

# FORAGE ANALYSIS DEFINITIONS

**David McIntosh**, Coordinator  
**Bruno Pedreira**, Associate Professor and Director  
Department of Plant Sciences

**Katie Mason**, Assistant Professor  
**Jennie Ivey**, Associate Professor  
**Elizabeth Eckelkamp**, Assistant Professor  
**Jessy Shanks**, Extension Specialist  
Department of Animal Science

**Robert Florence**, Director  
Soil, Plant and Pest Center

The following definitions are to accompany the forage analysis provided through the UT Extension Soil, Plant and Pest Center in Nashville, Tennessee. This information is provided to better explain the current forage nutritive value parameters offered and the methods by which these are analyzed. The laboratory uses near infrared spectroscopy (NIRS) instrumentation with forage calibrations provided by the NIRS Consortium (NIRSC — Berea, Kentucky). Water content, pH, nitrates and certain minerals are determined by wet chemistry methods in the lab. Calculated parameters are reviewed by specialists and provided as a reference to the quality of the forage sample. Forage testing in this lab is certified annually through the National Forage Testing Association (NFTA — Stuart, Florida).

## WATER CONTENT

**DM (Dry Matter)** Part of the forage that is not water.

**Moisture** Part of the forage that is water.

## PROTEIN

**CP (Crude Protein)** The estimated protein content of the forage as determined through total nitrogen content from true protein and non-protein nitrogen.

**ADICP (Acid Detergent Insoluble Crude Protein)** Residue of nitrogen extracted after the ADF analysis and is a fraction of the digestible ADF content in forages. This can be a possible heat damage indicator.

**NDICP (Neutral Detergent Insoluble Crude Protein)** Residue of nitrogen extracted after the NDF analysis and is a fraction of the digestible NDF content in forages.

**InsolCP (Insoluble Crude Protein)** Protein left over from the nitrogen extraction that is undigestible as a fraction of the protein content in forages.

**Lysine** Percentage of the amino acid, lysine, within the forage.

## FIBER

**ADF (Acid Detergent Fiber)** Portion of the forage containing highly indigestible cell wall components consisting primarily of cellulose and lignin.

**NDF (Neutral Detergent Fiber)** Portion of the forage containing digestible (hemicellulose) and digestible (cellulose) with the indigestible parts (Lignin and ADF) cell wall components.

**Lignin** Portion of the forage containing the completely indigestible portion of the cell wall that offers little nutritive value.

## CARBOHYDRATES

**ESC (Ethanol-Soluble Carbohydrates)** Amount of sugar in the forage which include simple sugars, disaccharides, oligosaccharides and fructans, typically not polysaccharides.

**Fructan** Amount of fructose-containing sugar polymers in the forage which are a highly digestible energy source.

**Starch** Amount of starch in the forage, which is a highly digestible energy source.

**WSC (Water-Soluble Carbohydrates)** Amount of carbohydrates in the forage that can be extracted from feed with water and includes simple sugars, disaccharides, oligosaccharides and some polysaccharides.

**NSC (Non-Structural Carbohydrates)** Amount of carbohydrates in the forage not contributing to the structure of the forage, which is determined by adding WSC plus starch.

**NFC (Non-Fiber Carbohydrates)** Calculated amount of carbohydrates of the forage that are not contained in the cell wall, which includes sugar, starch, pectin and fermentation acids.

## DIGESTIBILITY

**IVTDMD48h (*in-vitro* True DM Digestibility 48h)** Estimate of rumen digestibility of the forage following a 48-hour incubation.

**NDFD48h (Neutral Detergent Fiber Digestibility 48h)** The estimated digestibility of the NDF over a 48-hour incubation.

## FAT

**Fat** Total fat content of the forage. Expressed as a percentage.

## MINERALS

**Ash** Total mineral content of the forage expressed as a percentage.

## ENERGY CALCULATIONS

**TDN (Total Digestible Nutrients)** Sum of all nutrients in the forage that can be digested and serve as sources of energy for ruminant animals.

**DE (Digestible Energy)** Amount of energy in the forage that can be digested by the animal and is primarily used to quantify energy available to equine species

**NE<sub>M</sub> (Net-Energy for Maintenance)** Amount of energy in the forage that is available for maintenance of livestock and serves as an indicator of voluntary forage intake.

**NE<sub>G</sub> (Net-Energy for Gain)** Amount of energy in the forage that is available to be used for growth of livestock.

**NE<sub>L</sub> (Net-Energy for Lactation)** Amount of energy in the forage that is available to be used for milk production of livestock.

## CALCULATED PARAMETERS

**RFQ (Relative Forage Quality)** Indicator of forage quality based upon energy and fiber digestibility, which can be used to compare forage samples on a ranking scale reported for all grass, mixed, legume hays and haylages.

**RFV (Relative Feed Value)** This ranking scale is used to report Alfalfa quality only.

## COMPONENTS

**pH (Ensiled Forage)** The final pH of an ensiled forage, which can be used as an indicator of fermentation outcomes and the safety and stability of the forage. Represented as a numeric indicator of the acidity content of the forage.

**Nitrates** Amount of nitrate found in the forage determined by wet chemistry. Nitrate levels above 2,500 ppm can be toxic to ruminant animals.

For more information about forage testing, please visit [soillab.tennessee.edu](http://soillab.tennessee.edu), or contact your county Extension office [utextension.tennessee.edu](http://utextension.tennessee.edu).



Funding for this publication was provided by the Joe Burns Memorial Endowment. Professor Joe Burns spent his career educating forage producers in Tennessee and across the Southeast. Joe was a nationally renowned forage specialist with University of Tennessee Extension. Professor Burns served in this role for 37 years before retiring in 1992. During his career his was honored as the Tennessee man of the year in agriculture by Progressive Farmer magazine, and was awarded both the Merit Award and the Distinguished Grasslander Award from the American Forage and Grassland Council. Joe was well-known not only for his knowledge, but also for his kind and encouraging attitude. Joe was a role-model and mentor for many faculty at UT and producers across the state.



**[UTIA.TENNESSEE.EDU](http://UTIA.TENNESSEE.EDU)**

SP 774 (Rev) 05/25 Programs in agriculture and natural resources, 4-H youth development, family and consumer sciences, and resource development. University of Tennessee Institute of Agriculture, U.S. Department of Agriculture and county governments cooperating. UT Extension provides equal opportunities in programs and employment.