

THE USE OF ALFALFA HAY ANALYSIS IN ANIMAL NUTRITION

Leland M. Larsen, Ph.D.
Nutri-Systems
Fresno, California

Practical animal nutrition goal of the nutritionist is to increasingly rely on the science of facts improve

of science and of art. The reliance on the art of feeding and the art of nutrition. The reason is the quality of results.

Nutrient intake objectives for livestock production have become more precise, and it therefore is necessary to know with equal precision what feedstuffs contain. Laboratory analysis is the means to provide these facts. Alfalfa hay analysis is especially important to the practicing dairy nutritionist for two reasons. First, alfalfa hay is used at high levels in most dairy rations and, secondly, the quality of hay varies widely enough that analysis is needed to inform us of the specific quality available. Computers allow us to easily customize rations for differences in alfalfa hay analysis.

Objectives of the nutritionist

Overall, a reasonable objective would seem to be for a livestock enterprise to set standards for the quality of hay to be purchased or to be selected from hay grown by the enterprise. Laboratory analysis would be used to determine which lots of hay meet the quality standards. We approach this goal with reasonable success in a few operations where the owner will only buy hay that meets mutually agreed upon minimum standards based on analysis. We seldom make much progress toward this goal where a livestock enterprise grows its own hay and selects which fields and cuttings will be utilized. In the latter case, quality can vary widely. As an independent consultant I must deal with both types of clientele.

The nutritionist, then, has to operate under one of three possible scenarios:

1. The early-warning system of analysis in which control over hay quality is exercised.
2. The damage-control system in which analysis is used to help us make the best use of the quality of hay available
3. The problem-solving use of analysis, to explain what went wrong when a new hay was introduced.

Alfalfa hay analysis as an early-warning system

A dairyman named Tom with the aid of his nutritionist sets his objectives on alfalfa hay quality for the milking herd as follows (all values except for dry matter are on a 90 percent DM basis):

Dry matter, not less than . . .	86.0%
Crude Protein, not less than . .	19.0%
Crude Fiber, not less than . . .	18.0%
Crude Fiber, not more than . . .	21.0%
T. D. N., not less than	55.0%
T. D. N., not more than	57.5%

(Tom will use different specifications for dry cows and for growing heifers.)

Tom then works with brokers/growers to obtain analyses on lots of hay within a price range he feels is reasonable under current market conditions. No hay is purchased until he receives an analysis that he feels is reliable in terms of proper sampling technique and in terms of the laboratory used.

Once purchased, a copy of the analysis is provided to Tom's nutritionist. With quality of hay varying within relatively narrow limits, as stipulated above, the nutritionist formulates a feeding program for Tom's dairy. Usually Tom can change from hay to hay without informing his nutritionist. On a day to day basis Tom does monitor milk production and milk composition (milk fat, SNF, etc.) and his nutritionist is kept abreast of this information on a regular basis. Even with such control, a problem (reduced production, milk fat decrease, etc.) may show up that seems to coincide with a change in hay, and if no other possibility seems to explain the problem, then appropriate recommendations are made by the nutritionist in an attempt to correct the problem.

Seldom are major changes in Tom's feeding program necessitated by a shift to a new lot of hay. Efforts in nutrition are directed toward fine-tuning his nutrition program with the objective of constant improvement in milk and solids production and in cow health.

Alfalfa hay analysis as a damage-control system

Ernie is a dairyman who is known as a "price buyer". He desires to buy the best alfalfa hay he can buy, but he will not pay top dollar for his hay. He will on occasion purchase hay without an analysis if it looks good or if he has some past knowledge of the source. He usually purchases his cousin's hay even though the tonnage is small relative to his needs. In the case of larger lots of hay he will have an analysis performed and provide the results to his nutritionist. Faced with a rather large variation in hay quality the nutritionist must frequently reformulate the ration in an attempt to avoid deficiencies or excesses of T.D.N., fiber or protein. Often the ration changes are not made as rapidly as the hay being fed is changed due to communication problems or oversight. As a consequence, there are times when milk production drops or when milk fat test decreases more than Ernie is willing to put up with. In addition, there are instances when intake of hay or of the total ration dry matter decreases significantly, due either to introduction of a low quality hay or due to poor palatability.

Ernie's dairy has years when production is good and others when it's a struggle all year long. Alfalfa hay quality plays a big role in what happens on the dairy, though it can't be blamed for all the problems.

