

Alfalfa-Grass Mixtures – 2016 Update

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The vast majority of alfalfa acreage in NY is sown with a perennial grass. Until recently, there has been very little research on grass species selection or management of mixtures. We do not know what the optimum percentage of grass should be in mixtures, and it is unclear how consistent grass percentage is across species, varieties and environments.

An informal survey of forage seed companies active in NY in 2014 found timothy to still be over 30% of all forage grass seed sales in NY, with tall fescue and orchardgrass each around 20% of grass seed sales. Eight other grass species make up the remaining 30%, with each of these less than 10% of total seed sales. Forage tall fescue seed sales went from essentially zero 10 years ago to 20% of grass seed sales, and most of it is seeded with alfalfa.

Alfalfa-Grass Ratio in Stands

The primary negative point with mixtures is not lower forage quality, but variable forage quality. The main cause of this variability is a variable alfalfa-grass ratio. Botanical composition of alfalfa-grass fresh and ensiled mixtures is a key parameter for assessing forage and diet quality, as well as for managing mixed stands.

Previous attempts to validate near infrared reflectance spectroscopy (NIRS) equations for estimating botanical composition have not been very successful. We collected alfalfa-grass samples from across NY over several years, and Dairy One Forage Laboratory has successfully calibrated NIRS instruments to estimate grass% in alfalfa-grass samples. NIRS evaluation of samples taken after harvesting will provide good estimates, as the forage is mixed during chopping and unloading.

Keeping track of grass% in alfalfa-grass fields is useful for field and forage management. Estimating grass% in the field is difficult due to variability within a field. We are developing a cell phone app that will estimate grass% in the field, by evaluating a cell phone photograph of a mixed stand. Multiple photos will generate a representative estimate of grass%.

Meadow Fescue Potential for Mixtures

Meadow fescue (MF) is grown extensively in Canada and Europe, but dropped out of use in the USA decades ago primarily due to reduced yield, compared to other grasses. It can be grown in areas suitable for timothy, and is considerably more winter hardy than tall fescue in northern environments. Primarily grown for pasture use in recent decades, meadow fescue has considerable potential in mixture with alfalfa. Alfalfa-grass mixtures are as high or higher yielding than pure alfalfa, and have been shown to be an excellent forage for lactating dairy cattle.

Meadow fescue has higher fiber digestibility (NDFD) than most other grasses, consistently 2-4 percentage units higher than tall fescue. Feeding trials across the USA have shown that a one percentage unit increase in NDFD increases milk production by 0.5 to 1.0 lbs/cow/day, and more than 1.0 lb/cow/day for the highest producing cows. Meadow fescue in combination with new reduced-lignin alfalfa varieties has the potential to produce a very high quality forage for lactating dairy cows. A somewhat reduced yield potential for meadow fescue may actually be advantageous for alfalfa-grass mixtures, where a modest grass percentage is desirable.

2016 Trial Results

Ten grasses [meadow fescue (MF), tall fescue (TF), orchardgrass (OG) and festulolium (Fest.) varieties] were established in binary mixtures with 2 alfalfa varieties in spring 2015 in Oneida and Wyoming Counties. We thank Dave Curtin/Curtin Dairy and Dave Russell/Southview Farms for providing study sites. Optimum rainfall throughout the 2015 season resulted in abundant growth, and three seeding-year harvests were taken at both sites.

Meadow fescue headed out between May 26 and June 1, 2016, depending on variety and location. Tall fescue and festulolium had a similar heading date range, while orchardgrass varieties headed a few days earlier. About half of the grass varieties were at an early heading stage at spring harvest.

Cold spring weather in 2016 resulted in immature, very low fiber alfalfa forage under 30% neutral detergent fiber (NDF) and a little over 30% crude protein (CP) when harvested the last week of May, while NDF of grasses was generally optimum in the low 50's.

Both sites have fertile soils and, in spite of the weather conditions prior to the first two harvests of 2016, averaged a total of 4 tons dry matter/acre. The last three harvests in Oneida County produced good yields, totaling an average of 7.5 tons DM/acre (Fig. 1). Some combinations exceeded 8 tons DM/acre. Severe drought in Wyoming County prevented much regrowth the rest of the year after Cut 2, and reduced total yield to an average of 5.3 tons DM/acre.

