How Much Forage Can We Feed to Dairy Cows?

Kenneth Kalscheur, USDA-ARS, U.S. Dairy Forage Research Center

airy cattle are designed to convert forages and high fiber feedstuffs into high quality products. Diets formulated with high amounts of high quality forage can efficiently produce high milk levels. Ultimately, diets need to be formulated to keep the rumen healthy and produce milk efficiently while limiting nutrient waste, all at an economical price to keep the farm profitable.

Why are Forages Important?

Forages in dairy cow diets are required to keep the rumen healthy and fermentation optimal for high milk production. There are many benefits to increasing forage concentration: higher milk components (primarily milk fat percentage), improved cow health resulting from normal rumen function, lower culling rates, increased cow longevity, lower feed purchases, and increased income with homegrown forages. Increased forage consumption is directly related to improved rumen and cow health because it lowers the incidence of acidosis and metabolic disorders resulting in fewer foot problems and longer life.

There are potential challenges for increasing forages in the diet. As with any change in the diet or management practice, one needs to consider what will be affected. First, more high quality forage will be needed over the course of the year, meaning more forage acreage, harvesting, and storage capacity. Second, forage production can be challenging, but it will be important to harvest high quality, highly digestible forages to support high milk production. Since forages will be a greater portion of the ration, slight changes in nutritional concentration will result in significant nutrient supply changes to the cow. Therefore, the farmer or nutritionist will need frequent forage analyses and ration adjustments to account for nutritional changes. Third, if forage quality is not sufficient, cows will decrease feed intake because of lower ruminal digestibility resulting in lower milk production and profitability. Consequently, all of these challenges need to be factored in when deciding whether to increase the forage to be included in the ration.

How much forage can one formulate into high-producing dairy cow rations? Over the past decade, herds successfully increased forages (i.e., grasses, alfalfa, corn silage) from 50% of the diet (on a dry matter basis) to >55%. Today, many Midwest herds use 55-60% forage inclusion. What about even higher inclusion levels and what types of forages can be used to achieve this? Northeast U.S. researchers (Chase and Grant, 2013), summarized diets of six herds that successfully included 62-75% forages. Milk production was 76-105 lbs/cow/day and milk fat percentage was 3.6-4.3. Diet characteristics included:

- 1) A variety of forages (while all used some corn silage, alfalfa and grass silage were also important, indicating there was no specific recipe as long as the forage is highly digestible).
- 2) Dietary starch concentration from 24-27%.
- 3) Dietary crude protein concentration from 15.5-18.3%.
- 4) Dietary neutral detergent fiber (NDF) from 31-34%.
- 5) Forage NDF as a % of bodyweight (BW) from 0.9-1.1 (it is important forage NDF, as a BW %, is ≥0.9%; higher is better).

Economic Benefit of Forages

A major reason for increasing forages in diets is that cows can convert higher forage diets to milk more efficiently than lower forage diets, thereby reducing the cost to produce milk. In addition, forages are typically less expensive than purchased grains and concentrates, further enhancing income minus feed costs. For example, South Dakota State University researchers (Schuler et al., 2013) evaluated diets where forages were increased from 42 to 66%. The remaining portion of the diet consisted of grains, concentrates, and by-product feeds. The forage portion consisted of 30% alfalfa haylage and 70% corn silage on a dry matter basis across all four diets. In agreement with

Forage Focus, December 2015

previous forage inclusion experiments, dry matter intake (DMI) declined linearly as forage inclusion increased from 42 to 66%. Interestingly, milk production remained the same, averaging 88 lbs/cow/day. Consequently, this has an important impact on feed efficiency, or the conversion of one unit of DMI to one unit of energy-corrected milk produced. Energy-corrected milk is the desired unit of measure to account for any changes in milk fat and protein percentages. In this experiment, because cows consumed less feed on the higher forage diets, but produced similar quantities of energy-corrected milk, the conversion of feed to milk (otherwise known as feed efficiency) increased linearly from 1.36, 1.44, 1.54, and 1.57 for cows fed the 42, 50, 58, and 66% forage diets, respectively.

While improving feed efficiency is highly desirable, this effect is doubly enhanced by the fact that forages are less expensive than concentrate feeds. In this experiment, because energy-corrected milk was similar across diets, milk income was also similar, averaging about \$13.14/cow/day. On the other hand, feed costs declined from \$6.23 to \$5.49/cow/day for cows fed the 42% and 66% forage diets, respectively. Overall, income minus feed costs improved as forage increased in the diets.

Considerations for Feeding Higher Forage Diets

There are many factors that determine forage consumption by the cow. These include forage quality, rate of digestion in the rumen, rate of passage out of the rumen, forage particle size, and forage palatability. If forage digestibility is poor, rate of digestion decreases, rate of passage decreases, intake decreases, and in the end, milk production decreases.

Chase and Grant (2013) suggested the following guidelines for herds considering increasing forages in the dairy ration:

- 1) Strive for consistent quality with minimal variation. Variation in forage quality will greatly impact milk production.
- 2) Monitor forage inventory. Consider changes in cropping or feed sourcing program.
- 3) Allocate the highest and lowest quality forages to the most appropriate groups.
- 4) Frequently analyze forages (i.e., particle size, digestibility).
- 5) Adjust rations as needed based on forage analyses.
- 6) Target feeding management, including silage face management, aerobic stability, palatability, and feed delivery.
- 7) Monitor TMR mixer management. Ration is bulkier creating the need for more mixes per day or the need for a larger mixer.
- 8) Make dietary adjustments to higher forage concentration in small increments. Adjust ration and see how cows respond before making dramatic changes in the ration.

Forages are an important part of every dairy cow diet. Higher inclusion levels of lower digestible forages will reduce milk production, whereas higher inclusion of high quality forages in the dairy cow diet will maintain rumen health, improve milk components, and increase income per cow per day minus feed costs. While high forage diets may not fit the management of all dairy farms, it is an excellent option for those dairy farms with land base available to grow their own forages.