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Beef Cow Nutrition Through the Year: Managing for Efficient Reproduction

Profitable cow-calf operations manage so that a large proportion of the cow herd calves in the early portion of a short calving season. In order to maintain this level of reproductive performance, cows need to conceive on approximately a 365-day calving interval. To do so, a cow must rebreed within 85 days of calving. Length of the postpartum period of anestrus varies considerably among cows and as a function of management; however, most research estimates that a cow does not cycle for six-weeks post calving on average. Thus, a cow has roughly two estrous cycles in which to become pregnant again. Body condition and the plane of nutrition play outsized roles in keeping cows on a 365-day calving interval.

Importance of body condition at calving

Body nutrient reserves at calving and energy balance between calving and breeding affect when a beef cow will be ready to breed again. Table 1 (Houghton et al., 1990) relates postpartum interval to body condition score (BCS; 1–9 scale) at calving. In general, the postpartum interval is longer in thin cows (BCS ≤ 4) than cows in moderate (BCS 5–6) condition. For more information on body condition scoring beef cows, see MU Extension publication G2230, Body Condition Scoring of Beef Cattle (https://extension.missouri.edu/publications/g2230).

On average, a body condition score (1–9 scale) is 84 lb of weight (NASEM, 2016; pg 203). It is important to understand that body condition scoring is a subjective process. For the average beef farm, it may be more useful to identify cows as thin, moderate, and fleshy at calving. If possible, separate the thin cows from the rest of the herd and provide a higher quality diet. Specific interventions for thin cows are discussed below. However, a more proactive management strategy is recommended to ensure adequate BCS prior to calving.

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Table 1. Body condition score (BCS) at calving and the number of days from calving until resumption of normal estrous cycles.

BCS	Description	Postpartum interval
3	Thin	89 days
4	Borderline	70 days
5	Moderate	59 days
6	Good	52 days

Adapted from Houghton et al., 1990. J of Anim Sci 68:1438–1446.

Calving in sync with nature

The importance of allowing your forage base to absorb increases in nutrient requirements by beef cows cannot be overstated. For too long, beef cattle operations have filled nutritional deficits with purchased and/or raised feedstuffs. This type of management intervention is a drain on profitability. A recent MU Extension planning budget publication (https://extension.missouri.edu/publications/g679) estimates that 23% of annual operating costs ($210 out of $908) are purchased and raised feeds. A more thoughtful approach to reducing feed costs is to calve "in sync with nature" — in other words, at a time when a large quantity of high-quality forage is available at low cost in the production system.

A beef cow production cycle can be broken down into four phases, based on nutrient requirements: postpartum/pre-pregnancy, gestating and lactating, gestation, pre-calving (Figure 1). Peak nutrient requirements coincide with the critical postpartum/pre-pregnancy phase. Calving when forage is dormant often creates a nutritional deficit that must be filled to maintain BCS between calving and breeding.

Often herds in Missouri that are referred to as "spring-calving" are actually managed such that calving occurs in the winter (January and February) rather than in the true spring (April and May). There are multiple environmental challenges associated with true spring calving in Missouri. For example, March, April and May

are the wettest months of the year, and mud and pasture conditions can present a challenge. Likewise, calving in the true spring then necessitates breeding in the heat of summer (July and August). This can be detrimental to both female and male reproductive capabilities, particularly if this heat stress is exacerbated by fescue toxicosis.

Perhaps a more reasonable form of calving in "sync with nature" in Missouri is not to align with the spring flush of forage but with the timing of fall regrowth in cool-season (e.g., fescue) pastures. The considerations involved in moving to a fall-calving season are discussed in the MU Extension publication G2029, Calving Season Considerations for Commercial Beef Operations (https://extension.missouri.edu/publications/g2029). The University of Tennessee Extension publication Fall Versus Spring Calving: Considerations and Profitability Comparison (PDF) (https://extension.tennessee.edu/publications/Documents/W419.pdf) is also an excellent resource for the response to calving seasons in various production settings. In the Fescue Belt, it is common to see greater weaning weights and calving rates as well as reduced calf death loss when comparing a fall calving season to a spring calving season.

