Predicting Spring Fiber Content of Forages

The spring forage harvest is the most crucial of the year, and sets the stage for good harvest management the rest of the season. How do we determine optimum forage quality? Measures such as digestibility, fiber digestibility, Relative Forage Quality (RFQ), Milk per ton, and Milk per acre are possibilities. In perennial grasses, fiber digestibility is almost perfectly correlated with in vitro true digestibility, so they are equivalent in usefulness. This relationship can only be significantly impacted by varieties with radically different forage quality, such as brown-midrib mutants.

There currently are no perennial grass varieties with that level of improved forage quality. Also, dry matter yield per acre is highly correlated with milk yield per acre. Again, it would take quality differences on the scale of a brown-midrib to impact these high correlations. None of the above parameters have an optimum value, however, the higher the better. Therefore, none of them provide useful harvest date targets.

Selecting a Harvest Date Target

We define a forage as a crop that can meet the effective fiber needs of a cow when fed as the primary fiber source in the diet. We need to harvest forage grasses and legumes to optimize the fiber content (NDF) for the class of livestock being fed, therefore NDF is the most useful harvest date target. There is a relatively small range in optimal NDF for lactating dairy cows, making correct harvest management decisions relative to quality critical.

A reliable method to estimate the fiber content of grass and alfalfa-grass mixtures would help producers in timing harvesting operations to optimize the quality of the harvested forage. Once the forage is harvested and stored, an accurate forage quality analysis is needed prior to ration balancing.

Estimating Grass NDF

It is particularly difficult to assess standing quality of pure grass without actually analyzing samples. Grass morphology changes are not obvious until heading; once grass has headed it is too late for harvesting high quality grass. Often a calendar date works as well as any morphological indicators for spring harvest. In our region this varies from May 15 to May 30.

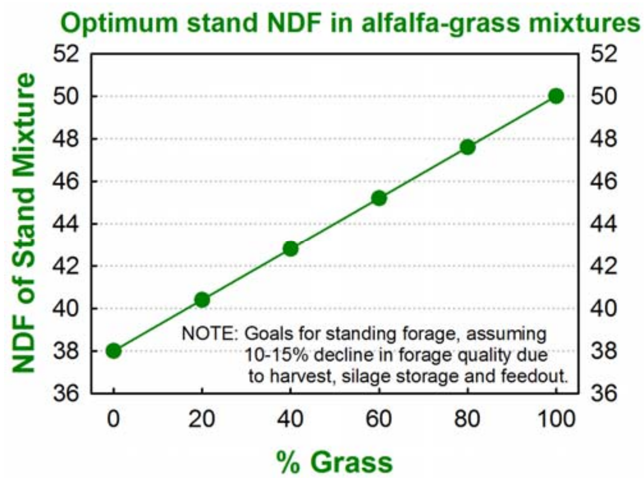

Figure 1. Target NDF values for mixtures.

Estimating Alfalfa-Grass NDF

The target NDF at harvest is approximately 38% for pure alfalfa and 50% for pure grass silage. It is possible to estimate alfalfa-grass NDF by evaluating alfalfa height and estimating the grass percentage. Optimum NDF of mixtures varies with the percentage of grass (Fig. 1), these goals assume a 10-15% decline in forage quality due to harvest, storage and feedout.

We can estimate the alfalfa height (tallest stem) needed to harvest at optimum mixed-stand NDF (Fig. 2). We have equations based on alfalfa height, sampling date, and grass-legume ratio estimates, for more accurate predictions than Fig. 2. For sampling a field, three to five locations in a field should be examined, so that the percent grass and alfalfa height values are representative. It is difficult to estimate the proportion of grass in a stand. Accurate estimating takes practice, and there is a tendency to underestimate grass.

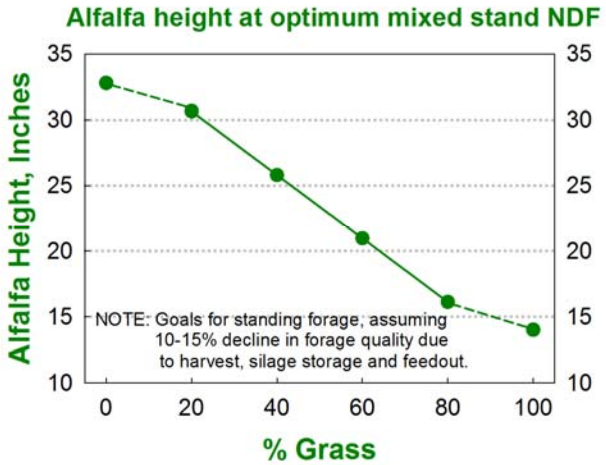

Figure 2. Gross estimate of alfalfa height (tallest stem) at harvest for pure species and mixtures. For 100% grass, use estimated alfalfa height in a nearby stand.

