require.

Forage Quantity. The amount of available forage affects any potential need for supplementation. If forage becomes limited and cows cannot eat their fill daily, performance (i.e., reproduction, milk production, body weight maintenance) will suffer. As forage supply declines, animals have less opportunity to selectively graze and their diet quality weakens. Balancing forage supply and animal demand is the most important factor affecting the need for and type of supplement that may be required.

Forage Quality. Forage with less than 7 percent crude protein (CP) is considered low in quality due to its low protein and low digestibility—less than 50 percent total digestible nutrients (TDN), which is a measure of energy available to the animal. Poor-quality forage usually is found in dormant perennial plants or dead annual plants, which contain a higher ratio of stems to leaves. Since forage quality and consumption are positively related, nutrient deficiencies limit forage consumption. Because both consumption and nutrient content of poor-quality forage are low, supplementation often is needed.

Medium-quality forage (7 to 11 percent CP and 50 to 57 percent TDN) eliminates or markedly reduces need for supplementation, especially among non-lactating and short-bred cows.

High-quality forage (above 12 percent CP and 57 percent TDN, containing more leaf than stem) can be consumed in larger amounts and usually precludes any need for supplement—except for high-milking cows in low body condition (e.g., fatness). However, forage of high quality but limited quantity, a common situation in early spring when cows "chase" short green grass, may require supplementation to balance energy and protein intake.

Daily intake potential ranges from as low as 1.5 percent of body weight for very low-quality forage to near 3.0 percent for very high-quality forage, with 2.0 to 2.5 percent being typical.

Body Condition. Body condition influences supplementation requirements. Body Condition Score (BCS) is an excellent and practical assessment of prior diet quality and recent nutritional status (see links below for visually evaluating BCS). Low body condition (less than BCS 4) markedly increases need for supplementation, and completely fulfilling this need often is cost prohibitive. Therefore, allowing cows to reach low body condition should be avoided if feasible. Moderate body condition (BCS 4 to 5) greatly reduces or eliminates supplement needs. With exception of minerals, fleshy, higher body condition cows (BCS equal to or higher than 6) generally need little supplement, if any.

Body Size. Potential for forage consumption is related to body size—the best measure of which is weight. Therefore, as a result of their ability to eat more, larger animals may not require more supplement than smaller animals. Adjustments to stocking rate and allowing adequate amounts of forage per cow may offset differences in body size, but will increase land cost per cow and reduce production per acre. If forage is limited or insufficient in quality, larger cows will require more supplement.

Milk Production. Cows with greater potential for milk production have higher body maintenance requirements year-round, not just during lactation. Higher-milking cows may consume more forage, but often not enough to completely satisfy their nutrient demand. When forage quality is inadequate, higher-milking cows need more supplement (i.e., anywhere from 50 to 100 percent more may be required for high- versus low-milking cows of the same body size).

Age. Females less than 4 years old are still growing and require extra nutrients. Their body size is smaller than mature cows, therefore younger animals do not consume as much forage. Consequently, heifers and young cows require a higher quality, more nutrient-dense diet than mature cows and often require more and different supplements.

INGREDIENTS AND SUPPLEMENTS TO PROVIDE PROTEIN AND ENERGY

Ingredients

Oilseed Meals. Cottonseed, soybean, sunflower, linseed, and peanut meals are the most common sources used in supplements to provide high-protein and medium- to high-energy. Although relatively costly per pound, they often are the least expensive on a cost per unit CP basis. These ingredients provide natural supplemental protein to support rumen microbes and sustain forage intake. Oilseed meals in particular are suitable for non-lactating cows in moderate to good flesh (BCS 4 to 5) consuming adequate amounts of low-protein, medium-energy forages.

Other Co-products. In addition to oilseed meals, other co-products often are used in supplements for cattle on pasture or range. These include low- to medium-protein, medium-energy, low-starch products such as wheat mids, soybean hulls, and rice bran. Readily digestible starch can interfere with forage digestibility. Therefore, these low-starch co-products are good supplements for grazing cattle. Other potential ingredients are medium-protein, high-energy products such as brewers grains, distillers grains, and corn gluten feed. Some of these are available either wet or dry. When considering high-moisture ingredients, proximity to the source can affect feasibility of their use.