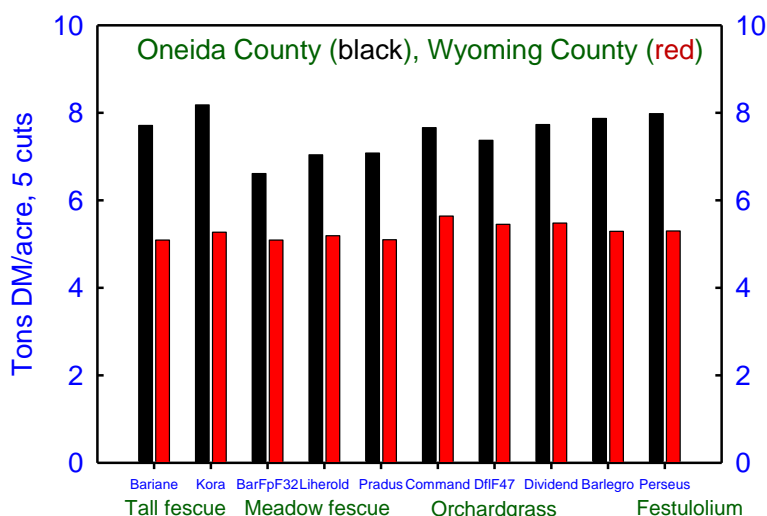


Fig. 1. Dry matter yield of alfalfa-grass mixtures at two NY sites in 2016.

With somewhat adequate rainfall at the Oneida County site, grass% was relatively stable or increasing (Fig. 2), tending to decline in late fall, except for MF. Less rainfall on a soil with less water-holding capacity resulted in a decrease in grass% from Cut 1 to Cut 2 in Wyoming County. The relative ranking of grass% among varieties was generally consistent over locations, but environmental conditions significantly impacted all grasses. Festulolium dropped from 70% grass in Cut 1 to about 10% grass in Cut 3, possibly due to drought in Wyoming County.

Meadow fescue was relatively inconsistent, with greatly increased grass% later in the year for two of the entries in Oneida County. In Wyoming County, grass% dropped sharply for all entries after cut 1, and then increased significantly for all entries in the late fall after some rainfall returned. Overall, grass% was too high in Oneida County, except for Bariane TF and meadow fescues. Grass% dropped for all entries in the fall in Oneida County, except for meadow fescues.

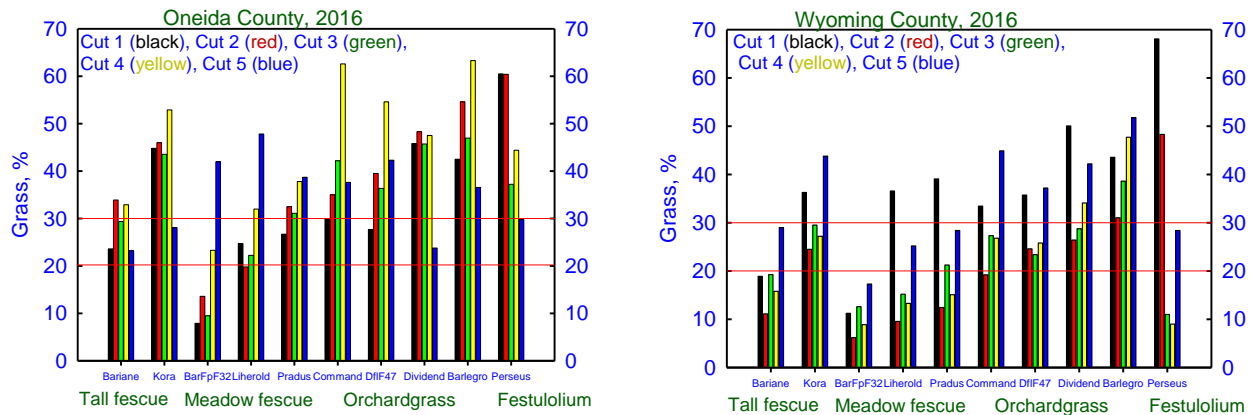


Fig. 2. Grass% over 5 harvests, 2016.

Quality Analysis

For Oneida County, a weighted average over 5 cuts, Hi-Gest360 alfalfa was 4.6% higher fiber digestibility (NDFD) and 5.4% lower lignin, compared to Pioneer 55H94. For Wyoming County, Hi-Gest360 was 7.5% higher NDFD and 7.3% lower lignin, compared to Pioneer 55H94. In three seeding year cuts in 2015, Hi-Gest averaged 9.5% higher NDFD and 7.9% lower lignin (Oneida); and 5.3% higher NDFD and 3.0% lower lignin (Wyoming), compared to 55H94, using weighted averages.

As the grass% increases in a mixed stand, there is less nitrogen available to grass from alfalfa, and also more grass requiring the limited available N. As the high-crude protein (CP) alfalfa% decreases, grass CP greatly decreases and total mixed forage CP drops correspondingly. However, CP should remain relatively high in the mixed forage up to at least 40% grass.

