Ridin' Herd

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Effect of cow weight, milk level on nutrient requirements

Understanding the nutrient requirements of the cow herd and items that affect those requirements are important for producers. It has been estimated that feed costs represent 40%-60% of annual cow costs. Make sure that cow type fits the feed resource of your operation, as that will affect cow costs. Because feed resources differ from ranch to ranch, not all cow types in a production system will be the same.

Cow nutrient requirements

Items that affect cow nutrient requirements are outlined in the 1996 National Research Council (NRC) *Nutrient Requirements of Beef Cattle*. Nutrient requirements for beef cows are affected by:

1) cow age (first-calf females vs. mature cows);
2) weight/size;
3) lactation ability (breed type);
4) stage of production (gestating vs. lactating);
5) environmental conditions; and
6) body condition of the female.

Up until 1996, the *Nutrient Requirements of Beef Cattle* assumed that cows were a body condition score (BCS) 5 (on a scale of 1 to 9; 1 being thin and emaciated, 9 being fat and obese) and environmental conditions were isothermic. All cows are not BCS 5, and to change BCS from thin to moderate, energy needs to be added to the diet in the form of a supplement or access to higher-quality forage.

Environmental conditions change throughout the production cycle of the cow. Degree of cow cold stress is a function of outside temperature, wind speed, hair coat (amount of hair and whether the hair coat is wet or dry) and body condition.

Hair is a good insulator, especially when dry, to keep body heat close to the animal. In the winter when there is a severe wind chill and the hair coat is wet, energy needs may be difficult to meet, even if cows are BCS 5 or 6.

The increase in nutrient needs of young cows vs. mature cows is primarily due to growth.

Cow size and nutrient needs

Nutrient needs for cows of different body weights are not the same. Cows that weigh 1,300 pounds (lb.) have a greater nutrient requirement [lb. of protein, lb. of energy in the form of total digestible nutrients (TDN), ounces of mineral, etc.] compared to cows that weigh 1,000 lb. If a 1,000-lb. cow and a 1,300-lb. cow are grazing the same forage resource, the 1,300-lb. cow will need to consume more forage to meet her requirements.

Maintenance feed intake is proportional to metabolic body weight, which is described as body weight to the ¾ power (body wt.^{¾}). Metabolic body weight isn't just weight of the animal, but also the surface area of the animal. Heavier cows eat more feed to meet their requirements. The question is, "How much more do heavier cows eat?"

Table 1 suggests that for each 10% increase in body weight, there is not a 10% increase in maintenance feed intake [metabolic body weight is expressed in kilograms (kg)]. Instead, the data suggest about a 7% increase in feed intake for each 10% increase in live weight. A 1,300-lb. cow will consume 22% more feed than the 1,000-lb. female, although there is a 30% difference in body weight.

Level of milk production affects nutrient needs

Managing for milk level in your cow herd is kind of like determining whether the porridge is too cold, too hot or just right. Too little milk in the cow herd equates to lighter weaning weights, which affects dollars generated in the cow-calf enterprise. However, low milk level in a cow herd should result in lower feed costs.

A high milk level equates to heavier weaning weights, but it also has the potential to increase feed inputs and, therefore, cow costs. As milk potential increases, so do nutrient needs. Cows that have a high milk level have a greater need for protein, energy (TDN), mineral, etc., to be consumed daily to meet those needs compared to cows with a low level of milk potential.

A number of years ago at the University of Nebraska, three groups of cows were developed that were similar in weight, but differed in level of milk produced (see Table 2). The cows in the moderate-milk-level group gave 28% more milk than the cows in the low-milk-level group. Likewise, the cows in the high-milk-level group gave 46% more milk than cows in the low-milk-level group. As one would expect, the feed needs for lactation between the three groups differed. Cows in the moderate- and high-milk-level

Table 1: Bigger cows eat how much more feed?

Cow wt., lb.	% increase	Metabolic body wt., kg.	% increase
1,000	----	217	----
1,100	10	233	7
1,200	20	248	14
1,300	30	264	22
1,400	40	280	29
1,500	50	295	38

Maintenance feed is proportional to metabolic body weight (weight^{¾}).