Grain. Corn and grain sorghum are energy-dense ingredients commonly included in supplements for grazing cows. Other grains used less frequently include oats, wheat, and barley. Grains typically are the least expensive ingredients based on cost per unit TDN.

Whole Seed. While cottonseed, soybean, and other oilseeds usually are processed to produce meal and oil, they also can be fed as whole seeds. These are considered moderate in protein at 15 to 25 percent CP but high in energy due to their high-fat content (e.g., oil remains in the seed). Whole cottonseed in particular often is used as a supplement for grazing cattle. Handling seed to feed cattle is the main limitation for using it. If delivery is economically available, it is one of the best supplements for cows.

Supplements

The success or failure of a supplementation program for grazing beef cows primarily depends on quantity and quality of available forage being supplemented. Mismatches between these forage factors and type of supplement will reduce both animal performance and financial return.

Note: Where recommended pounds of supplements appear later, they are based on cows weighing 1,300 pounds in BCS 5. Any variation from these determinants should be considered.

High-protein Cubes. Protein cubes usually are made from oilseed meals and contain 38 to 41 percent CP. They typically are fed on the ground and often are the most economical and practical means for providing supplemental protein to grazing cows. These cubes generally should be fed at a daily rate of 1 to 3 pounds. Oilseed-meal cubes in particular are suitable for dry cows in moderate to good flesh when they have access to a sufficient quantity of low-protein, medium-energy forages.

Range/Breeder Cubes. These are commonly 20 percent CP, but range from 12 to 32 percent CP. They are designed to provide a combination of both protein and energy to be fed in larger daily amounts (3 to 6 pounds) than high-protein supplements. If the ingredients are readily available and producers have equipment for mixing and feeding, a mix of 1/3 oilseed meal and 2/3 cracked or ground grain is approximately equivalent to a 20 percent cube. A mix of about 3/4 meal and 1/4 grain is the approximate equivalent of a 32 percent cube.

Some cubes include non-protein nitrogen (NPN), usually in the form of urea, as a nitrogen source for potential synthesis of rumen microbial protein, which cows can digest. (Considerable variation exists in how much of this potential is converted to protein.) Cubes with low crude fiber (below 10 percent), which is listed on feed tags, generally are highest in energy and usually contain added minerals and vitamins. They often are marketed as “breeder” cubes rather than as lower-quality “range” cubes.

Blocks and Tubs. The primary advantage of block and tub supplements is continuous access and self-limiting consumption. Nutrient content and expected intake can differ considerably among these products. Be sure to read the label to determine expected consumption by grazing cattle. These supplements are relatively expensive based on cost per unit of nutrients provided. Generally, they will not correct for large nutrient deficiencies, nor support higher levels of animal performance. Adequate forage should be available to

avoid potential over consumption of these supplements and the associated health problems. Placement of supplement also will affect consumption—products offered near water or loafing areas will experience greater consumption.

Pressed blocks. Pressed blocks (the most common being a 33-pound product) are formed much like cubes. Ingredients are conditioned with steam and pressed together under high pressure. Protein content may range from 20 to 40 percent CP. Mature cattle generally consume 1 to 4 pounds daily depending on the hardness of the block and number of blocks offered.

Chemically Hardened. These supplements are manufactured by combining liquid and dry ingredients into a slurry and pouring it into a container. Protein content is generally 20 to 30 percent CP. Hardness (which regulates daily intake) is determined by the reaction of a metal oxide (such as calcium oxide) with water. Once hard, these products do not change shape. Expect consumption rates of 1 to 3 pounds per day.

Low-moisture Tubs. In this manufacturing process, liquid ingredients are heated to 240°F to 280°F (cooked), subjected to a vacuum to remove moisture, combined with dry ingredients, and poured into plastic or metal containers. Protein content can range from 10 to 40 percent CP. Containers must remain upright because this product will change shape. Typically, supplement consumption across the herd is uniform. However, daily intake tends to be the lowest of any supplement at 0.5 to 1.5 pounds per day among the block and tub options.

Liquid Supplements. Most cattle managers who use liquid supplements depend on a retailer for product distribution. Therefore, liquid supplements can be the least labor-intensive supplementation option. Industry experience suggests that liquid supplements are most effective when offered year-round. Consumption will vary depending on quality and quantity of available forage and cow nutrient requirements. Liquid supplements are fed in open-top or lick-wheel containers and can vary widely in composition and nutrient content.

