

Total Protein Requirements of Beef Cattle III: Match the Diet to Animal Nutrient Requirements¹

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This is the third of a three-part series on protein requirements of beef cattle. The two preceding EDIS bulletins (AN167 and AN168) discussed the function of ruminal bacteria and differences in the nutrient profile of by-product feedstuffs, respectively. The series culminates here applying the knowledge from the first two parts in a realistic example. This series is intended to provide a broad overview of an important part of beef cattle nutrition with a perspective of how these diets should be formulated and balanced.

Below are descriptions of one beef cow in three different productive states and the nutrient profiles of the diets at corresponding points on a spring-calving calendar. The diet at each point in time is a representative example under the conditions described. Of course, as environmental, production, or animal conditions change, so will the animal's nutrient requirements. These examples will help you to understand why it is important to know the nutrient profile of the supplemental feeds you may be feeding your cows and whether you should provide more energy or more protein. If protein is needed, it will help you choose supplements that balance degradable intake protein (DIP) and undegradable intake protein

(UIP) appropriately. Table 1 shows how the change in diet composition affects body condition and thus, productivity. Even if a cow's total dietary dry matter intake (DMI) remained relatively constant over the three productive states below, because of the change in diet composition, i.e., progressively less fresh forage available throughout the season, the cow's body condition will slowly decrease. Since crude protein (CP) remains relatively constant as noted in Table 1, it is easy to see that a negative energy balance, or a shortage of dietary calories compared with an animal's requirement, can result in decreasing body condition score (BCS) at an increasing rate. Therefore, choosing feedstuffs with moderate or lower CP values and higher DIP proportions and TDN values will likely improve BCS and the overall nutritive status of the cow.

Thin cows are typically not a result of low dietary protein intake, but a result of reduced DMI and/or calories. Remember dietary protein can increase a cow's appetite or DMI, but if the forage is not available then you've really exacerbated an already declining nutritional status. Once pregnant and into the second and third trimester of gestation, mortality of the fetus is seldom at risk. Feeding cows

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adds to the cost of production but is not recommended only for aesthetic purposes. Thin cows at calving can result in higher rates of calving difficulty (dystocia) and lower rates of rebreeding. First calf heifers are especially prone to these problems; therefore nutritional management of these is critically important. Good and proper nutrition is important to the success and long term profitability of any cow herd. To further emphasize the importance of cow herd nutrition, here is an excerpt from the Florida Cow-Calf Management handbook (EDIS 117, Kunkel, et al.): *The keys to profitability in a commercial cow-calf operation include percentage of cows weaning a calf, calf weaning weight, and the annual cost of maintaining the brood cow. Nutrition is the most significant influence on these. You must meet the nutritional needs of your herd if you want a high calf crop percentage, heavy weaning weights, and short calving intervals.*

1. 1100 lb Crossbred cow (Angus x Braford)

61 months of age

BCS = 4.5

Five months pregnant

Grazing poor quality, short to medium height

bahiagrass in October

Receiving average quality bahiagrass

hay *ad libitum*

2. 1100 lb Cross bred cow (Angus x Braford)

64 months of age

BCS = 4.0

Eight months pregnant

Grazing poor quality, short bahiagrass

in January

Receiving average quality bahiagrass

hay *ad libitum*

3. 1100 lb Cross bred cow (Angus x Braford)

66 months of age

BCS = 4.0

Nursing a 75 lb calf

Grazing poor quality, very short

bahiagrass in March

Receiving average quality bahiagrass

hay *ad libitum*

Refer to EDIS AN167 and AN168 for further information on this subject and a selection of supplemental feedstuffs. Also, EDIS 117 presents a comprehensive look at the importance of feeding the cow herd.

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Table 1. Changes in diet quantity and nutrient composition affect cow body condition

Diet statistics ¹	Cow Physiological State ²		
	1	2	3
Estimated hay intake (lb) ¹	10.0	14.0	17.5
Estimated total intake (lb) ^{1,6}	20.7	20.6	20.7
Diet TDN (%)	52.5	51.9	51.3
Predicted energy balance (Mcal NEm) ³	-2.7	-2.9	-3.1
Days to lose 1 body condition score (BCS) ⁴	60.2	53.8	50.4
Diet CP (%) ⁵	8.6	8.4	8.3
Degradable protein (DIP) balance (g)	-50.0	-83.0	-113.0
Metabolizable protein (MP) balance (%)	40.0	41.0	50.0

¹Estimates calculated using NRC 2000 software.

²Refers to examples of physiological or productive state described in the text of this article.

³Mcal NEm is a representation of the caloric density of the diet; these calories are available for maintenance of the animal only.

⁴The number of days that would result in a decreased BCS by one full score. Related to a negative energy balance.

⁵Dietary crude protein is balanced if DIP and MP requirements are met. In this table, these values are divergent; therefore, DIP must be adjusted to provide correct dietary CP. Adjusting DIP may also improve diet TDN and result in improved BCS.

⁶Refers to the total estimated intake of both hay and vegetative or stockpiled forage.