

Parameter	Units*	Abbrev.	Definition	Notes
<b>Acid Detergent Fiber</b>	%DM	ADF	Residue remaining after boiling a forage sample in acid detergent solution. ADF contains cellulose, lignin, and silica, but not hemicelluloses.	Often used in some equations to calculate energy digestibility, TDN, and/or NE <sub>L</sub> , but newer energy estimates include more complete lab analyses. Contrast with crude fiber and neutral detergent fiber.
<b>Acid Detergent Insoluble Crude Protein</b>	%DM	ADICP	Equals ADIN x 6.25 to convert to crude protein basis. It has a larger error than ADIN since not all protein in this fraction is 16% nitrogen.	The term ADICP is used in NRC, 2001. The term ADIP (same as ADICP or ADF-CP) is used in CPM.
<b>Ash</b>	%DM		An estimate of the total mineral content; the residue remaining after burning a sample at 550°C	Values above 6% for grasses or 8% for legumes usually indicate soil contamination of forage. Ash, ADF-ash, and NDF-ash will be different values because ADF and NDF procedures remove some minerals. Note that this is greater than the sum of minerals since the major component, silica, is not measured in most mineral analysis.
<b>Crude Protein</b>	%DM	CP	6.25 times the nitrogen content for forage or 5.7 times the nitrogen content for grain.	
<b>Digestible Energy</b>	Mcal/lb or Mcal/Kg	DE	The energy in a forage or feedstuff that is not excreted in feces. Calculated for most feeds for dairy cows at maintenance (NRC 2001): $DE_{ix}(Mcal/kg) = (dNFC/100) \times 4.2 + (dCP/100) \times 5.6 + (FA/100) \times 9.4 - 0.3$	DE, 1x Maintenance NRC of Dairy Cattle 2001
<b>Dry Matter</b>	% As Fed	DM	The percentage weight of the sample that is not water (100% - Moisture)	
<b>Lignin, Acid Detergent</b>	%DM	ADL	Undigestible plant component, giving the plant cell wall its strength and water impermeability. Technically, a chain of phenyl propane units.	There are two methods of measuring lignin in acid detergent fiber: sulfuric acid lignin and Permanganate lignin. High levels of lignin also reduce digestibility within a plant species. Permanganate lignin is a larger value than sulfuric lignin for most feeds.
<b>Lignin : NDF Ratio</b>			An estimate of forage quality and digestibility that varies with forage type.	
<b>Metabolizable Energy</b>	Mcal/lb	ME	The energy in a forage that is not lost in feces, urine, or rumen gases.	ME, 3x Maintenance NRC of Dairy Cattle 2001
<b>Net Energy, Gain</b>	Mcal/lb	NE <sub>G</sub>	An estimate of the energy value of a feed used for body weight gain above that required for maintenance.	NE <sub>G</sub> , NRC of Beef Cattle 1996
<b>Net Energy, Lactation</b>	Mcal/lb	NE <sub>L</sub>	An estimate of the energy value of a feed used for maintenance plus milk production during lactation and for maintenance plus the last two months of gestation for dry, pregnant cows.	NE <sub>L</sub> , 3x Maintenance, NRC of Dairy Cattle 2001.
<b>Net Energy, Maintenance,</b>	Mcal/lb	NE <sub>M</sub>	An estimate of the energy value of a feed used to keep an animal in energy equilibrium, i.e., neither gaining nor losing weight.	State method of calculation.
<b>Neutral Detergent Fiber, with Sodium Sulfite (NA<sub>2</sub>SO<sub>3</sub>) + amylase</b>	%DM	aNDF	Residue left after boiling sample in neutral detergent solution. If amylase and sodium sulfite are used during the extraction (this is recommended procedure), the fiber fraction should be called amylase-treated NDF (aNDF) to distinguish from original method.	The NDF in forages represent the indigestible and slowly digestible components in plant cell walls (cellulose, hemicellulose, lignin, and ash). Contrast with crude fiber and acid detergent fiber.
<b>Neutral Detergent Insoluble Crude Protein</b>	%DM	NDICP	6.25 times the nitrogen in the NDF Residue. Used in NRC model. It has a larger error than NDFN since not all protein in this fraction is 16% nitrogen. See NDF-CP above.	
<b>Nitrate</b>	%DM or ppm	NO <sub>3</sub>	The most common form of nitrogen taken up from soil by plants (NO <sub>3</sub> <sup>-</sup> ).	Can be toxic to animal if it accumulates in plants (for example from over fertilization, High manure, and/or drought)
<b>Nitrate Nitrogen</b>	%DM or ppm	NO <sub>3</sub> -N	The nitrogen concentration expressed as nitrate.	To convert NO <sub>3</sub> -N to ppm Nitrate, multiply results by 4.4.
<b>Nonfibrous Carbohydrate</b>	%DM	NFC	An estimate of the rapidly available carbohydrates (primarily starch and sugars) in a forage. This value is calculated from one of the following equations: NFC = 100% - (CP%+NDF%+EE% + Ash%) Or, if corrected for NDICP, NFC% = 100% - [CP%+(NDF%-NDICP%)+EE%+Ash %]	

<b>pH</b>			A measure of the acidity of a feedstuff calculated as the negative logarithm of the H ion concentration. Scale ranges from 0 to 14 with 7 being neutral.	
<b>Relative Feed Value</b>		RFV	An index ranking cool season grass and legume forages based on intake of digestible energy. RFV is calculated from ADF and NDF as follows: RFV=[(120/NDF)*(88.9-(0.779*ADF))]/1.29	The higher the RFV, the better the quality. It is used to compare varieties, match hay/silage inventories to animals, and to market hay.
<b>Soluble Protein</b>	%CP	S-CP	The nitrogen fractions extracted by a phosphate solution.	Generally an indicator of protein rapidly digested in the rumen.
<b>Starch</b>	%DM		A polysaccharide consisting of a long chain of glucose units ((C <sub>6</sub> H <sub>10</sub> O <sub>5</sub> ) <sub>n</sub> ). Most starch in plants is 20 to 25% amylose (linear) and 75 to 80% amylopectin (branched).	Starch is digestible by both ruminants and non ruminants; however, physical characteristics of the feedstuff may restrict the amount and rate of starch availability for digestion.
<b>Sugar</b>	%DM		A class of crystalline substances, mainly sucrose, lactose and fructose. Produced by all plants when growing. Rapidly digested by all animals.	High sugar in diets has been associated with laminitis, a failure of the attachment of the pedal bone and the inner hoof wall.
<b>Total Digestible Nutrients, 1X NRC 2001</b>	%DM	TDN	Dairy NRC 2001: The sum of digestible crude protein, fat (multiplied by 2.25), nonfibrous carbohydrates, and digestible NDF.	TDN, 1x Maintenance, NRC of Dairy Cattle 2001

\* Expressed on DM basis unless specified otherwise.

<sup>2</sup>Sources:

Undersander, Dan. 2008. Glossary of Forage Quality Terms. National Forage Testing Association.

Barnes, R.F., C.J. Nelson, K.J. Moore, and M. Collins. 2007. Forages, The Science of Grassland Agriculture, 6<sup>th</sup> Ed. Blackwell Publishing, Ames, IA.

National Research Council. 2001. Nutrient Requirements of Dairy Cattle. 7<sup>th</sup> rev. ed. Natl. Acad. Sci. Washington, DC.

Notes: The definitions often refer to the chemistry methods of analysis which are used to calibrate NIR equations.

*(Revised by Glenn Shewmaker, Tim Snyder, and Dan Undersander 4/29/2009)*