Alfalfa averaged 58, 38, 43, 43, and 61% NDFD for 5 cuts. Weighted average NDFD for grasses across cuts and sites for MF was 79%, while Fest, TF, and OG all averaged 74% (Fig. 3). Festulolium headed out after Cut 1, due to moisture stress, greatly reducing NDFD for Cut 2. Cuts 2 and 4 at Oneida were taken about one week too late, resulting in lower NDFD.

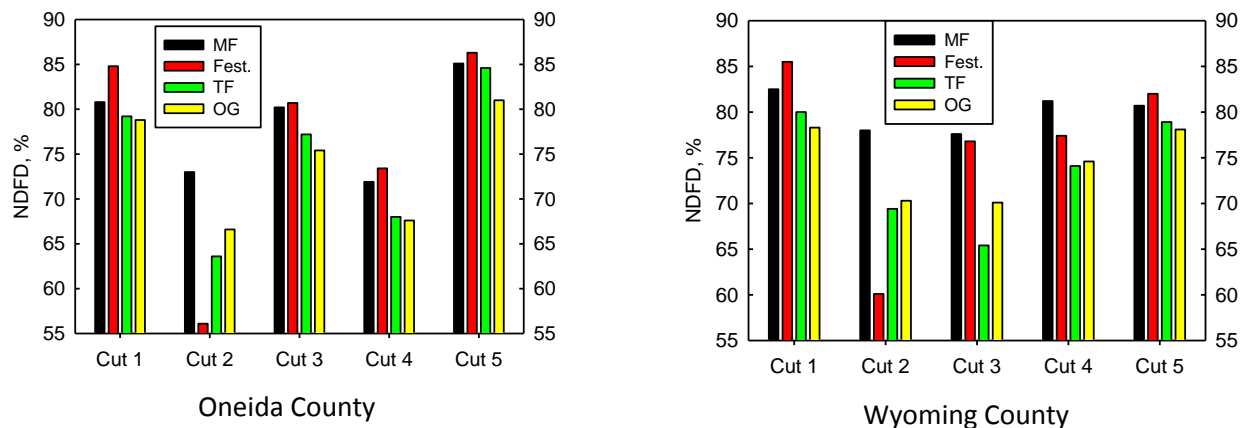


Fig. 3. Grass 48h fiber digestibility, 2016.

Summary

Mixtures can increase both yield and quality of forage stands. Grass% in mixed stands is strongly influenced by environmental conditions. Environmental conditions during the establishment phase have a great impact on the alfalfa:grass ratio in succeeding years. Average grass percentage of stands over the 2016 season was double that of the previous fall for both sites.

Grass CP content is greatly impacted by the grass percentage of stands, as a limited supply of available soil N is diluted through increased grass production. As the amount of alfalfa in a stand declines, this also reduces the total supply of available N for grasses. Nevertheless, a mixed stand with up to 40% grass is still likely to have reasonably high CP content.

Results in 2016 indicate that the optimum grass percentage in alfalfa-grass stands at the end of the seeding year may be around 5-15% grass, with about 25-30% in the first production year. A grass percentage as low as 10% can still result in a significant increase in total forage fiber digestibility. Switching from a lower quality grass to a higher quality grass such as meadow fescue may impact forage quality as much as a switch to a higher quality reduced-lignin alfalfa.

Grass has considerably higher fiber digestibility than alfalfa. To-date, selection of either a high quality grass (e.g. MF) or a high quality alfalfa (e.g. reduced lignin type) has been shown to increase NDFD of both grass and alfalfa about 7%. If less than 20% grass in a mixture, grass species/variety selection will probably not significantly influence NDFD of the total mixed forage. Conversely, if more than about 30% grass in an alfalfa-grass mixture, alfalfa variety selection will probably not significantly influence NDFD of the total mixture.

Right now our best bet is to first select a site reasonably well drained with near neutral pH and maintain high soil K to maintain alfalfa. In mixture with alfalfa at 12-15 lbs/acre, meadow fescue should be seeded at 4-5 lbs/acre in either the spring as early as possible, or late summer about 4-5 weeks prior to first freeze. Plan to manage it 4x4; 4 cuts/season with a 4" stubble height, with somewhat higher stubble height for the last cut of the season.

Meadow fescue often contains a naturally occurring endophytic fungus, but unlike the tall fescue endophyte, no harmful anti-quality alkaloids are produced. Meadow fescue cannot be infected by the tall fescue endophytes, so there are no concerns of livestock disorders with meadow fescue.



Drones may be used in the near future to provide pictures of alfalfa-grass stands for digital analysis of grass% and possibly NIRS for forage quality analysis.

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