



Making the Most of Forage Sampling

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The most important step in the forage analysis process is the first one: taking a good sample at the farm. It doesn't matter what type of laboratory analysis is being performed—blood, water, feed, etc.—it is the actual sample, and protocol used to collect the sample that will have the greatest impact on the usability of the results. Remember, as a forage makes its way through the sampling process, it goes from tons of material in the silo, to a 1 lb. sample submitted to the lab, to a 1 gram of dried ground sample used for each of the different nutrient analyses. Therefore, it all starts with a representative sample taken at the farm. The word “representative” is key: the sample must be representative of the feed being offered to be useful in building and balancing your ration.

How do I take a good sample?

A representative sample is obtained by taking multiple sub samples of the forage or feed to be analyzed. To demonstrate this point, the University of Minnesota visited a hay auction and had 20 agri-business people sample 20 different bales of alfalfa from the same lot of second cutting hay. The results are summarized in Table 1.

Table 1. Nutrient values from multiple bales of alfalfa hay (n = 20)

Nutrient	Average	Range	Composite
CP%	20.4	18.2 - 22.4	20.7
ADF%	32.4	28.6 - 36.9	31.5
NDF%	40.5	33.7 - 54.1	40.7
RFV	148	103 - 184	147

Depending upon the bale selected, the nutrients varied widely. For example, Relative Feed Value (RFV) serves as an index of hay quality computed from the ADF and NDF. It typically ranges in value from grasses to legumes from 80 – 200. Note that the RFV of individual bales varied from 103 – 184. Thus, if you randomly subsampled only one bale and chose the best bale at an RFV of 184, you'd overestimate the quality of the hay and end up underfeeding the herd.

After analyzing the individual bales, a composite sample was made by blending the individual bale samples together. The results of the composite samples appear in the “Composite” column of Table 1. Compare the composite results to the average. The composite analyses yielded results that were similar to the mathematical averages of the individual bales. The take home point is that the sample submitted to the lab must be representative—and to be representative, it must be composed of multiple subsamples. We recommend 12 – 20 subsamples be taken from silage or hay and blended together to form a composite. The composite sample is then subsampled to send to the lab. For more information on how to take a proper sample, visit our website at <http://dairyone.com/analytical-services/feed-and-forage/submitting-forage-samples/>.

How often should I sample?

Sampling too frequently increases your analytical costs. Not sampling often enough may result in lost production or health issues if a change in

feed composition was not identified in a timely manner. The Ohio State University conducted research over the last few years aimed at changes in forage quality and sampling frequency. One aspect looked at day to day nutrient variation within farms. Samples of corn silage and haylage were taken daily on 8 farms over a 2 week period. Within farm, the average range of dry matter (DM), neutral detergent fiber (NDF), and starch for corn silage was 7.3, 8.8, and 12.2 percentage points, respectively. For example, the average farm with a 31.7% starch value would range from 25.6 – 37.1% starch over the 2 week trial period. Likewise, the haylage ranges for DM, NDF, and crude protein (CP) were 11.8, 8.5, and 3.4 percentage points, respectively. They concluded that the ranges were primarily due to natural and sampling variation, with a greater percentage attributed to sampling. This led them to recommend taking multiple samples to minimize the impact of sampling variation, and its potential influence on the diet.

Using the Ohio State data, the University of Wisconsin created a sampling chart based on herd size, inventory feed out, nutrient variation and sampling variation (Table 2).

Table 2. Sampling schedule based on herd size (milking cows)

	50	100	200	400	800	1600
Interval between sampling days	30	15	15	10	10	10
No. of sampling days/month	1	2	2	3	3	3
No. of samples/sampling day/forage	1	1	2	2	2	2
No. of samples/month/forage	1	2	4	6	6	6

For example, if you're milking 200 cows and feeding corn silage and haylage as your base forages, you should collect samples on the 15th and 30th of the month. On each day, collect 2 representative samples of corn silage and 2 samples of haylage to submit to the lab. Do not take one sample and split it in two, collect two independent samples of each forage. This is to help smooth sampling bias and minimize the risk of ration changes based on a non-representative sample.

Putting results to work

Using the above example, if you followed the schedule and did a good job collecting representative samples, how should the results be utilized?

1. If the results of your replicate samples are similar to each other, average them together and compare the results to the previous test day. If the change in primary nutrients (CP, NDF, starch, etc.) is low (<5%), then the change may simply be due to random error associated with sampling and/or the lab analyses. In this case, average the new results with previous test and work with your nutritionist to determine if a change is warranted. This will depend upon the inclusion rate of the feed in the diet.

2. If the results of your replicate samples are similar and differ (>5%) from the previous test day and there is a legitimate reason for the change (different fields, cutting, variety, location in the silo, etc.), depending upon the inclusion rate in the diet, rebalancing is probably warranted.
3. If the replicate analyses differ between themselves (Rep. 1 is similar to the previous test and Rep. 2 is different) and there is no visible change in forage quality nor a change in milk production, then Rep. 2 is probably an outlier. Discard this result and proceed as in No. 1 above.

Forage analysis is a powerful tool to keep your herd performing at optimum levels. Develop a testing schedule using Table 2. Use good sampling techniques to obtain representative samples. Make sound judgments based on the results. Just because the results changed from the previous test doesn't automatically mean that the ration needs to be adjusted. Take into consideration the magnitude of the change and the inclusion rate to determine if adjustments are needed. Following a set schedule will allow you to monitor forage quality and make timely ration adjustments to keep cows performing at their best.

For more information, or to find out how to submit samples to the Dairy One Forage Lab, go to our website www.dairyone.com, e-mail forage@dairyone.com, or call 800-344-2697, ext 2.