

# Alfalfa Quality Analysis: Definitions

Cooperative Extension Service  
College of Agriculture and  
Home Economics



## Guide A-331

Shane T. Ball, Extension Agronomy Specialist  
Leonard Lauriault, Forage Specialist

This publication is scheduled to be updated and reissued 12/03.

Laboratory evaluation of alfalfa quality may be performed by chemical analysis or by near infrared reflectance spectroscopy (NIRS). Below are the terms used in quality analysis (adapted from *Alfalfa Management: Diagnostic Guide*, 1990, Pioneer Hi-Bred International).

**Crude Protein (CP)** is a mixture of a true protein and nonprotein nitrogen, and also includes insoluble crude protein. In general, a high CP level is desirable; it's usually obtained by harvesting at an early growth stage.

**Insoluble Crude Protein (ICP)** is actually acid detergent insoluble nitrogen. It is an indicator of the amount of heating that has taken place in storage and the fraction of crude protein that is indigestible to livestock. A low ICP is desirable.

**Adjusted Crude Protein (ADF)** is the amount of crude protein available to livestock for digestion:  $ACP = CP - ICP$ . The ICP:CP ratio should be less than 10 if harvest and storage practices were correct. ICP:CP ratios higher than 10 can occur when cutting is delayed; hay is baled too wet; or haylage is stored too dry, resulting in excessive heating that can cause significant heat damage.

**Acid Detergent Fiber (ADF)** represents highly indigestible parts of the forage such as cellulose, lignin, silica, and insoluble nitrogen compounds. As forage plants mature, ADF increases and digestibility of forage decreases.

**Neutral Detergent Fiber (NDF)** is composed mainly of the cell wall part of the forage and includes hemicellulose and the ADF components. The NDF part of the forage is only partially digestible. The higher the percentage NDF, the less of the forage the animal will eat. Therefore, a low NDF is desirable.

**Dry Matter (DM)** is the percentage of the forage that is not water. If a forage is 55% dry matter, then it has 45% water ( $100 - 55 = 45$ ). Rations are balanced on a dry matter basis.

**Digestible Dry Matter (DDM)** is an estimate of the percentage of the forage that is digestible as determined from ADF concentration. DDM can be used to estimate the energy value of the forage. The lower the ADF, the higher the DDM will be. Use the following formula to estimate DDM:

$$DDM (\%) = 88.9 - 0.779 \text{ ADF } (\% \text{ of DM}).$$

**Dry Matter Intake (DMI)** is based on NDF concentration and is an estimate of the amount of forage an animal will consume. Use the following formula to estimate DMI:

$$\frac{DMI (\% \text{ of body weight}) - 120}{\text{forage NDF } (\% \text{ of DM})}$$

**Digestible Dry Matter Intake (DDMI)** is an estimate of the DDM the animal will consume. DDMI is determined by the equation

$$DDM \times \frac{DMI}{100}$$

Intake of digestible energy can also be estimated by DDMI.

**Related Feed Value (RFV)** is an index that combines ADG (digestibility) and NDF (intake) nutritional factors to arrive at one number to measure and compare forage quality. Use the following formula to calculate RFV:

$$RFV = \frac{DDM \times DMI}{1.29}$$

New Mexico State University is an equal opportunity/affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

---

**December 1998**

**Las Cruces, NM**  
5C