Crops and Manure

By K.C. McRoberts and D.J.R. Cherney

Quality estimation for harvests in mixed alfalfa-grass stands

NDF is the most useful mixed stand harvest date target for haylage production to feed dairy cows. Stand NDF can be estimated using alfalfa maximum height and an estimate of the grass fraction in the stand.

Grass and alfalfa are commonly grown together in the Northeast and Mid-Atlantic. Mixes are becoming more popular in other regions. Timing of spring forage harvests is critical to ensure high quality forage for dairy cattle production. Spring forage quality and harvest timing can be predicted based on fiber (NDF) concentration when forages are the principal source of fiber in dairy rations. Fiber content of forages is primarily impacted by maturity. Other forage quality parameters, such as protein and fiber digestibility, are important for ration balancing, but they are not as useful for harvest date targets. Application of simple equations to predict harvest NDF can help improve spring forage harvest management.

Target NDF at Harvest

Target NDF at harvest for lactating dairy cows is approximately 50% for pure grass stands for haylage and 40% for pure alfalfa stands for haylage. NDF concentrations are given as percent of dry matter. For mixed stands, optimum harvest NDF varies with the amount of grass in the stand or stand composition (Figure 1). The relatively narrow range in optimal NDF for lactating dairy cows makes harvest management decisions critical. Optimal first cut harvest timing sets the stage for high quality across the growing season. In general, for the northern tier of dairy states, optimal harvest dates occur between May 15 and 30. After forage is harvested and stored, an accurate forage quality analysis must be completed prior to ration balancing for best forage use.

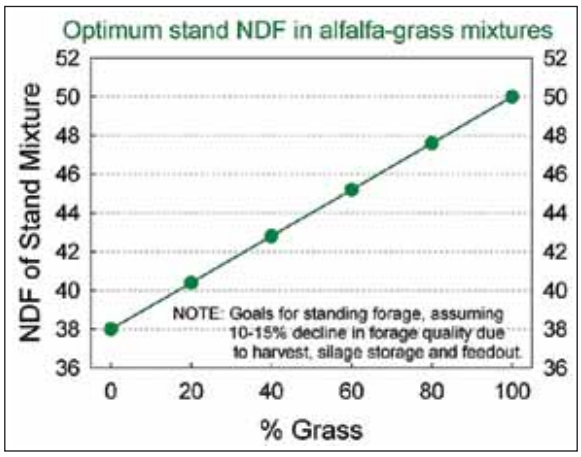

Figure 1. Target NDF for alfalfa-grass mixtures.

Mixed Stand Equations to Estimate Spring Harvest Timing and Quality

Quick and accurate methods are needed to estimate NDF of alfalfa-grass mixtures. A number of methods estimate alfalfa NDF, including models based on weather, chronological age (age or days of growth from a specific date to harvest), and plant morphology. Research in mixed stands of farmers' fields and experimental plots in NY in 2004 and 2005 produced simple equations to predict NDF for pure stands of alfalfa, various grass species (such as timothy, reed canarygrass, orchardgrass and tall fescue) and mixed stands of alfalfa-grass. This research demonstrated that numerous parameters are useful to predict mixed stand NDF, but maximum alfalfa height (maximum height of the terminal bud) is as effective as more complex prediction models and requires fewer inputs. Required inputs for mixed stand equations include alfalfa maximum height and stand composition (grass fraction in the stand). Mixed stand equations assume a harvest height of 4" above ground level. These equations are useful over a range of conditions, grass species and years.

Field Sampling and Use of Mixed Alfalfa-Grass Stand Management Tools

Field sampling should be completed prior to the anticipated harvest date range, generally mid to late May, by measuring the alfalfa maximum height and estimating the grass fraction in at least three to five representative locations in each field. A simple graphical or tabular tool (Figure 2) can then be used to determine harvest timing. For a mixed stand with 50% grass and 50% alfalfa, Figure 2 indicates that the stand should be harvested at an alfalfa maximum height of 23" to achieve optimal NDF for the mix (44%, from Figure 1).

A Microsoft Excel calculator further simplifies equation use and is available for download at

FYI

■ Contact **Keenan McRoberts** at kcm45@cornell.edu and **Debbie Cherney** at djc6@cornell.edu.

