

Feed Ingredients and Their Units of Measure

Nutrient

Common Units

Moisture	_____ %
Crude Protein	_____ %
Total Digestible Nutrients	_____ %
Neutral Detergent Fiber	_____ %
Acid Detergent Fiber	_____ %
Calcium	_____ %
Phosphorus	_____ %



Net Energy	_____ Mcal / lb
Vitamins	_____ IU / lb



Copper, Zinc	_____ ppm
--------------	-----------



These nutrient definitions can be helpful when understanding terminology you will see on a feed analysis.

MOISTURE

Dry Matter (DM): Dry matter is the moisture-free content of the sample. Because moisture dilutes the concentration of nutrients but does not have a major influence on intake (aside from severe deprivation), it is important to always balance and evaluate rations on a dry-matter basis.

Digestible Dry Matter (DDM): Calculated from acid detergent fiber (ADF; see below); the proportion of a forage that is digestible.



Feed Ingredients and Their Units of Measure (cont.)

PROTEIN

Crude Protein (CP): Crude protein measures the nitrogen content of a feedstuff, including both true protein and non-protein nitrogen. In ruminants, evaluation of the fraction that is degradable in the rumen, degradable intake protein (DIP), versus the rumen-undegradable fraction, undegradable intake protein (UIP), is also important. However, the rumen degradability of protein is not measured in most commercial labs. Therefore, it is recommended that rations be formulated using analyzed CP values and average values for DIP and UIP that can be found in the 1996 National Research Council Nutrient Requirements of Beef Cattle.

- **Degradable Intake Protein (DIP):** The fraction of the crude protein which is degradable in the rumen and provide nitrogen for rumen microorganisms to synthesize bacterial crude protein (BCP) which is protein supplied to the animal by rumen microbes. DIP also includes non-protein nitrogen found in feeds or ingredients.
- **Undegradable Intake Protein (UIP):** The rumen-undegradable portion of an animals crude protein intake. Commonly called “bypass protein” because it bypasses rumen breakdown and is mainly digested in the small intestine. Bypass protein is utilized directly by the animal because it is absorbed as small proteins and amino acids.
- **Metabolizable Protein (MP):** MP is protein that is available to the animal including microbial protein (BCP) synthesized by the rumen microorganisms and UIP.

Heat Damaged Protein or Insoluble Crude Protein (ICP): Nitrogen that has become chemically linked to carbohydrates and thus does not contribute to either DIP or UIP supply. This linkage is mainly due to overheating when hay is baled or stacked with greater than 20% moisture, or when silage is harvested at less than 65% moisture. Feedstuffs with high ICP are often discolored and have distinctly sweet odors in many cases. When the ratio of ICP:CP is 0.1 or greater, meaning more than 10% of the CP unavailable, the crude protein value is adjusted. Adjusted crude protein (ACP; see below) values should be used for ration formulation.

Adjusted Crude Protein (ACP): Crude protein corrected for ICP. In most nutrient analysis reports, when ACP is greater than 10% of CP, the adjusted value is reported. This value should be used in formulating rations when ICP:CP is greater than 0.1.

Digestible Protein (DP): Reported by some laboratories, do not use without the guidance of a nutritionist. Digestible protein values are not needed for most ration formulation because nutrient requirements and most formulation tools are already adjusted for protein digestibility. Furthermore, protein digestibility is influenced by external factors.



Feed Ingredients and Their Units of Measure (cont.)

FIBER

Crude Fiber (CF): Crude fiber is a traditional measure of fiber content in feeds. Neutral detergent fiber (NDF) and acid detergent fiber (ADF) are more useful measures of feeding value, and should be used to evaluate forages and formulate rations.

Neutral Detergent Fiber (NDF): Structural components of the plant, specifically cell wall. NDF is a predictor of voluntary intake because it provides bulk or fill. In general, low NDF values are desired because NDF increases as forages mature.

Acid Detergent Fiber (ADF): The least digestible plant components, including cellulose and lignin. ADF values are inversely related to digestibility, so forages with low ADF concentrations are usually higher in energy.

ENERGY

Total Digestible Nutrients (TDN): The sum of the digestible fiber, protein, lipid, and carbohydrate components of a feedstuff or diet. TDN is directly related to digestible energy and is often calculated based on ADF. TDN is useful for beef cow rations that are primarily forage. When moderate to high concentrations of concentrate are fed, net energy (NE, see below) should be used to formulate diets and predict animal performance. TDN values tend to underpredict the feeding value of concentrate relative to forage.

Net Energy (NE): Mainly referred to as net energy for maintenance (NE_m), net energy for gain (NE_g), and net energy for lactation (NE_l). The net energy system separates the energy requirements into their fractional components used for tissue maintenance, tissue gain, and lactation. Accurate use of the NE system relies on careful prediction of feed intake. In general, NE_g overestimates the energy value of concentrates relative to roughages.

Ether Extract (EE): The crude fat content of a feedstuff. Fat is an energy source with 2.25 times the energy density of carbohydrates.

Relative Feed Value (RFV): A prediction of feeding value that combines estimated intake (NDF) and estimated digestibility (ADF) into a single index. RFV is used to evaluate legume hay. RFV is often used as a benchmark of quality when buying or selling alfalfa hay. RFV is not used for ration formulation.

Relative Forage Quality (RFQ): Like RFV, RFQ combines predicted intake (NDF) and digestibility (ADF). However, RFQ differs from RFV because it is based on estimates of forage intake and digestibility determined by incubating the feedstuff with rumen microorganisms in a simulated digestion. Therefore, it is a more accurate predictor of forage value than RFV. Neither RFV nor RFQ are used in ration formulation.

