

USING RFQ: Defining Quality and Categorizing Hay

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Understanding the many forage quality terms can be a bit overwhelming. Over the years, cattlemen have said, “Just give me one number to look at.” Two of the most common numbers used to assess forage quality have focused on Crude Protein (CP) or Total Digestible Nutrients (TDN). However, looking at just one of those numbers can be misleading. If you pin down a nutritionist, he or she will tell you that the most important characteristics in determining forage quality are: (1) how much digestible energy is in the forage; (2) how much of it the animal is likely to eat.

Focusing on these two fundamentals, forage specialists at the University of Wisconsin and University of Florida combined the amount of digestible energy in a forage (i.e., TDN) and an estimate of dry matter intake (DMI) into one number. They called this Relative Forage Quality (RFQ). To celebrate the upcoming 15-year anniversary of RFQ’s introduction, I will be providing a series of articles on this important measure of forage quality over the course of the next couple of months. The purpose of this series will be to describe how RFQ is useful, how it can help the user determine the best use or market for their forage, and the limitations of RFQ. We’ll begin this series with a more detailed look at RFQ and how it can be used by the producer to categorize hay.

What is RFQ?

The RFQ term is calculated in the equation below by using two other terms provided in the forage test results. These other terms are Total Digestible Nutrients (TDN), which is a measure of digestible energy, and Dry Matter Intake (DMI), which is a prediction of how much of the forage the animal is likely to be able to consume. Additionally, there is an adjustment used in the calculation, which provides the RFQ term with a reference point to market value. The RFQ equation was designed to have a reference point of 100, which is roughly equivalent to fully mature alfalfa (this is the purpose of the unitless denominator value, 1.23). Since the base price

for hay sales and auctions in many parts of the world is the value of poor-quality alfalfa, RFQ provides a mechanism for indexing quality to value.

$$\text{RFQ} = \frac{\text{TDN} \times \text{DMI}}{1.23}$$

Why is It “Relative”?

Consider the following real-world example. Pictured in Figure 1 are 25-pound piles of fair-quality alfalfa and good-quality bermudagrass that were freshly cut from plots at one of our research farms. Some data about the size and volume of each pile and selected measures of forage quality for the fresh forage are listed in Table 1. These plots were chosen because the TDN would be virtually identical.

Note that despite having the exact same weight, the loose pile of alfalfa is shorter and narrower than that of the bermudagrass. Consequently, it has a smaller volume. Even though the TDN levels are virtually identical, the RFQ of the alfalfa is substantially higher. This is because the DMI predicted for these forage lots differs substantially. If one were to feed forage from these two lots ad libitum (free choice) with no additional supplementation to beef cows, it is estimated that the cows fed the choice alfalfa would consume 4.2 pounds more forage per 1,000 pounds of body weight (b.w.), relative to the cows fed the standard bermudagrass. Consequently, those beef cows on the alfalfa would have consumed ~24 percent more TDN than those fed the bermudagrass.

This example illustrates why RFQ is a “relative” measure of forage quality. The forage quality is defined in RFQ by not just how much energy is in the crop, but also the relative amount of energy that can be consumed. By combining TDN and DMI, the RFQ index provides a more robust and superior measure of forage quality than other single measurements. Comparing the alfalfa and bermudagrass forages mentioned

above simply on the basis of TDN would have led to a conclusion that they were roughly the same. However, this is an “apples to oranges” comparison. By using RFQ, one can compare different forage species and types against one another on an “apples to apples” basis.



Figure 1. A 25-lb pile of alfalfa (L) and bermudagrass (R) that had been freshly cut with a flail plot harvester. The loose pile (no compression) illustrates the difference in volume each required.

Table 1. An illustration of the combination of energy concentration and the importance of supporting high DM intake (DMI). Note that despite similar TDN values, the higher DMI of the alfalfa predicts much higher TDN intake.

Item	Units	Alfalfa	Bermuda
Weight	lbs	25.0	25.0
Loose Pile Height	in.	22.5	25.5
Loose Pile Diam.	in.	44.3	60.0
Approx. Volume	in. ³	12,000	24,000
RFQ		144.7	110.4
TDN	%	60.2	59.6
DMI	% of b.w.	3.0	2.3
TDN Intake	lbs per 1000 lbs b.w.	17.8	13.6

Using RFQ to Categorize Hay

As a result of the robustness of the RFQ measure, scientists have been able to link ranges of RFQ that are most likely to meet the needs of different animal classes. These ranges can be found in Figure 2. This would allow a livestock manager with RFQ data on a particular lot of forage to quickly determine whether it is appropriate to the needs of the animal class that he or she is managing.

These ranges illustrate the RFQ values that are most likely to minimize supplementation. Be aware that just because a forage lot falls within these recommended ranges, this DOES NOT mean that it will automatically provide all the nutrients

needed for the livestock being fed. One does not use RFQ to develop a ration. However, RFQ provides a reasonable first approximation as to whether or not a forage will provide a cost-effective base to the diet being fed to the selected animal class.

An RFQ value that is lower than the identified range may still work for the animal class that is being fed. However, additional supplementation will likely be required. This additional supplementation may make the ration (forage plus supplement) less economical.

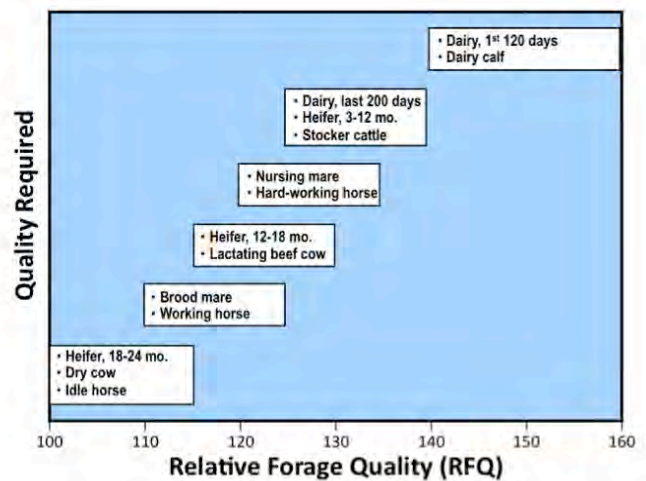


Figure 2. The Relative Forage Quality (RFQ) range that are suitable to various livestock classes. Adapted from Undersander et al., 2011.

How Does Your Hay Rank?

If you are curious to see how your hay or baleage compares with that of other producers in the Southeast, consider entering it into the 2016 Southeastern Hay Contest presented by Massey Ferguson. The Contest is held each year in association with the Sunbelt Ag Expo in Moultrie, Georgia. The Grand Prize is the use of a new Massey Ferguson RK Series rotary rake OR DM Series Professional disc mower for the 2017 hay production season AND \$1,000 cash! Plus, all of the nine categories have been sponsored by other industry partners. These sponsorships will provide cash awards to the top three places in each category (1st prize \$125, 2nd prize \$75, and 3rd prize \$50)! The rules and entry form for the Southeastern Hay Contest are available at <https://sehaycontest.wordpress.com>. Please note: All entries must be in by 5 p.m., Thursday, Sept. 22.

For more information on forage quality, beef cattle nutrition, and the Southeastern Hay Contest, visit our website, www.georgiaforages.com. If you have additional forage management questions, visit or contact your local University of Georgia Cooperative Extension office by dialing 1-800-ASK-UGA1.