The fall growth period common to cool-season perennial forages facilitate lower-input fall-calving systems than is possible in warm-season forage systems. Figure 2 describes the growth curve of tall fescue in Missouri. Fall calving coincides with the fall flush of fescue growth, and quality grazeable forage is often available through peak nutrient requirements of early lactation and into the early part of the breeding season. Producers entertaining the switch from spring to fall calving are encouraged to enhance your farm's ability to stockpile tall fescue in the fall.

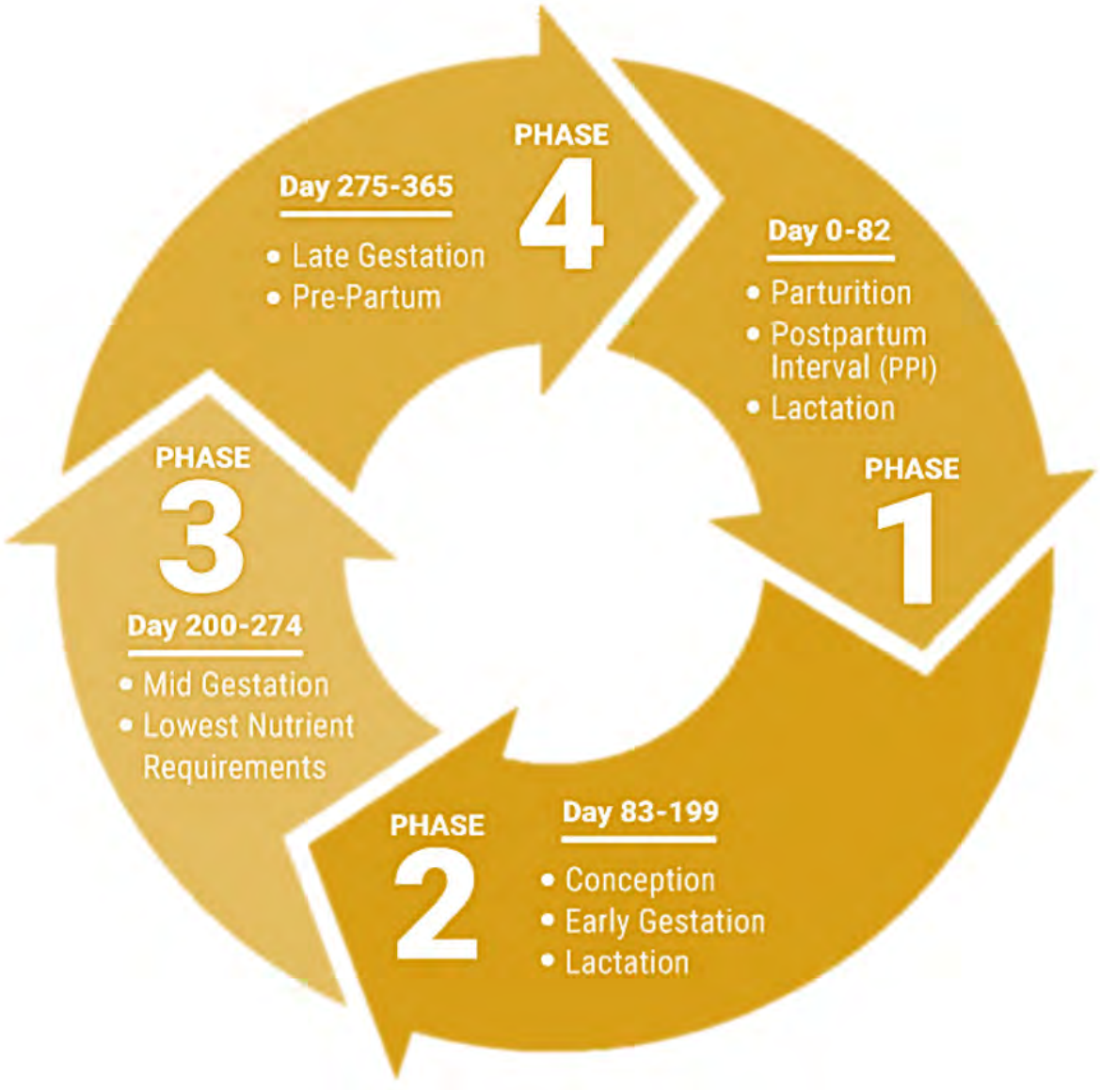


Figure 1. Phases of production in an annual beef production cycle. Adapted from Beef Cattle Research Council.