Table 2: Effect of milk production

Trait	Milk Level Low	Medium	High
Cow wt., lb.	1,219	1,131	1,131
Milk, lb. per day	13.8	+28%	+46%
Feed, lactation, Kcal per kg^{¾*}	126	+17%	+12%
Feed, gestation, Kcal per kg^{¾*}	97	+18%	+13%
Feed, feedlot, Kcal per kg^{¾*}	144	+9%	+14%

*Kcal per kg^{¾} is a way to express energy needs for maintenance for a cow.

groups needed more feed to stay in similar weight and body condition as compared to cows in the low-milk-level group.

Even more interesting is that feed during gestation was greater for cows in the moderate- and high-milk-level groups compared to cows in the low-milk-level group, indicating that even when the cows with different milk-producing abilities were not lactating, milk potential increased nutrient needs. In addition, feed needed in the feedlot was greater for the offspring from dams that had higher milk potential.

Data from the U.S. Meat Animal Research Center (MARC) near Clay Center, Neb., indicate that cows with greater potential to produce milk also have a greater percent of their body weight as heart, liver and lungs. So the greater nutrient need for non-lactating cows and for their offspring in the feedlot may be a result of having to maintain more heart, liver and lungs, which are highly active tissues.

Figs. 1 and 2 illustrate the amount of forage that a 1,150- to 1,200-lb. cow would have to consume to meet her protein and energy requirement if the forage quality was either high (green portion of the bar), average (green and white portion of the bar), or low (green, white and yellow portion of the bar). As quality of the forage decreases, cows need to consume more of the forage as they move from mid-gestation to late gestation to lactation. This same concept holds true as milk potential increases from 10 lb. per day to 20 lb. per day.

If you study the graphs closely, they indicate that it will be a challenge to meet the energy and protein requirements of a cow that gives 20 lb. of milk per day on medium- to low-quality forages. The challenge is that she will have difficulty consuming enough of the forage to meet her needs without supplementation. If cattle are asked to produce in a lush environment, then cow mature weight and level of milk is less of a concern except that carrying capacity will be reduced. If feed resources are limited, cow weight and milk production need to be carefully scrutinized.

Summary

Cow weight and milk level affect nutrient requirements and feed intake. Cows bred for a high level of milk production have higher nutrient requirements even when not lactating.

So, you ask, "How big should my cows be, and how much milk should they give?" It depends! Match cow size and milk level to your feed resources. From an economic standpoint, the greater number of cows that can be grazed on a given forage base and meet their nutrient needs from the grazed resource base, the greater the profit potential of the enterprise.

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Editor's Note: *"Ridin' Herd" is a monthly column written by Rick Rasby, professor of animal science at the University of Nebraska. The column focuses on beef nutrition and its effects on performance and profitability.*

Fig. 1: Forage DM intake needed to provide energy required for pregnancy and milk for a 1,150- to 1,200-lb. cow

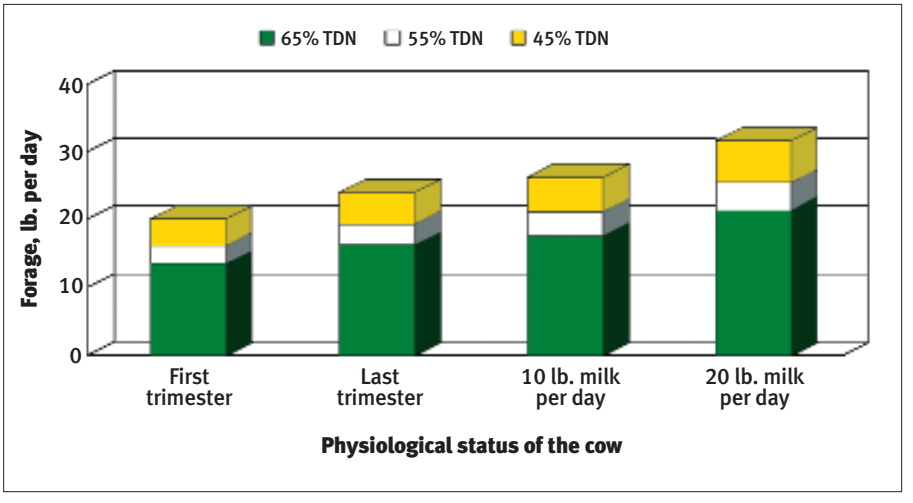

Fig. 2: Forage DM intake needed to provide protein required for pregnancy and milk for a 1,150- to 1,200-lb. cow