Co-products from several industries (i.e., molasses, corn steep liquor, condensed corn distiller's solubles, and more) form the base of liquid supplements. Protein content ranges from 16 to 40 percent CP—a significant portion of which may come from non-protein nitrogen (urea). In contrast to dry supplements, fat content can be 10 percent or greater. Some liquids are fortified with a complete mineral/vitamin package. As is true for any supplement, adequate forage (or hay) must be available. Also, supplement containers should not be allowed to empty because possible over consumption after re-filling could cause health problems, some severe.

Hays and Silages. High-quality hays such as alfalfa can be used as supplements. These medium-protein (usually 15 to 20 percent CP), medium-energy sources can be limit-fed in place of one of the previously discussed supplements. These hays also can be fed free choice, although doing so results in inefficient use of supplemental protein and can be costly. Low-protein, medium-energy silages such as corn and sorghum also can be used as supplements, or full-fed during drought and other harsh weather conditions if suitable facilities and equipment are available.

SUPPLEMENTATION STRATEGIES

Supplementation (e.g., protein and energy, hay, and mineral) is almost always among the three largest variable costs for a cow/calf enterprise. To minimize supplementation, forage supplies should be used logically. In general, hay (excluding alfalfa and others when used as a supplement) should not be limit-fed with standing forage. Limit-feeding of hay encourages cows to reduce grazing and fails to use pasture or range while forage quality remains reasonably good. For example, available forage for grazing might include some introduced pasture (such as coastal bermudagrass), some native range, and some hay. As forage supply diminishes, instead of allowing access to all three forages at the same time, introduced pasture could be grazed, followed by native range, and hay fed last. Thereby, each forage is utilized most efficiently and hay use is postponed until late winter to early spring when green, high-quality forages emerge but are limited in quantity.

No two years, seasons, or herds are alike, therefore, general recommendations are only a guideline. Usually, non-lactating mature cows in medium or higher body condition on typical dormant warm-season grazing or low-quality hay often need only 1 to 2 pounds per day of a high-protein supplement. (On extremely low-quality forage, such as tallgrass prairie in winter, 3 to 4 pounds of high-protein supplement may be needed.) In contrast, thin, non-lactating mature cows on this grazing or hay may require 3 to 4 pounds per day, but from a medium-protein, high-energy supplement. After calving, all of these amounts essentially should be doubled.

Due to the small quantity offered and the cow's ability to recycle and conserve nitrogen, daily feeding of high-protein supplements such as cottonseed meal cubes is not required. Instead, weekly requirements can be divided and fed every other day, twice a week, or possibly as infrequently as once a week, depending on the specific supplement and amount required. Less frequent feeding of these supplements facilitates grazing, often is more efficient, and can help reduce variability in consumption among animals. However, combination protein-energy supplements, especially breeder/range cubes and meal-grain mixes that are required in larger amounts, generally should be fed daily to no more infrequently than every other day for best forage and supplement use, higher animal performance, and greatest efficiency.

Perhaps the most common supplement for grazing cows is a 20 percent CP breeder cube (high or all-natural protein and low crude fiber). Breeder cubes often are a compromise for the common situation of low-quality forage and low to medium body condition. To effectively manage grazing cow weight and condition, 20 percent cubes must be fed in adequate amounts as discussed above. With the exceptions of facilitating weight loss in fleshy cows and using cubes as bait to gentle, move, or handle cattle, there are few situations where feeding smaller amounts of breeder cubes is applicable. If a producer is unwilling or unable to assume the cost for the required amounts of these cubes (or their nutritional equivalent), then a lower amount of a higher-protein supplement should be fed. However, it is important to realize that optimum body condition, reproduction, and productivity will not be realized and financial returns will decline if nutrient requirements are not met.

A Power Point presentation on Body Condition Scoring is available at: *http://animalscience.tamu.edu/wp-content/uploads/sites/14/2012/04/beef-bc-scoring.pdf*. Other publications on beef cow nutrition and other topics on beef cow management can be accessed at: *https://animalscience.tamu.edu/livestock-species/beef/publications/*.