Minnesota - On-Farm Evaluation of Alfalfa/Grass Mixtures: Establishment and Initial Performance

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Alfalfa and corn silage are the primary forages fed in total mixed rations (TMRs) for dairy cows in Minnesota and the North Central region as a whole, largely due to high yield and forage quality potentials. Grasses have usually played a lesser role and been less appreciated for their capacity to contribute to profitability. During the last decade, interest in forage grasses for pasture, hay, and haylage has increased but data and experience are lacking. This study, funded in part by MFA, addresses agronomic and nutritional potential of grasses and grass-alfalfa mixtures as harvested forage for dairy/ beef animals.

Reasons for increased interest in grasses include, among others, their digestible fiber, yield and persistence potential, and responsiveness to manure. Compared to alfalfa, grasses generally have greater total fiber content, as measured by neutral detergent fiber (NDF). Greater NDF content usually implies less intake potential by dairy cows. NDF is a key negative contributor to the Relative Feed Value (RFV) calculation, so grasses usually have lower RFV than alfalfa and thus are assumed to have less dairy feeding value. However, the NDF of grasses can have double the ruminant digestibility of that of legumes, so NDF amount tells only part of the story. Commercial labs are now routinely offering NDF digestibility (NDFD) analyses. Also, a newer forage quality index, relative forage quality (RFQ), developed to incorporate NDFD, is growing in acceptance and use.

Grasses can be grown alone, but greatest potential is likely in mixtures with alfalfa. Alfalfa-grass mixtures are the norm in areas such as the Northeast. Well-managed grasses can yield as much or more than alfalfa. Also, their presence in mixture with alfalfa can improve overall forage stand persistence. Since alfalfa is currently most often grown solo on Minnesota farms, this project includes several grasses in mixtures with alfalfa vs. alfalfa alone to demonstrate and document yield, quality, and persistence differences and potential on farms.

Procedures

Minnesota alfalfa/grass mixture trials were seeded near Hutchinson on 25 August 2008, near Underwood on 29 August 2008, on the St. Paul campus on 8 September 2008, and near Avon on 4 May 2009. Treatments included binary mixtures of alfalfa with different perennial grasses compared to alfalfa seeded alone at three different rates. Three alfalfa varieties were used: Rebound 5.0, 4S419, and Spredor 4. Rebound 5.0 is a standard high-yielding hay-type variety that has done well in previous UMN trials. Seed was coated, and thus 65% pure live seed (PLS). 4S419 is a hybrid that also did well in previous trials. Spredor 4 is a grazing-type, fall-dormant variety with some yellow-flowering (falcata) alfalfa in its genetic background. Alfalfa seeding rates in binary mixtures for the three 2008 seedings were 10 lb PLS/acre (15 lb/ac with coating) for Rebound 5.0, and 15 lb/ac for 4S419 and Spredor 4. The different varieties were used to see if regrowth genetics affects compatibility with grasses, and also to increase overall robustness of results.

Two varieties of nine different grass species were also included. Grass species included smooth bromegrass (10 lb/ac), meadow bromegrass (10 lb/ac), timothy (4 lb/ac), reed canarygrass (6 lb/ac), orchardgrass (6 lb/ac), perennial ryegrass (8 lb/ac), festulolium (8 lb/ac), tall fescue (8 lb/ac) and meadow fescue (8 lb/ac).

Plots were 3'x20', with alfalfa and grass seeded together in 5 rows per plot. Two replications were seeded at all sites with alfalfa as whole plots ("internal reps") and grasses as subplots. Two varieties of each grass species mixed with each alfalfa variety were seeded side-by-side. Estimated seeding depth was ½-1". Initial fertility and pH at Hutchinson and St. Paul were optimum, so no amendments were added. Some P and K fertilizer was top-dressed at Underwood after seeding. pH, P, K, and OM (coarse-textured soil) were suboptimal prior to seeding at Avon; so lime, N, P, K, and S were applied and incorporated prior to seeding.

Hutchinson was harvested 29 May and 1 July 2009. Underwood was harvested 11 June and 10 July. Plots were harvested to a ~4" residual using a flail harvester to determine fresh weight yields. Samples were obtained from 28 selected plots/site/harvest for dry matter and forage quality analyses. Samples were placed in paper bags, dried in a forced-air oven at 140°F for 3-5 days, and sent to UW Forage Testing Lab for processing and analyses.

Preliminary Results

Establishment. Establishment data were not collected, but observations were made. August 2008 Hutchinson seeding

followed a fallow period and had some annual weeds but not enough to be of competitive significance. Temperature and moisture conditions were near-optimum for alfalfa, so it established rapidly and uniformly. Grass establishment was good, but variable and less vigorous than alfalfa. Initial stands are generally alfalfa dominant.

August 2008 Underwood seeding followed wheat. There was a fair amount of volunteer wheat; it did not appear to negatively affect forage establishment and may have helped provide winter cover as the seeding was later than recommended. Forage seedling development was less vigorous than at Hutchinson. However, seeding is better balanced than Hutchinson so far. Grasses are considerably more present, perhaps because fall and early spring climate did not favor alfalfa over grass as it did at Hutchinson. Seeding rates were identical. Early September 2008 St. Paul seeding appeared to establish well, but Canada goose grazing resulted in nearly 100% winter kill, so the site was abandoned.

Early May 2009 Avon seeding had alot of annual grass/mustard competition as well as periodic drought stress due to soil coarseness. Data have not been obtained. Entire plot was mowed late June to suppress weeds. It is difficult to assess perennial grass establishment but presence of some perennial ryegrass and festulolium seedheads indicates these species have established to some degree. Alfalfa looks fairly good, but is short in stature due to drought/weed competition. This site also included a few red clover/grass mixtures, and they appear to be doing quite well.

Initial forage yield. To date, average total yields at Hutchinson (2.1 ton DM/ac) are almost double Underwood (1.1 ton DM/ac), whereas average grass percentages at Underwood (30.4 %) are quadruple Hutchinson (7.6 %). Yield across individual plots is 1.2-2.9 ton DM/ac at Hutchinson, and 0.7-1.6 ton DM/ac at Underwood, so there is considerable plot-to-plot yield variability. It is too early to draw conclusions about yield potential comparisons, as all mixtures and alfalfa alone are yielding similarly.

Initial Forage Quality. RFQ of standing forage of all treatments has generally been "dairy quality." RFQs have been somewhat higher at Underwood together with greater grass percentages suggesting that forage with significant grass content could consistently be of dairy quality. Unavoidable harvest and storage losses would likely result in slightly lower RFQ values on-farm. So far, there is no clear quality advantage or disadvantage of alfalfa alone compared to alfalfa/grass mixtures.

Variations in yield, grass percentage, and quality initially appear to be greater across locations (environments) than across treatments within locations (environments). This suggests a challenge in predicting initial alfalfa/grass performance based on species and seeding rates alone, as environment played a large role in mixture establishment and initial performance.

For complete report of this MFRP study, visit the MFA website at www.midwestforage.org.