Cow Sense Chronicle

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Buying Hay? Tips for Interpreting a Forage Analysis

I've been hearing reports of variable hay production throughout the state. Some folks aren't getting any dryland hay at all. Others are getting a pretty good first cutting, but are skeptical about a second cutting. These conditions might result in producers purchasing hay, perhaps from long distances and previously unknown sources. While recommended every year, obtaining a forage nutrient analysis on hay becomes even more important in this situation. Remember: it's hard to manage if you don't measure first. A forage nutrient analysis is a critical step in determining least-cost rations for wintering beef cows. This month's newsletter will cover how to interpret forage nutrient analyses for beef cattle. Below is an example nutrient analysis for a grass hay, including minerals. Definitions of important terms are found on the next page, along with energy and protein requirements for a 1400-pound cow.

Sample ID: FL 2698
Feedstuff: GRASS HAY

ANALYSIS RESULTS		
Component	As Sent	Dry Wt.
Moisture (%)	12.58	///////
Dry Matter (%)	87.42	///////
Crude Protein (%)	6.92	7.92
Acid Detergent Fiber (%)	35.3	40.4
Total digestible nutrients (%)	49.4	56.5
Net energy-lactation (Mcal/lb)	0.50	0.57
Net energy-maint. (Mcal/lb)	0.48	0.55
Net energy-gain (Mcal/lb)	0.28	0.32
Sulfur (%)	0.13	0.15
Phosphorus (%)	0.18	0.20
Potassium (%)	1.55	1.77
Magnesium (%)	0.15	0.18
Calcium (%)	0.36	0.42
Sodium (%)	0.06	0.07
Iron (ppm)	443	507
Manganese (ppm)	50	58
Copper (ppm)	6	6
Zinc (ppm)	17	20

Moisture

As Fed – Values in the "As Fed" or "As Received" column include the moisture contained in the submitted sample. Because of the dilution effect of the water, values in this column will be smaller than the Dry Matter column.

Dry Matter – Values in the "Dry Matter" column give nutrient information with the water removed. To accurately compare forages of differing water content, they must be compared on a dry matter basis.

Protein

Protein (or Crude Protein) – A measure of the amount of nitrogen in the feedstuff. Laboratories measure the nitrogen in a sample, then multiply by a factor of 6.25 to get the crude protein value.

Fiber

Acid Detergent Fiber (ADF) – Refers to the cellulose and lignin components of the forage cell wall, and relates to the ability of an animal to digest the forage. As ADF increases, digestibility of a forage usually decreases.

Neutral Detergent Fiber (NDF) – Refers to the total cell wall – cellulose, hemicelluloses and lignin. NDF values reflect the amount of forage an animal can consume. As NDF increases, dry matter intake will generally decrease. Labs often analyze for ADF but may not include NDF values unless specifically requested.

Energy

Total Digestible Nutrients (TDN) – An estimate of the digestibility of the forage and one measure of the energy content of a feedstuff. The higher the TDN value of a forage, the more energy it contains.

Net Energy for Maintenance (NEm) – The net energy system is an alternative way to assign energy values to feedstuffs, based on how the energy is partitioned for different uses. NEm describes the ability of a forage to meet the maintenance energy requirements of an animal.

Net Energy for Growth (NEg) – NEg describes the amount of energy in a forage available for growth after the maintenance needs have been met.

Net Energy for Lactation (NEl) – NEl describes the ability of a forage to meet the energy requirements of lactation. This is primarily used in dairy cow ration balancing.

Energy and Protein Requirements for a 1400-pound Mature Cow
1996 Nutrient Requirements of Beef Cattle

	Diet Nutrient Density		Daily Nutrients per Animal	
Physiological Stage	TDN (% DM)	CP (% DM)	TDN (lbs)	CP (lbs)
20-lb peak milk				
Early Lactation	58.0	9.9	17.6	3.00
Late Lactation	54.2	8.3	16.0	2.45
Post-Weaning	47.4	6.6	12.2	1.68
Late gestation	52.3	7.9	14.4	2.15
30-lb peak milk				
Early Lactation	60.9	11.3	20.1	3.38
Late Lactation	56.3	9.3	17.4	2.88
Post-Weaning	47.4	6.6	12.2	1.68
Late gestation	52.3	7.9	14.4	2.15

When comparing the cow requirements to the forage analysis, the hay would meet requirements pre-calving, but would not meet requirements for early lactation. Note that the listed requirements are for mature cows, not replacement heifers or first-calf heifers. Younger cows will have higher requirements for both energy and protein.

Producers purchasing hay containing forages prone to nitrate accumulation should also request a nitrate test. Annual small grain crops, corn, sorghum, sudangrass, and many common weeds are prone to accumulate nitrate in drought conditions. Nitrate uptake is normal part of plant metabolism. Nitrate is converted to nitrite, which is then converted to ammonia for protein synthesis in the plant. These conversions happen in the leaves of the plant, so any conditions negatively impacting leaves (drought, hail damage, etc.) may result in nitrate accumulation in these forage types. Nitrate concentrations are highest in the stem or the stalk, especially the lower portion.

The nitrate conversion pathway is exactly the same in the rumen as in plants; however, high nitrate concentrations overwhelm the conversion pathway from nitrite to ammonia and nitrite accumulates. As nitrite enters the bloodstream, it competes with oxygen for red blood cells. Nitrite converts hemoglobin to methemoglobin, which is incapable of oxygen transport. Chronic nitrate toxicity can result in reduced appetite and milk production, unthrifty appearance, poor gain performance, or abortion. Acute nitrate toxicity generally results in death from lack of oxygen. Symptoms include accelerated pulse rate, labored breathing, muscle tremors, cyanosis (blue mucus membranes), and death.

The table below provides a summary for interpretation of nitrate concentrations in forages. Note that these numbers are more conservative than those you might receive from a testing laboratory or in publications from other states. Also note that it is critical to match the method of nitrate measurement on the analysis to the correct column in the table. Nitrate-nitrogen (NO_3-N) is a different measurement than nitrate (NO_3). If the nitrate concentration is reported in percent, move the decimal 4 places to the right to convert to parts per million. For example, 0.18% NO_3 is the same as 1800 ppm NO_3.

Reported on 100% dry matter basis as:		**COMMENT**
NO_3-N (ppm)	**NO_3 (ppm)**	
< 350	< 1500	Generally safe for all conditions and livestock.
350-1130	1500-5000	Generally safe for non-pregnant livestock. Potential early term abortions or reduced breeding performance. Limit use to bred animals to 50% of the total ration.
1130-2260	5000-10000	Limit feed to 25-50% of ration for non-pregnant livestock. **DO NOT FEED TO PREGNANT ANIMALS**, may cause abortions, weak calves, and reduced milk production.
> 2260	> 10000	**DO NOT FEED.** Acute symptoms and death.

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