Variations in Alfalfa Hay Grading

Guide A-329

R.D. Baker, Extension Agronomist
Shane T. Ball, Extension Agronomy Specialist

HISTORY OF GRADING STANDARDS

Alfalfa hay grading is not a new concept. The original federal standards, established in 1933, were revised in 1944 and again in 1949 under the authority of the Agricultural Marketing Act of 1946 and the Farm Products Inspection Act. The basis of these standards were visual estimates of leafiness; percent green color; percent foreign matter; coarseness of stems; and other qualities such as odor, mold, or dust.

This grading method hasn't been widely used because

- It assumed a central marketing area,
- Visual estimates were difficult to substantiate, and
- Grades were not related to animal performance.

UPDATING GRADING STANDARDS

There is renewed interest in establishing national hay grading standards because new technologies can more accurately reflect the feeding value of the product, and its market has expanded. Because of this expanded market, new standards are necessary to

- Establish more uniform marketing systems so fair prices can be set for hay from different areas.
- Describe hay entering foreign trade, and
- Provide consumers with improved estimates of feeding value prior to purchase.

The emergence of alfalfa hay as a true cash crop in long-distance commerce pressures the industry to develop a uniform way to describe it. Several states are using (or evaluating) hay grading systems. However, there is little uniformity between the systems. It's easy to see how confusion can be created by different grading systems between the alfalfa's origin and its destination. The following three systems illustrate the differences.

Hay Grading in California

California uses these hay grading factors:

Lot - A lot is hay from the same field, same cutting, and having the same stage of maturity. A lot can be of any size.

Sampling site - The sample is taken from the ends of 20 bales (horizontally) with a core sampler. Sampling is done by the party seeking the information on hay quality.

Analyses - The hay is analyzed for moisture concentration or dry matter (DM), and modified crude fiber (MCF), assumed to be fiber plus silica (soil). The analyses are performed by commercial laboratories, who supply the results to the party who developed the sample.

Estimated values - Estimated values include total digestible nutrients (TDN), estimated net energy (ENE), and digestible protein (DP) based on modified crude fiber.

Hay grades - Hay grades are based on estimated net energy and are classified as *excellent*, *good*, *fair*, or *poor*.

Visual appraisal - This appraisal, performed by either the buyer or the seller, is based on stage of maturity, leafiness, foreign matter, color, and conditions at harvest.

California producers also have proposed a method of evaluating hay prices in terms of estimated quality.

Hay Grading in Oregon-Idaho-Washington

Another alfalfa hay grading system is the Tri-State Reference Hay Testing used in Oregon, Idaho, and Washington. Factors used in this system are:

Lot - A lot is hay from the same field, the same cutting, and the same stage of maturity. A lot can be of any size.

Sampling - The sample is taken from the ends of 25 bales (diagonally) with a 12- or 18-inch core sampler.

Analyses - Analyses is made for moisture concentration or dry matter (DM), crude protein (CP), and acid detergent fiber (ADF).

Estimated values

Total digestible nutrients (TDN) = 54.3208 + 0.7387 (CP) - 0.2915 (ADF)

Quality factor (QF) = 0.9199 + 0.0136 (CP) - 0.0054 (ADF). This is the estimated feeding value compared to a reference hay. (A reference hay is assumed to contain 18.5% CP, 32% ADF, and have a quality factor percent of 1, a reference factor of 1.0, and a TDN of 58.7%.)

Reference factor (RF) = QF x DM** x 0.0114. All factors are evaluated on a 100 percent dry matter basis. Test results are supplied to the person who submits and pays for the supplies.

Visual appraisal - The visual appraisal, provided by the sampler, is based on color, grass, weeds, damage, leaf retention, amount available, processing method, irrigation method, storage, and sampling method.

Hay Grading in Oklahoma

Oklahoma's Hay Market System uses the following factors:

Lot - A lot is one cutting from one field. The size of a lot is not specified.

Sampling - Three bales are used for visual evaluations, and core samples are taken from at least five different bales.

Analyses - Analyses are performed for moisture concentration or dry matter (DM) and crude protein (CP).

Estimated values - No quality values are estimated.

Visual appraisal - A visual evaluation is made using cutting number, color, type and amount of foreign matter, type of package, maturity, and coarseness of stems and "softness" of bale.

This information is placed on a computer listing and distributed to buyers and producers in a manner similar to the Hay Hotline operated by the New Mexico Department of Agriculture.

Problems in Standardizing Lot, Sampling, and Analysis

Hay grading systems must be fair to both the producer and the buyer and must accurately represent the product. But a bale of hay is not a uniform product. Distribution of leaves and stems is not uniform throughout the bale. In the conventional small bale, leaves tend to be more concentrated in the solid and tight sides of the bale. Sampling points, therefore, are critical in getting a true representation of the bale. Sampling is further confused because each alfalfa field also is variable. Research at New Mexico State University has shown variability between consecutive bales in an alfalfa field.

Hay is often sold in lots of 25 tons or more, and field size may vary from 1 or 2 acres to more than 100 acres. It is reasonable to assume that bale-to-bale variation would be greater in larger lots. Hay lots should represent hay of the same stage of maturity, the same cutting, and be handled the same way. Other factors that might be considered are varieties, fields involved, time of day the hay was baled, and weather conditions before baling.

Samples must be taken in a uniform manner to standardize procedures from one area to another. Analysis of samples will be greatly influenced by the concentration of leaves in the sample. Therefore, samples should be taken from fixed locations within the bale, and an adequate number of samples must be taken from a lot. A set number of samples should be taken from lots of up to 1 ton, and the number of samples should increase proportionally in increments of 5 to 10 tons of lot size. It also would be desirable to have a uniform sampling tool. The Pennsylvania State University Core Sampler, powered by an electric drill, has been an acceptable sampling tool be-

cause the units are available and provide uniformity in this aspect of grading hay.

Near Infrared Reflectance Spectro-Computer (NIR) analysis is a new and rapid form of analysis. It is capable of performing all the analyses used in hay grading. But success or failure of NIR analysis depends on proper calibration of the machine. Calibration samples must be collected and analyzed chemically. These samples must represent all the hay to be analyzed. Quality of the chemical analysis used for calibration also is critical to the NIR analysis. The NIR analysis will be no more accurate than the chemical data it's based on. Accuracy decreases when samples fall outside the calibration range. Seldom will one set of calibration samples suffice for all factors measured.

New Mexico alfalfa growers have developed a reputation for producing high quality alfalfa. This reputation has helped develop a high demand for their hay. When hay buyers purchase over a long time from the same source, they assume a certain quality, so no hay grading is necessary. But if the buyer wants to know about the chemical qualities of a lot of hay, then whatever hay grading system is used must provide results that truly represent the feeding value of the lot of hay.