Alfalfa hay analysis as a problem-solving tool

Alex is a pretty good dairyman who tries to do almost everything himself. There are times when he is so busy that he must give priority to the daily tasks on the dairy and let some relatively important things go. He doesn't have time to spend looking at stacks of hay and working with hay brokers to assure quality. In the press of everyday business he will sometimes buy hay on the appearance of one bale in the back of a pickup truck, without even a reliable analysis. A steady or sudden production drop or a health problem stimulates him to call for nutrition help, suspecting that the last change in his commercially manufactured barn grain might have precipitated the problem. If he calls on a professional nutritionist Alex's explanation is not automatically accepted. The nutritionist will not give him an opinion until he has a complete history on the dairy which includes rations being fed, creamery and computer records (DHIA or other), health history and a milk quality (somatic cell count) history. In addition, the nutritionist will require laboratory analysis on major roughages and perhaps other feeds, depending on what the herd history information reveals.

Potentially, Alex may have one or more of the following problems relating to alfalfa hay:

- a. Laboratory analysis reveals that the hay is lower in I.D.N. or protein than its appearance would indicate
- b. The analysis provided to Alex when he purchased the hay was erroneous either because of improper sampling or because of poor laboratory procedure
- c. The barn grain may not have been properly formulated to result in a balanced diet with the quality of hay being fed, and this led to the production drop.
- d. A high molybdenum level in the hay led to a toxic condition which depressed production.
- e. The production drop has nothing to do with hay quality but rather is due to one of the other factors revealed by herd history.

These are not all the possibilities. In readily see the importance of hay analysis as an important right explanation for Alex's problem.

Alfalfa hay vs alternative roughage sources

With dairy cattle, and other livestock as well, alfalfa hay must compete with other feedstuffs. Increasingly, livestock operations rely on the use of computers to formulate rations on a least cost or profit-optimizing basis. Quality and cost of alfalfa hay is critical to the level of hay selected by the computer. Higher protein, higher energy hay has an advantage providing it is competitively priced.

Computer ration formulations are often constrained by a lower limit set to force a certain amount of hay, regardless of cost. A nutritionist is more likely to set this minimum constraint high if alfalfa hay is believed to be a more reliable source of nutrients than other alternatives. Only frequent and accurate analyses can provide this assurance.

As alfalfa growers and hay dealers realize, there is a market for lower quality grades of hay. Feeding programs for dairy dry stock, beef cattle, and sheep normally utilize higher fiber, lower energy hay. As long as the nutrient needs of the animal involved can be met, and as long as their objectives for an economical feeding program can be realized this type of hay will find a home.

Improvements needed in use of alfalfa hay analysis

We have had gratifying advances in the way hay is produced, analyzed and marketed in recent years. There is still room for improvement, however. I can visualize the day when each lot of hay would be sold with a Certificate of Analysis. This certificate would be the grower's (broker's) assurance to the buyer that the hay was properly sampled and the analysis was performed by a laboratory certified as to its accuracy. Many chemical laboratories already participate in quality assurance programs sponsored by trade associations such as the California Grain and Feed Association, the Oil Chemists Society, etc. In order to be approved for specific analyses the laboratory has to demonstrate a minimum accuracy level in a blind sample test program.

I personally believe that laboratories using the near infrared system (NIR) equipment and computer technology should have to meet similar quality assurance certification before being accepted by the alfalfa hay growers and

the livestock industry

To highlight the importance of laboratory quality assurance I present the following results of a recent sample split performed by one of our nutritionists and sent to a chemical laboratory and to a laboratory using NIR testing (all analyses except dry matter are on a 90 percent DM basis):

	<u>Wet Lab</u>	<u>NIR</u>
Dry Matter, %	91.4	91.0
Crude Protein, %	19.4	20.1
Mod. Crude Fiber, %	21.6	20.5
Acid Det. Fiber, %	30.2	24.1
Neutral Det. Fiber, %	37.3	33.1
TDN, est., %	54.5	57.2

The NIR results were obtained within an hour, but the chemical laboratory results took ten days!

This hay sample was taken to help find the answer to a problem situation. "Time is money" when attempting to find the cause of a production slump or similar problem, but so is accuracy! Which set of analyses is correct? Question is cast on NIR in this case because the modified crude fiber value and the TDN value computed from it do not agree. It isn't fair to reach overall conclusions about relative accuracy from one sample, but discrepancies of this type are occurring with too great a frequency. I won't accept NIR analysis without reservation until its accuracy and reliability approach that of the certified chemical laboratory.

As stated at the beginning of this paper, the objective of the nutritionist is to improve predictability of results through the use of scientifically established facts. We would like to work more and more under the early-warning system of analysis for the benefit of our clients.