Troubleshooting deficits in your herd

Troubleshooting losses in body condition in the cow herd can be a frustrating task. Identifying the limiting nutrient can be a challenge, as often the limiting factor is overall feed availability, not a nutrient concentration deficiency, per se. Many farmers stock farms based on a desired number of cows to manage, rather than based on the carrying capacity of the land. Also, with the advent of round hay baling equipment and the convenience that it provides, hay production and hay feeding has become an unquestioned standard practice for many producers despite significant costs associated with hay-intensive winter-feeding strategies. Likewise, many producers pursue tonnage (i.e., cut and bale late) from tall fescue hay fields rather than quality. As a result, it is common to run into a situation where a producer feeds hay for 4–5 months per year, yet the hay is insufficient to meet the nutrient requirements of a beef cow.

When forage quality is lacking, many producers around the country supplement protein. This is done because of extensive promotion of the positive associative effect that occurs when feeding supplemental crude protein to cattle consuming low-quality (<7% crude protein) forages. However, while this management strategy is effective in many parts of the country due to the type of forage present in different regions, providing supplemental protein in Missouri forage cool season forage systems is generally ineffective. Authors rarely find crude protein in dormant tall fescue samples less than 7% crude protein. Also, the literature (Mathis et al. (2000), http://dx.doi.org/10.2527/2000.781224x; Bohnert et al. (2002), https://doi.org/10.2527/2002.80112967x) does not show the same magnitude of response to protein supplementation when cattle graze low-quality cool-season perennial forages.

Generally, forage analyses of tall fescue forage indicate energy is the limiting nutrient, not crude protein. Energy supplementation to beef cows is difficult in practice because of the need to supplement energy daily. While many feed companies promote high-energy supplements (e.g., lick tubs), these are often intended to be consumed at <5% of expected daily dry matter intake. Thus, it is difficult to conceive how providing high-energy supplements in this manner could meaningfully impact the energy status of a mature beef cow.

If BCS is declining, first ensure that the cattle have enough to eat. When the average forage height across a pasture is <4", it is likely that forage intake is limited. This rule of thumb works because every "acre-inch" (an inch of forage evenly grown across an acre) equates to 300–400 lb of dry matter in tall fescue pastures. In practice, this rule of thumb is difficult to conceptualize because patchy grazing leads to unreliable estimates. Be conservative in your estimates and intervene by rotating pasture or providing supplemental forages. The Noble Foundation (PDF) (https://www.noble.org/globalassets/images/news/ag-news-and-views/2014/10/pdf/rules-of-thumb.pdf) in Oklahoma uses the following rules of thumb for estimating the TDN requirement of beef cows: 55% TDN for pregnant cows, 60% TDN for late-gestation cows, and 65% TDN for lactating cows. The authors have used these rules of thumb extensively and found good success.

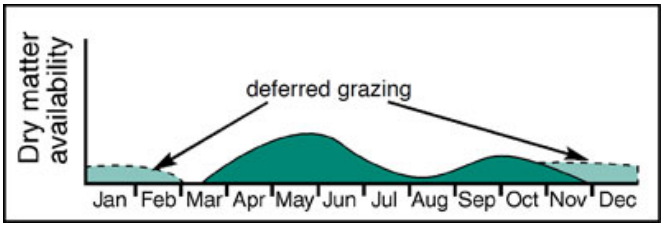


Figure 2. Yield curve of tall fescue in Missouri, as well as opportunities for winter forage availability (stockpile) through deferred grazing.

Supplementation strategies for Missouri beef cow herds

Figure 3 is a supplement decision guide put together by Dr. Clay Mathis a number of years ago. The ideas put forth in Figure 3 are fleshed out below.

When forage quantity is limiting

In a scenario in which forage quantity is limiting, being mindful of feeding supplemental forage is critical to keep feed costs from spiraling out of control. The authors prefer to feed stored forages daily as a strategy to reduce waste. Conventional wisdom is to feed 3 days' worth of feed in hay rings, because it basically does a better job creating space in the hay ring for cows. Feeding scenarios where several days' worth of hay is put out for cattle at once leads to significant wastage, regardless of bale feeder design.

