Indexing Hay Quality to Animal Performance

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INTRODUCTION

Forages comprise 35% to 70% of the dry matter (**DM**) in diets for lactating dairy cows. Forage quality impacts DM intake, diet energy density, dietary grain and protein supplementation, feed costs, and lactation performance.

RFQ vs. RFV

Milk production decline with diminishing alfalfa quality (increasing ADF and NDF contents and decreasing RFV) is well established (Nelson and Satter, 1990). Relative feed value (RFV; Rohweder et al., 1978), used for forage evaluation and hay marketing, is based on NDF and acid detergent fiber (ADF) concentrations as predictors of intake potential and energy value, respectively. Relative feed value has evolved to the point where it is commonly available on commercial forage test reports, used routinely in evaluations and comparisons of hay-crop forage quality, and used in the marketing of hays. Data from Wisconsin quality-tested hay auctions show that dairy producers pay $0.90 per point of RFV above the RFV of a base quality alfalfa (Undersander, 2002). But, the RFV estimates do not account for differences in vitro NDF digestibility (**NDFD**). We have incorporated NDFD measurements into the RFV calculations, where forage energy value is estimated using summative equations and DM intake (**DMI**) potential is estimated using NDF and NDFD. The new quality estimate has been termed relative forage quality (RFQ; Undersander and Moore, 2002). The regression of RFV versus RFQ is presented in Figure 1. The graph and its low R-square value (0.68) show that RFQ varies above and below its line of equality with RFV. For example, samples with RFV of 140 have RFQ values ranging from 110 to 170. The use of NDFD measurements in forage evaluation schemes appears to detect variation in forage quality not previously detected in schemes based solely on fiber concentrations; i.e. grasses and alfalfa-grass mixture. The foregoing discussion may partially explain why dairy producers often report widely different animal performance from lots of hay with the same RFV. Factors that cause NDFD to vary include plant species, varieties within a species, stage of maturity at harvest, climatic condition that the crop was grown under, and interactions between these factors.

Milk Per Ton And Milk Per Acre

Another index of forage quality, milk per ton of forage DM (Undersander et al., 1993), was based on energy value of the forage predicted from ADF content and DM intake potential of the forage predicted from NDF content. Milk per ton has been modified to include forage energy value estimated from summative equations (Shaver et al., 2002; NRC, 2001) and forage DMI calculated from NDF (Mertens, 1987) and NDFD (Oba and Allen, 1999). The University of Wisconsin MILK2006 Alfalfa – Grass Evaluation System to calculate milk per ton and milk per acre is available on the internet as a spreadsheet (Undersander et al., 2006). Milk per ton has evolved to the point where it is commonly used in agronomic performance trials, because an estimate of forage DM yield often obtained in these types of trials multiplied times the estimate of milk produced per ton of forage DM provides an estimate of the milk produced per acre which combines yield and quality into a single term.

CONCLUSIONS

Dairy producers that purchase their forage should evaluate quality using the RFV/RFQ index, while those that produce their own forage should evaluate quality and yield using the milk per ton of forage DM and milk per acre indexes. The RFV/RFQ index is useful for hay pricing/valuing and for targeting hay of varying quality to animal groups according to their nutrient requirements. The milk per ton and milk per acre indexes are useful in forage variety selection programs and for evaluating cropping practices.

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Figure 1. Current RFV versus proposed RFQ (Undersander and Moore, 2002).