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FORAGE SOLUTIONS

Forage-focused: Evaluating fiber and its impact on feed efficiency

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Over the past several years, on-farm income for dairy producers has been less than ideal due to lower-than-average milk prices nationwide. In order to remain in business during tough times, it is sometimes necessary to turn to novel nutritional strategies when considering ways to increase feed efficiency and lower the cost of production. We have all been taught that increasing forage quality at the farm level is crucial to elevating the performance of the herd, but what specific parameters should we consider when analyzing our forages for quality while keeping feed efficiency in mind?

For starters, benchmark your herd based on energy-corrected milk (ECM), feed cost per pound of dry matter, and feed cost per hundredweight (CWT) of ECM. Dividing the feed cost per pound of dry matter by your feed cost per CWT of ECM determines your energy-corrected feed conversion efficiency (EC_FCE). Benchmarking your herd in terms of EC_FCE is a great way to evaluate your herd over time or against other herds to ensure that you are maximizing the efficiency and profitability of your farm.

ECM formula = (0.327 x milk lbs.) + (12.95 x fat lbs.) + (7.65 x protein lbs.)

Scenario: 99.1 lbs. ECM; $5.39 feed cost/CWT; 53.9 lbs. dry matter intake (DMI); $0.099 feed cost/lb. dry matter (DM)

Example: ($0.099 feed cost/lb. DM/$5.39 feed cost/CWT) * 100 = 1.84 EC_FCE

Fiber's role in feed efficiency

Evaluating fiber's impact on animal and ruminant nutrition is not a new area of focus for dairy nutrition, as producers, nutritionists and scientists have been studying this topic for decades. Fiber, defined as neutral detergent fiber (NDF) in dairy nutrition, contributes two major facets to dairy diets: it is important for both physical fill and energy. Energetically, fiber theoretically contains the equivalent calories per gram as starch and sugars; however, a substantial portion of the calories in fiber remain locked in an undigestible form. Therefore, fiber provides the least energy per pound of all nutrients in the total mixed ration (TMR). From a physical effectiveness standpoint, fiber is also essential to maintain rumen health and function. It is important to consider both fiber's physically effective and energetic attributes together, as these are important in their own right but also when combined into newer nutrition metrics.

Gone are the days of measuring forage quality by simply looking at RFV, NDF, ADF and, to a certain extent, 30- or 48-hour NDF digestibility (NDFD). Both undigested NDF (uNDF) and the potentially digestible fiber digestion rate (pdNDF kd) should be used in the decision-making process when balancing rations. To simplify, the goal is to reduce the percentage of undigestible fiber in the forage while increasing the amount of potentially digestible fiber and the rate of digestion. To decrease the uNDF and, thus, increase the pdNDF, the lignin percentage of the fiber in the stored forage must be reduced, or the percentage of starch, sugar or protein must increase to dilute the lignin. Low-lignin alfalfa and brown-midrib (BMR) varieties are two options that reduce uNDF (as a percentage of the total NDF) when pursuing more digestible forage. However, the costs associated with this technology should be evaluated to ensure that the calculated cash flow projections are profitable. When harvesting conventional alfalfa, cut first-crop alfalfa each year at a height of 22 to 24 inches, and do not assume that 28-day cutting intervals will result in dairy-quality forage. Scout the fields starting about 17 days after the prior cutting, and monitor plant maturity every 3 to 5 days with scissor clippings. In conventional corn silage, harvesting at a higher cut will leave more fibrous stalks in the field, reducing uNDF as a percentage of the dry matter by achieving a higher percentage of starch in the final corn silage harvest.

Feed conversion

The goal in changing the type and amount of fiber fed should be to increase the feed conversion efficiency by increasing the percentage of available feed (less uNDF) as part of working toward an optimized amount of total digestible tons (TDN) per acre. According to researchers Oba and Allen (1999), a 1-unit gain in forage rumen NDF digestion corresponds to a roughly 0.38-pound increase in DMI and just over a 0.55-pound increase in 4% fat corrected milk production per cow per day. With a milk-to-intake increase of roughly 2:1 per unit NDFD, theoretically, feed conversion should improve via reduced lignin forages, assuming NDFD increases. Assuming a TMR cost of $0.11 per pound of dry matter and an income of $0.17 per pound of milk gained, we can project an increased income opportunity of $0.115 per every unit increase of forage NDFD.

Corn silage fiber in relation to dairy performance

A recent case study conducted by Geiser and Goeser evaluated corn silage NDFD and uNDF (as routinely assayed by Rock River Laboratory) in relation to commercial dairy performance. After analyzing the corn silage and TMR samples for 59 dairies, the statistics were compared for various starch and fiber measurements, along with the corresponding production parameters. The results suggested that a 1-unit increase in corn silage NDFD30 or total tract NDF digestibility (TTNDFD) corresponds to a 0.45- and 0.62-pound increase in DMI and a 0.98- and 0.78-pound increase in ECM, respectively. In comparison, a 1-unit increase in corn silage uNDF240 appeared to correspond to a 0.60-pound decrease in dry matter intake and a 1.29-pound decrease in ECM. Finally, feed efficiency was measured, and the results suggested that a 1-unit increase in corn silage NDF30 could equate to a 0.005-unit increase in feed conversion efficiency (FCE). We would then expect a 10-unit increase in NDFD30 in corn silage to translate to an increase of 0.05 in ECM FCE. Based on the average feed costs in the U.S. in 2019, this improvement in efficiency should equate to roughly $0.20 per CWT in reduced feed costs.

In summary, DMI and ECM increase as ration NDFD30 and TTNDFD increase, while an increase in uNDF240 negatively affects both parameters. Feed efficiency has many applications as a management tool for improving production and profitability. Making improvements in feed efficiency will almost always be profitable, as it means getting more milk per unit of dry matter fed — or the same amount of milk by feeding smaller amounts of higher-quality feeds. High-quality forage is irreplaceable and, if prepared correctly, sets the stage for maximized feed efficiency throughout the year.

For more information, or for assistance with calculating your energy-corrected feed conversion efficiency, contact one of our Hubbard Dairy team members.

Reference: Goeser, J. 2019. Understanding fiber for profitable ration decisions. Mid-South Ruminant Nutrition Conf. Grapevine, TX. August 6-7, 2019.