

Total Protein Requirements of Beef Cattle III: Match the Diet to the Cattle 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 rumen microorganisms and differences in the nutrient profile of feedstuffs, respectively. The series culminates here, applying the knowledge from the first two parts in realistic examples. 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 (**Table 1**). Certainly, as environmental, production, or cattle conditions change, so will the cattle's nutrient requirements. These examples will help to explain the importance of knowing the nutrient profile of the supplemental feeds offered cows and whether more energy or more protein is required. If protein is needed, choosing supplements that balance rumen degradable protein (RDP) and rumen undegradable protein (RUP) is required.

Table 2 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.

In example 1, forage and hay intakes would result in a positive energy balance. However, the low amount of RDP consumed results in a deficiency of RDP despite an estimated over-supply of metabolizable protein. Without a positive RDP balance, rumen function is compromised and estimations of total performance should be viewed critically and are likely not feasible. In examples 2 and 3, estimated energy balances decrease, body condition score losses are predicted, and the negative RDP balance is increased compared to example 1. The decrease in RDP balance in examples 2 and 3 is caused by the decreased forage consumption relative to hay consumption and the change in respective RDP proportions.

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The deficiency of RDP is a situation that needs to be addressed. One solution would be to provide a supplement to the forage and hay being offered. Corn gluten feed is one potential feedstuff that could be considered in these examples. Re-formulation of the diets in examples 1, 2, and 3 to address the RDP deficit requires 3.5 and 5 pounds which displaces pasture consumption. Correcting the RDP deficit allows for full rumen function and optimizes rumen conditions for performance. The utilization of corn gluten feed also supplies additional energy to address the negative energy balance predicated without supplementation. Therefore, choosing feedstuffs with moderate or lower crude protein values and higher RDP 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 reduced forage availability exacerbates an already declining nutritional status. Feeding cows 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 rebreeding rates. 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.

Understanding nutrition and providing adequate protein is one component of proper nutritional management for the cow herd. Proper diet formulation that incorporates grazable forages, stored/conserved forages, and supplemental feeds are all possible for beef cattle. Understanding what cattle nutritional requirements are and what each feedstuff provides is imperative to feeding the cow herd to optimize production and profitability.

Refer to EDIS documents AN167 and AN168 for further information on this subject and a selection of supplemental feedstuffs. Also, AN117 presents a comprehensive look at the importance of feeding the cow herd.

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Table 1. Example production scenarios

Example cow is a mature 1,100 pound, Angus x Braford crossbred cow			
	Production example		
	1	2	3
Calendar Month	October	January	March
Cow Age, months	61	64	66
Cow Body Condition Score	4.5	4.0	4.0
Gestation Month	5	8	Lactating
Pasture Amount	Adequate	Limited	Very limited
Pasture Quality	Poor	Poor	Poor

Table 2. Changes in diet quantity and nutrient composition affect cow body condition

	Example without supplementation			Example with supplementation		
	1	2	3	1	2	3
Estimated hay intake, lb ^a	10	14	17.5	10	14	17.5
Estimated supplement intake, lb ^{a,b}	0	0	0	3.5	5.0	5
Estimated total intake, lb ^a	23.8	23.6	24.5	24	24	24
Diet TDN, % ^{a,c}	55	53	53	58	58	58
Predicted energy balance, Mcal of NEm ^d	+2.6	-0.1	-3.2	+3.9	+1.9	+3.9
Days to change 1 BCS ^e	+89	0	-49	+57	+119	+59
Diet crude protein, % ^f	8.2	7.5	8.5	10.5	11.1	11.5
RDP balance, g	-115	-192	-128	+15	+25	+53
Metabolizable protein balance, %	+61	+33	+1	+83	+60	+98

^a Estimates calculated using NRC 2000 software.

^b Corn gluten feed utilized as a supplement.

^c Total digestible nutrients; refers to the total estimated intake of both hay/pasture forage and supplement.

^d Mcal NEm is a representation of the caloric density of the diet available for maintenance of the animal only.

^e The number of days that would result in an increase (+) or decrease (-) of one body condition score.

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