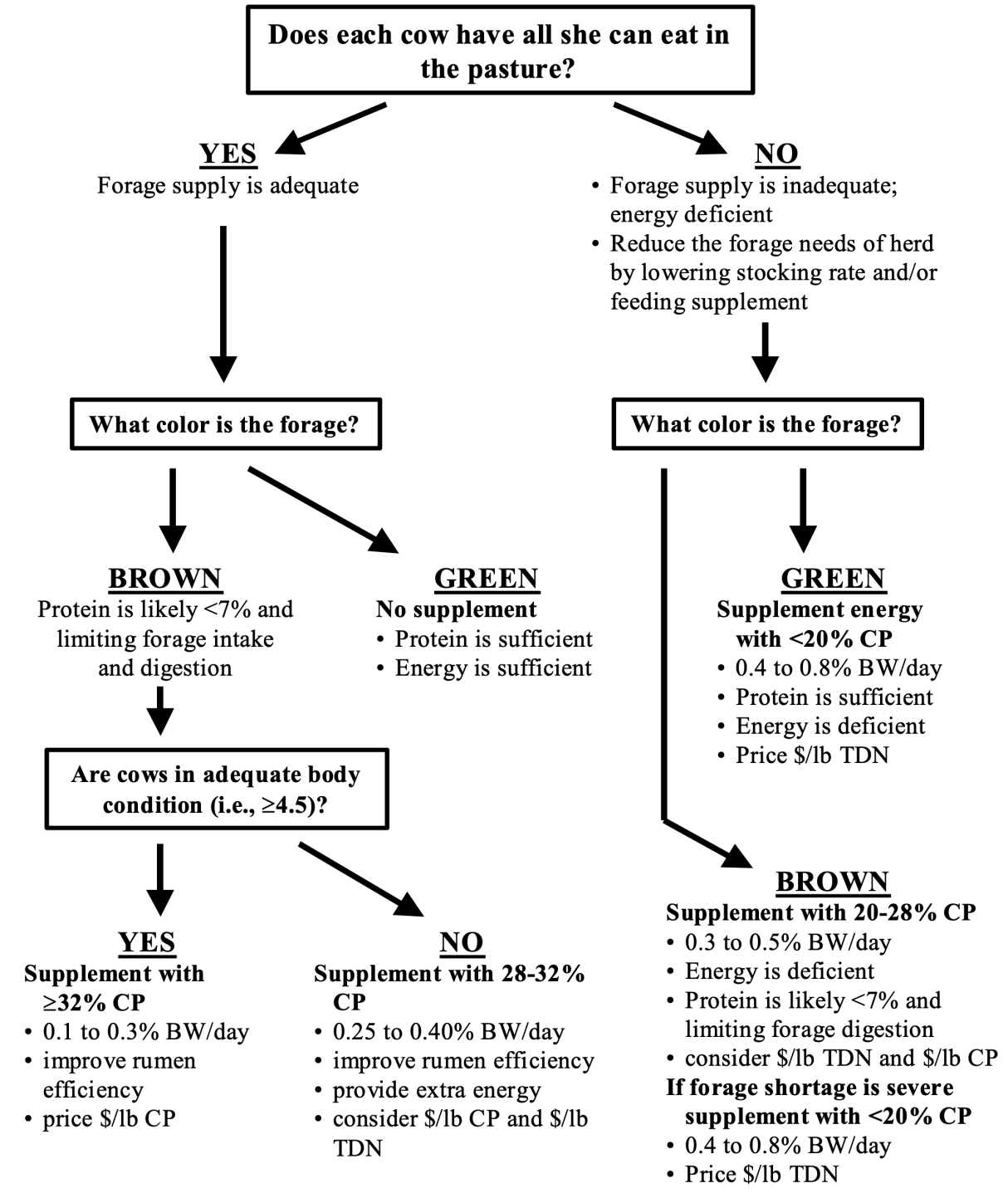
A good rule of thumb to use when planning for stored forage needs is that a 1,000 lb bale of hay will provide a days worth of feed for 30 cows. A 5' x 5' round bale of normal density should weigh roughly 1,000 lb. When working through a hay feeding budget, the authors usually plan for roughly 33 lb of hay per cow per day. Assuming the bale is 10% moisture, then the cow has access to 30 lb of dry matter. Assume that 15% of the 30 lb is wasted, leaving a cow to consume ~25.5 lb of dry feed per day, which is roughly 2% of body weight for a 1,200 lb cow.

