Hay Sampling and Testing Using NIRS at Dairyman's

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Dairyman's Cooperative Creamery Association is a member owned company established in 1909. Feed and Hay testing is one of many free services provided to the Cooperative's 262 member dairymen. This information is used by our members to make management decisions that help them remain efficient producers in an increasingly competative industry. We purchased our NIRS equipment in August of 1985 and began distributing information generated from it in April 1986.

Why use NIRS? As the cooperative "family" grew and more dairymen realized the benefits of feeds testing, especially free testing, the feed lab staff found it near impossible to keep up with the demand for their services. This was especially true during first and second cuttings in the spring. NIRS provides a method for accurate, rapid, and environmentally safe hay testing with a bonus of increased labor productivity.

What are the disadvantages of NIRS? We found demand for our services almost doubled overnight. Many non-member dairymen submitted samples because they knew we could give them an accurate test result while they waited. Since we do not directly charge for this service, some unscrupulous hay brokers submitted samples under false pretenses. This led to changes in how and from whom we will now accept samples.

For commercial feed testing laboratories, doubling of sample throughput and having customers standing in line to purchase your services would not be considered a disadvantage.

Dairymen seemed to lose track of time. In past years they would excitedly explain they must have sample results by the next morning, roughly 24 hours later. This year they absolutely must have the results before 9:00 A.M. though it's already 8:30.

A mathematical equation is used by this equipment to compare the test sample with known values stored in computer memory. We found the calibration equation supplied with this equipment did not accurately estimate the value of our local hay. We cooperated with the University of California and using software purchased from the equipment supplier, developed our own equation. This process took us about 8 months.

Comparison hay lot sampling done by our resident nutritionist, Jack Pearson, has shown many of the disputes involving hay test results between hay buyer and seller stem from poor hay sampling technique.

Proper technique as outlined by U.C. (Vern Marble, Alf. Symp. Proceedings 1984) involves use of a coring device with an internal diameter of at least 3/8". This is about the I.D. of a hollow golf club handle. A minimum of 20 bales should be probed. Samples should be taken from near center of one end of each bale. Considerable variation in T.D.N. estimation can occur if fewer than 20 individual bales are sampled.

Examples of Sampling Frequency And T.D.N. Estimation

	5 Bales	10 Bales	15 Bales	20 Bales or more
Curti	55.6	57.9	56.8	56.9
Ribeiro	55.3	55.6	55.4	55.7
Felipe	52.6	52.6	53.4	53.6
Ferreira	51.2	53.2	51.6	52.0
Quinn	53.2	52.5	53.1	52.9
Lor	52.9	51.3	52.5	52.3
Lorenzo	52.0	49.6	50.8	52.2

T.D.N. values based on a 90% dry matter basis)

The probe should be inserted at 90 degrees to the bale end to a depth of 12-18 inches. The cutting surface of the probe must be sharp and care should be taken hay does not build up inside the probe as each series of samples are taken. Polishing the interior surface of the probe improves sample flow-through.

Bales should be selected for sampling at random from a set lot of hay. Randomness can be insured by sampling at various heights on the stack, sampling every nth numbered bale going around the stack, truck, or down the row in the field.

The sample should be placed in a plastic bag and tightly sealed to prevent sample moisture changes that would affect dry matter determinations. Samples should be stored or transported in a cool place where the bag won't be punctured.

We have also tested different probe configurations to determine if probe type would affect test result. With the exception of one probe tested, all of the probes gave similar test results. These results are similar to those of others (see Vern Marble, Alf. Symp. 1984).

Effect of Probe Type on Hay Test Result

PROBE	TDN	ADF	CP	MCF	DM
Forageurs	52.1	32.5	18.9	24.4	91.8
Golf Club	52.3	32.4	19.0	24.2	92.3
Hay Check	52.4	32.2	19.1	24.0	91.9
E-Z Probe	52.7	32.5	18.9	23.7	92.1
Penn St.	52.9	32.3	19.1	23.5	91.7
Quick Stab	54.6	30.1	20.3	21.5	90.9

(Results reported on a 90% dry matter basis)

The Quick Stab probe has a cutting surface that cuts at an angle. This probe produced samples with consistantly higher T.D.N. estimations. This might result because the probe separates and slides between stems rather than cutting cleanly through them.

In summary, we are very pleased with the performance of NIRS for alfalfa hay testing. It has improved accuracy, efficiency and safety of our lab technicians. In addition, NIRS is used to test other feeds. We anticipate this equipment will fulfill our needs for several years.

The main disadvantage of NIRS at the time we purchased our equipment was lack of an accurate calibration equation to predict the quality characteristics of our local hay.

As hay testing becomes standard operating procedure and accuracy of testing equipment improves, sampling technique becomes more important. Certain types of probing instruments and improper sampling technique can significantly affect hay test results. At least 20 random bales from each lot of hay should be sampled. Considering the last statement, select a probe that is easy to use.