

What determines forage-marketing benchmarks?

DO YOU know what actually goes into TDN (total digestible nutrients), RFV (relative feed value) or milk per ton values used to buy or sell hay or silage? Is the important nutrition component, fiber digestibility, included in the evaluation?

Feed value indices have evolved substantially over the past 30 years as numerous researchers have published

and documented the impact NDFD (neutral detergent fiber digestibility) has upon animal performance, with greater NDFD measures corresponding to greater gains or milk per cow. Gaining two to three units in NDFD will often lead to 1 pound per cow improvement in performance.

As dairies and feedlots recognize performance variances from one crop

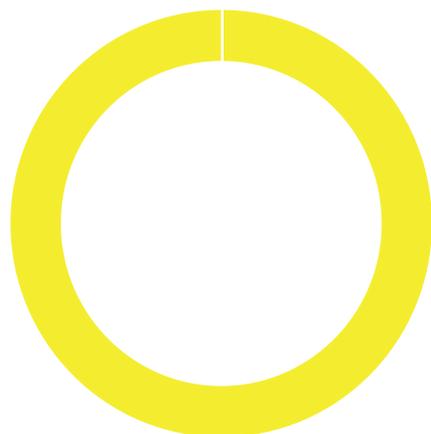
to the next, in many cases due to NDFD, the industry's search for better crop value measures intensified. As a result, crop value predictions have evolved to incorporate NDFD measures and improved in accuracy under the guidance of university researchers and professors. However, with all of this progress in understanding, too many conversations and transactions still center on forage measures that do not consider advanced nutrition NDFD.

Millions of dollars in hay and silage are bought and sold each year based upon quality values that do not reflect fiber digestion potential. Does the benchmark used to value forage consider appropriate nutrient measures or NDF digestibility within the ranking? In the following discussion and figures, an outline of how forage nutrient parameters (such as crude protein; CP) and NDFD are related to, and explain, common forage value measures.

Early crop quality predictions, dating back 20 years or more, began by measuring acid detergent fiber (ADF), which is the amount of fiber that was not soluble in acid. Some early research showed that ADF was strongly correlated to TDN, and California TDN (CA TDN) was born. TDN is estimated solely based upon the ADF content. Figure 1 demonstrates that ADF content explains all variation. Notice that NDFD does not explain any of CA TDN.

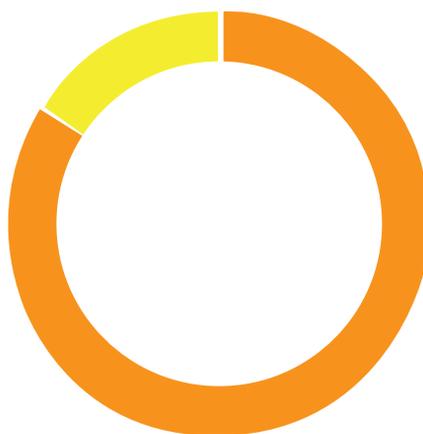
Fiber content matters and ADF is important. But while research-backed, ADF alone falls short of explaining many animal performance swings. As time has gone on, forage crop value estimates further evolved to incorporate another fiber measure, neutral detergent fiber (NDF), into RFV. The RFV measure added slightly more complexity, however it still simply rep-

Figure 1: California TDN based solely on ADF



*Pie chart representing the amount of California TDN (CA TDN) variation, as percent of total, explained by core forage nutrient and digestion (NDFD30) measures.

Figure 2: RFV is impacted entirely by ADF and NDF



*Pie chart representing the amount of relative feed value (RFV) variation, as a percent of total, explained by core forage nutrient and digestion (NDFD30) measures.

CP aNDF Lignin ADF Fat Ash NDFD30

Figure 3: RFQ came close to measuring alfalfa's value



*Pie chart representing the amount of relative forage quality (RFQ) variation, as a percent of total, explained by core forage nutrient and digestion (NDFD30) measures.

Figure 4: Milk 2006 ties alfalfa quality to animal performance



*Pie chart representing the amount of Milk2006 variation, as a percent of total — excluding starch and dry matter, explained by core forage nutrient and digestion (NDFD30) measures. Please note, both starch and dry matter were excluded in the evaluation here to demonstrate nutrient and NDFD contributions to Milk2006 across all forage crops.

JOHN GOESER

The author is the director of nutrition research and innovation with Rock River Lab Inc. and adjunct assistant professor, University of Wisconsin-Madison's Dairy Science Department.



resents only fiber content as evidenced in Figure 2. The hay or haylage NDF explains over 75 percent of RFV, while other nutrient measures, such as crude protein and NDFD, have no impact on RFV.

As mentioned previously, fiber content is important and is the first parameter that many evaluate when interpreting hay or silage value. But the fiber digestibility is equally valuable relative to animal performance, and is not considered in RFV. As a result, the Relative Forage Quality (RFQ; Undersander and Moore, 2001) measure was developed. Relative forage quality is built upon NDF and ADF but also builds in other nutrients reported on the forage analysis, and incorporates NDFD, as highlighted in Figure 3.

Further investigating the forage analysis measures that contribute to RFQ, NDF remains a large stake-holder, similar to RFV. However, crude protein (CP), fat, and ash are important forage nutrients to consider, and RFQ builds these in — meaning RFQ is more dynamic than RFV. The RFQ index not only builds these valuable nutrients into the equation, but further relates to animal performance by incorporating NDFD, which accounts for roughly 25 percent of the RFQ result (Figure 3).

Greater NDFD will be reflected in higher RFQ values, other things being equal, and this is logical. The goal for RFQ should be 175 or greater for high performing dairy or beef cattle. While RFQ is applicable for hay and haylage, there is one more advanced quality ranking; the Milk2006 equation, which seeks to better relate to animal performance.

The Milk2006 equation and forage value expands upon ration model equations (NRC, 2001) to refine how NDFD contributes to forage value, as can be seen in Figure 4. Milk2006 also offers outputs in several fashions to fit a variety of users — TDN, net energy for lactation (NEL) or pounds of milk per ton of forage.

Milk2006 is currently the most dynamic forage value index available to date and applicable for all forage types, incorporating starch and dry matter for corn silages to better reflect silage performance. Fiber digestibility is now a primary forage analysis component in determining TDN, NEL or milk per ton using the Milk2006 approach. And rightfully so. The goal in TDN is to be greater than 70 percent. The goal in milk per ton is to be greater than 3,200 pounds per ton.

Develop a system

These pie charts are a visual representation of which forage analysis measures, and to what extent, are used to value forage with your favorite index. If your index seems overly simple, such as being based on a single nutrient or two, work with your consulting team to choose a new one that has potential to better reflect the quality of your forage for use on your own herd, or for marketing your forage to others. Consider using the more advanced quality rankings to more appropriately value your forage and better relate to animal performance.

Besides analyzing your forage value to build a great ration, the forage quality measure utilized on your farm or your clients' farms can also hone a benchmarking program to continue to improve quality through the years. All of this can be done while the industry waits for history to repeat itself with new parameters for forage quality measurement that get us closer to knowing exactly what happens within the cow. ●