When energy is limiting

If it is determined that that energy is the limiting nutrient in the diet but forage intake is not limiting,

Beef Cow Supplement Decision Guide*

Clay P. Mathis, New Mexico State University



**This decision tree is a general guide and is not as accurate as measuring actual forage quality and quantity to develop a strategic supplementation program for a specific class of cattle.*

Figure 3. Beef cow supplement decision guide. Courtesy Clay Mathis, New Mexico State University.

a good place to start supplementation is 0.5% of body weight, fed daily. The energy concentration and price of various commodity feedstuffs are constantly in flux, so price supplements per lb of TDN to identify the most economical supplemental feed source for your cows.

When protein is limiting

In cases where forage crude protein is well below 7% or if cows are consuming dormant warm-season forages, it is wise to provide 1 lb of crude protein per cow per day. If the supplement used is 20% crude protein, then you would need to feed 5 lb of supplement (5 lb supplement * 0.2 crude protein factor) = 1 lb of supplemental crude protein. Protein does not need to be supplemented daily to be effective. It can be supplemented as infrequently as 2x/week without impacting the response to supplement, so long as a week's worth of supplement is prorated into the two feedings.

Price supplements on a price per lb of nutrient (TDN or protein) basis

If you are in the market for supplements, one effective strategy to reduce supplement costs is to price them per pound of nutrient required. Example: Feed A is 20% crude protein (CP) feed costing $200 per ton versus Feed B which is 40% CP feed costing $350 per ton. If you had previously calculated you need to feed 1.0 lb of CP per cow per day, you would need to feed 5 lbs of the 20% CP feed or 2.5 lb of 40% CP feed to provide 1 lb of CP. Feed A costs $0.10 per pound and Feed B costs $0.175 per pound, yet when priced per pound of crude protein, Feed A costs $0.50 per lb of CP and Feed B costs $0.44 per lb of CP. If you feed a cow for 90 days, Feed B will save $5.40 per cow, assuming that equipment and labor costs associated with feeding either feedstuff are similar. Bear in mind that feed companies make a profit selling convenience. Producers selling commodity beef cattle (non-value added) with modest profit margins need to reduce use of purchased and raised feeds to improve chances to be profitable.

Stockpiled fescue is quality winter feed

Stockpiled tall fescue (Figure 4) is as good of a feed as any available, with the benefit that it is grown on your farm with minimal input. With good yearlong planning and good grazing management during the winter, stockpiled tall fescue can serve as an excellent winter feeding program well into the winter months. Many producers in the transition zone of the United States have reduced or eliminated the need for hay feeding during the winter months through use of stockpiled fescue.

Figure 4. Stockpiled tall fescue is an excellent winter feed resource for cow-calf operations in Missouri, particularly with good grazing management (e.g., strip-grazing as shown here).

The nutrient profile of stockpiled tall fescue is outstanding and, when forage intake is not limiting, will meet the nutrient requirements of even lactating beef cows. No additional hay or other macronutrient supplement (energy or protein) will be needed. However, it is a good idea to keep minerals and vitamins available. The University of Arkansas conducted on-farm surveys from 2002 to 2006 (PDF) (https://www.uaex.edu/publications/pdf/FSA-3133.pdf) and showed that the TDN (total digestible nutrients; energy) of stockpiled fescue was adequate to support a lactating cow from October through February. Protein was never limiting in this demonstration.

A concern with stockpiled tall fescue is inconsistency in growth from year to year. The development of an adequate stockpile is dependent on two factors: 1) deferred or minimal grazing of the area during the fall growing period (September through first frost) and 2) precipitation, which is not under your control. August nitrogen application (current MU Extension recommendations are 40 lb of N per acre) can increase the amount of stockpile grown, but a fall growth period with inadequate rainfall will produce less stockpiled forage than is desired.

Conclusions

Take a systems-based approach to nutritional management of the cow herd, basing supplementation and feeding decisions on forage quality, cow body condition, and an understanding of cow requirements in the various stages of the production cycle.

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