Prediction of Mixed Stand NDF

Prediction equations for NDF of mixed stands were developed based on sampling fields across NY in 2004 and 2005. A range of variables were shown to be useful in predicting mixed sward stand NDF, the most useful equations were based on a prediction using alfalfa height and percent grass (Fig. 2).

Table 1. Estimated stand NDF of a mixed alfalfa-grass stand based on alfalfa height and percent grass in the stand. Target NDF for each mixture is highlighted.

Max. alfalfa	%Grass in the stand (dry matter basis)								
height, in.	10	20	30	40	50	60	70	80	90
14	23.5	26.7	29.9	33.1	36.3	39.5	42.7	45.9	49.1
15	24.3	27.5	30.7	33.9	37.1	40.3	43.5	46.7	49.9
16	25.1	28.3	31.5	34.7	37.9	41.1	44.3	47.5	50.7
17	25.9	29.1	32.3	35.5	38.7	41.9	45.1	48.3	51.5
18	26.8	30.0	33.2	36.4	39.6	42.8	46.0	49.2	52.4
19	27.6	30.8	34.0	37.2	40.4	43.6	46.8	50.0	53.2
20	28.4	31.6	34.8	38.0	41.2	44.4	47.6	50.8	54.0
21	29.2	32.4	35.6	38.8	42.0	45.2	48.4	51.6	54.8
22	30.1	33.3	36.5	39.7	42.9	46.1	49.3	52.5	55.7
23	30.9	34.1	37.3	40.5	43.7	46.9	50.1	53.3	56.5
24	31.7	34.9	38.1	41.3	44.5	47.7	50.9	54.1	57.3
25	32.5	35.7	38.9	42.1	45.3	48.5	51.7	54.9	58.1
26	33.4	36.6	39.8	43.0	46.2	49.4	52.6	55.8	59.0
27	34.2	37.4	40.6	43.8	47.0	50.2	53.4	56.6	59.8
28	35.0	38.2	41.4	44.6	47.8	51.0	54.2	57.4	60.6
29	35.8	39.0	42.2	45.4	48.6	51.8	55.0	58.2	61.4
30	36.7	39.9	43.1	46.3	49.5	52.7	55.9	59.1	62.3
31	37.5	40.7	43.9	47.1	50.3	53.5	56.7	59.9	63.1
32	38.3	41.5	44.7	47.9	51.1	54.3	57.5	60.7	63.9
33	39.1	42.3	45.5	48.7	51.9	55.1	58.3	61.5	64.7
34	40.0	43.2	46.4	49.6	52.8	56.0	59.2	62.4	65.6
35	40.8	44.0	47.2	50.4	53.6	56.8	60.0	63.2	66.4

By making one additional assumption, the daily rate of NDF increase, we can estimate the days until harvest at optimal NDF. A rough estimate is a 0.85 percentage unit increase in NDF/day for alfalfa or grass. E.g. for a 50:50 alfalfa grass stand at a 17" maximum alfalfa height, optimum harvest would be in 6 days.

Summary

Improved management for high quality has made grass and grass-legume mixtures attractive options for dairy producers. A harvest date target based on optimum forage NDF for the class of livestock being fed is the goal. By determining alfalfa height and the proportion of grass in a mixed field, it is possible to estimate stand NDF. The most difficult part is estimating grass percentage.

Additional Resources

- 2011 Cornell Guide for Integrated Field Crops Management. Electronically accessible at: http://ipmguidelines.org/Fieldcrops/.
- Cherney, J.H., D.J.R. Cherney, and D. Parsons. 2006. Grass Silage Management Issues. p. 37-49. In Proceedings from "Silage for Dairy Farms: Growing, Harvesting, Storing, and Feeding". NRAES-181. 23-25 Jan., 2006. Harrisburg, PA. Natural Resource, Agriculture, Engineering Service, Ithaca, NY.
- Parsons, D., Cherney, J. H., and Gauch, H. G., Jr. 2006. Estimation of Preharvest Fiber Content of Mixed Alfalfa–Grass Stands in New York. Agron. J. 98:1081-1089.

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For more information

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Grass Management Manual
http://forages.org

David Parsons, Jerry Cherney, Debbie J.R. Cherney

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