

Fundamentals of Ration Formulation for Beef Cattle

Part III: Determining the Nutrient Content of Your Forage

Randy Wiedmeier, Regional Livestock Specialist, South-Central Area

What information and skills are required to balance diet for beef cattle?

1. The nutrient content of the feeds available, as well as the cost or value of those feeds.
2. The nutrient requirements of beef cattle based on production expectations and some knowledge regarding nutrient balance, overloads and toxicities.
3. PPPHC: piece of paper, pencil, and a hand calculator.
4. Arithmetic skills.

In Parts I and II of this series, As-Fed/Dry Matter and Nutrient Terminology were covered. In this article (Part III), the importance of knowing the nutrient content of animal feeds is emphasized.

Visual Appraisal can be used to “guesstimate” the nutrient content of forages (my best guess). Several studies have shown that most people, even those with extensive experience, usually **overestimate** the nutrient content of forages such as hay. I consider myself to be somewhat experienced regarding visually judging the nutrient content of hay and other forages after conducting several thousand laboratory analyses on forages. The following table compares my visual estimations of the nutrient content of a local grass hay with the actual laboratory results:

Nutrient	My Visual Appraisal	Laboratory Report
Total Digestible Nutrients (TDN), % DM	58.0	55.3
Crude Protein, % DM	12.0	10.8

Although my estimates were “in the ballpark”, these differences could result in major negative implications regarding the nutritional management of the animals being fed this hay.

Book or Tabled Nutrient Values can also afford us some “ballpark” estimates of the nutrient content of our forages. However, these descriptions are usually compiled on a nation-wide or a state-wide basis and thus do not take into account local soils, elevation, and climatic conditions, etc., that could affect nutrient concentrations at given stages of maturity. Feed nutrient content tables can be found via a number of sources:

1. National Research Council publication such as Nutrient Requirements of Beef Cattle, 8th Revised Edition, https://www.nap.edu/resource/19014/19014_summary.pdf
2. Publications by various Land-Grant Institutions: <https://www.uaex.edu/publications/pdf/FSA-3043.pdf>.
3. Popular Press publications: <https://www.beefmagazine.com/nutrition/feed-composition-tips-how-use-2018-data-m...>

Laboratory Analysis is the only “sure” method of ascertaining the nutrient content of you forage. However, the accuracy of laboratory analysis is highly dependent on the sample you send to the laboratory. Thus **Forage Sampling Procedures** are extremely important. The following are a few points to remember when sampling forages for laboratory analysis for nutrient content:

1. Forage samples should be representative a certain lot. In other word, try to avoid mixing samples from different fields, different cuttings, different years, different species, etc.
2. Sample forages as **close to the time of feeding or purchase** as possible to account for post-harvest changes.
3. When sampling forages such as hay, try to avoid sampling bales from only one area in the field, i.e., only the bales on the perimeter of the field. Sample bales from all areas of the field.
4. Try to sample about **10% of the bales** in a lot of hay. It is

recommended that a minimum of **20 small square bale** be sampled in a lot and a minimum of **10 to 15 larger bale packages** such as round bales.

5. Remember that it is very important to obtain a “representative sample”.

There are 454 grams in a pound and the lab will use only 2 to 5 grams for the analysis, which may represent many tons of hay.

6. Pulling a “**grab sample**” by hand from a bale of hay is **NOT** recommended. This method usually always results in an underestimation of nutrient content. Use an **Approved Hay Sampling Probe or tube**. These are usually constructed of a stainless steel tube of 5/8 inch inside diameter and about 24 inches in length with a sharpened edge for cutting a core sample in bales. The cutting takes place as pressure is placed on the probes as it is rotated into the bale by either a hand brace or an electric drill. On square bales, core samples are removed from the middle of the butt end of the bale so as many flakes as possible are sampled. On round bales, core samples are removed from the middle of the wrapped surface with the probe perpendicular to the bale. The National Forage Testing Association (NFTA) lists several sources for hay sampling probes:

www.foragetesting.org/index.php?page=hay_probes.

7. **Don't depend on the laboratory to mix the sample you send in.** It is best to place all of the core samples for a given lot of hay in clean plastic bucket and mix them thoroughly by hand. Then place this mixed sample in a clean zip-lock plastic bag for shipment to the laboratory. It is recommended that the sample fill a half-gallon bag and weight about **.5 lbs**. Try to remove as much air as possible from the sample bag.
8. **Make sure you properly identify the sample bag with a permanent marker:** field, cutting, date, etc.
9. **Don't let the sample sit in the window of your pickup** for two weeks before sending it to the lab.
10. Make sure the lab used is certified by the National Forage Testing Association (NFTA).

