Understanding an NIR Forage Analysis Report

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The use of Near Infrared Reflectance Spectroscopy (NIR) can quickly provide the user a wealthy of information regarding forage quality. Unfortunately, this analysis can only be performed on select forages and plant materials. Thousand of samples from each forage or plant species must be processed both through the NIR and through traditional wet chemistry methods in order to develop regression calibration data for the NIR. Currently, the Soil, Water and Forage Testing Laboratory can perform NIR analysis on alfalfa, bahia and bermuda grass samples.

The following data is reported on a NIR report form:

MOISTURE, % — The amount of water in forage at time of analysis. (NOTE: All tissue must undergo drying in order to help facilitate the required tissue grinding.)

DRY MATTER, % — The amount of dry forage present at time of analysis. Calculated by subtracting the MOISTURE % from 100).

CRUDE PROTEIN, % — A measure of both true protein and non-protein nitrogen. This figure may include true protein, non-incorporated ammonium, and nitrogen from protein supplements. (Note: This figure may represent protein and nitrogen compounds which are not nutritionally available to the animal.)

HEAT DAM. PROTEIN, % — A measure of "deformed/malformed" protein which is generally not available to the animal. (May be caused during plant development or post harvest handling.)

AVAILABLE PROTEIN, % — This represents the amount of protein available to the animal. It is calculated by subtracting the heat damaged and insoluble protein levels from the crude protein.

DIG. PROTEIN EST., % — This number, by convention is calculated as follows: (Crude Protein x 0.908)-3.77. This provides an estimate of the available protein levels but does not account for a heat damaged proteins.

ACID DET. FIBER (ADF), % This figure represents the quantity of cellulose, lignin, silica, insoluble crude protein and ash, which are the least digestible parts of the plant. Thus ADF in forages negatively relates to digestibility. Low ADF is preferred because it means higher net energy. The level of ADF increases with plant maturity.

NEUT. DET. FIBER (NDF), % This figure measures the structural part of the plant (the cell wall). This measurement is one of the best measures available to predict animal intake of forages. Like ADF, a low NDF is desirable. For example, corn grain generally will have approximately 10% NDF and is nearly 90% digestible, where as most straw has nearly 90% NDF and ranges for 20 to 50% in digestibility. The level of NDF also increases with plant maturity.

TDN EST., % A term describing the energy value of the forage. It is the sum of the digestible proteins, carbohydrates, and ether extractable lipids. Another method for calculating this number is: TDN%=88.9-(ADF x0.779). Thus as ADF increases TDN decreases.

ENE EST., THERMS/CWT A term expressing available energy in a forage. The higher the number, the greater the energy to the animal.

NE/LACT, MCAL/LB Available energy to a lactating cow. Calculated from wet chemistry data as NEL: Mcal/lb=(TDN% x 0.01114)-5.054. The higher the value the greater the energy available to the cow.

MINERALS (P, Ca, K, Mg),% While this data is currently presented on the NIR analysis report form, the NIR ability to provide ration quality mineral data is currently being revisited by researchers. If exact mineral data is required, please have sample digested for minerals via a wet chemistry method.

Note: The NIR analysis is based on correlation data from thousands of NIR scans and wet chemistry analysis. While NIR analysis only provides an estimate based on previous samples, it currently provides the only quick and low cost method to provide extensive data on large sample numbers. In general, the crude protein and ADF data determined by the NIR is very close to that of wet chemistry analysis.