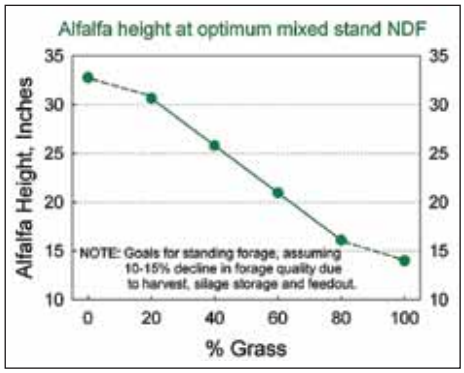

Figure 2. General estimate of alfalfa height (maximum height of terminal bud) at harvest to achieve optimum harvest NDF for alfalfa-grass mixtures.

http://forages.org/joomla/index.php/tools#gmt2. The calculator (Figure 3) consists of a graphical user interface to input required parameters. Assumed maturation rates (daily rates of NDF increase based on stand composition and weather conditions) permit estimation of days until harvest for optimal or desired harvest NDF. The calculator generates harvest timing estimates to achieve targeted NDF at harvest in graphical and print formats. Input parameters can be adjusted to assess the impact of changes on NDF concentration and harvest timing estimates in real time. Similar calculators are available at http://forages.org for pure alfalfa stands and pure grass stands.

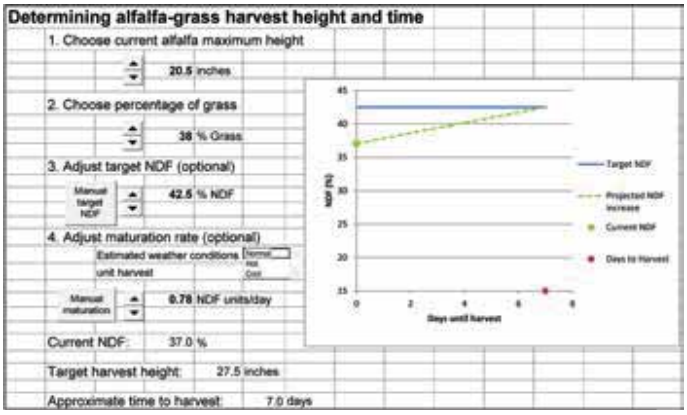

Figure 3. Screenshot of mixed stand Microsoft Excel calculator.

Targeting Uncertainty in the Stand Composition Input

Mixed stand equations are sensitive to changes in stand composition (grass fraction), which is difficult to accurately predict by visual observation alone. The amount of grass in the stand is often underestimated. Seeding rate has a poor relationship with actual composition, which also varies with stand age, grass species in the mix and climatic factors. Difficulty in estimating stand composition was reported by Extension educators as the principle problem limiting the utility of mixed-stand equations for Northeast farmers. For example, misestimating composition by just 20% can result in late harvests by five or more days, potentially leading to NDF at harvest > 5% past target levels. Critical potential nutritive and economic losses for dairy farms can result.

Current research is targeting this weak link in the mixed stand equation using digital image analysis. In the future, representative digital images of mixed stands, along with stand height measurements could be uploaded to a Web system on http://www.forages.org to obtain harvest timing estimates for optimal quality. ❐

Using small grains in dairy rations

By Larry Chase, Cornell University

Interest has renewed in using small grain silages. One reason is that small grains are used as an emergency forage crop. A second is the use of small grain silages as cover crops in a double cropping system. This use can increase the quantity of forage produced per acre and allow more manure nutrients to be applied. Wheat, oats, rye, barley and triticale have been used.

Nutrient composition of these small grain silages can vary due to the variety used and stage of maturity at harvest. Triticale samples analyzed at the Dairy One Forage Lab had a normal range for CP of 12.9% to 19.4%. These samples represent about 67% of the total samples analyzed. The normal range for NDF was 50.4% to 60.4% and NDF digestibility was 57.8% to 68.2% for a 30 hour incubation period. The nutrient content of small grain silages drop rapidly with maturity so forage analysis is essential to plan for use in feeding programs.

A number of research trials have compared triticale or other small grains with alfalfa or corn silage based rations. Workers at Ohio State reported similar milk production when a mix of alfalfa and corn silage was replaced with triticale silage on an equal NDF basis. However, it did require more grain for cows on the triticale ration to balance the nonfiber carbohydrate component of the ration. A trial at the University of Alberta used rations that were 60% forage and 40% grain. A barley/triticale mix was compared to an alfalfa silage ration. The barley/triticale mix was 16% CP and 54% NDF. Milk production was similar between the two rations. Since the small grain silages are lower in starch than corn silage, some additional grain may be needed if they are used to replace corn silage.

What are the considerations for using small grain silages in dairy rations? The following are key items to be considered:

- Small grain silages are similar to grass forages in NDF and digestibility. They decrease rapidly in nutritive value as maturity increases. If they are used in milking cow rations, they need to be harvested rapidly to minimize changes in nutrient value during harvest.
- They should be stored in separate storage facilities and samples for dry matter, CP and NDF taken during the harvest process. This will help determine which animal group they should be fed to.
- In some herds, these small grain silages are harvested at a later maturity and targeted to animal groups with lower nutrient demands such as older heifers or dry cows. This approach helps to reserve the higher quality forages for the milking cows.
- Small grain silages can be high in potassium. This needs to be accounted for if they are used in dry cow rations. ❐