



## Feed Testing & Analysis for Beef Cattle

Feeding beef cattle, regardless of class, is typically the most expensive part of a producer's cost of production.

**Forage sampling and feed testing** are valuable tools that enable producers to:

1. Develop appropriate rations that meet the nutritional needs of their beef cattle;
2. Identify gaps that may require supplementation;
3. Economize feeding, and possibly make use of opportunities to include diverse ingredients;
4. Prevent or identify potential devastating problems due to toxicity from mycotoxins, nitrates, sulfates, or other minerals or nutrients;
5. Determine insidious production problems, such as poor gains or reduced conception, attributed to a mineral or nutrient deficiency or excess, and;
6. Accurately price feed for buying or selling.



Feed quality differs according to forage species, stage of maturity at time of harvesting, weathering of forages, storage conditions, plant disease, and other factors. It is important to **not rely on averages** and to **test feeds annually**.

### Obtaining Feed Samples

It's critical to collect a feed sample that is *representative* of the feed ingredients that you are testing. Any feed type that will be used to feed beef cattle can and should be analysed, including baled forages and straw, by-products, silage, baleage, grain, swath grazing, cover crops, and corn.

For *baled products*, use a forage probe to obtain the minimum recommendation of twenty cores for each sample you wish to submit. Collect the forage in a plastic zip bag and clearly label. For *silage*, collect hand samples from the upper, middle, and lower parts from four quadrants of the silage pile or pit *as long as it is safe to do so*.

This will result in a larger sample size than what can be submitted. Mix these samples well and obtain a sub-sample from that material. For *swath grazing* or *standing crops*, obtain representative samples of the sward (swaths) or the whole plant, according to lab specifications.



Obtain 20 cores for each sample you wish to submit using a forage probe.

*Photos courtesy of SK Ministry of Agriculture.*

Feed samples can be sent to labs across Canada and the United States. A listing of labs can be found on [www.agric.gov.ab.ca](http://www.agric.gov.ab.ca) Tests may cost anywhere from \$30-150 depending on the test being performed.

## Meeting Nutrient Requirements for Cattle

The main purpose producers feed test is to ensure they are adequately meeting the nutritional needs of their livestock. Nutritional needs vary greatly depending on stage and age of cattle and whether you are growing, finishing, breeding, or maintaining cattle. Body condition, hide thickness, and hair coat can affect nutrient requirements of cattle as can weather conditions like temperature and wind speed, or environmental factors such as mud depth, bunk space, or other factors. An example of nutrient requirements for cows compared to bred heifers is in the following table.

**Nutrient Requirements for Pregnant Cows and Bred Heifers\***

	<b>TDN (lb/day)</b>	<b>Net Energy Maintenance (Mcal/day)</b>	<b>Net Energy Gain (Mcal/day)</b>	<b>Crude Protein (lb/day)</b>	<b>Calcium (g/day)</b>	<b>Phosphorus (g/day)</b>
<b>1300 lb Mature Cow (Body Condition Score of 3.0, assumed to be maintaining weight)</b>						
<b>1<sup>st</sup> trimester</b>	11.0	10.7	-	1.5	17	14
<b>2<sup>nd</sup> trimester</b>	12.8	12.4	-	1.6	17	14
<b>3<sup>rd</sup> trimester</b>	15.3	15.2	-	2.1	30	19
<b>900 lb Heifer (Body Condition Score of 3.0, assumed to gain 1.25 lb/day)</b>						
<b>1<sup>st</sup> trimester</b>	12.7	8.1	2.3	1.7	24	16
<b>2<sup>nd</sup> trimester</b>	14.9	10.4	2.5	1.9	25	16
<b>3<sup>rd</sup> trimester</b>	18.0	13.6	2.7	2.4	36	22

\* Values are from [www.BeefResearch.ca](http://www.BeefResearch.ca) and were generated using Alberta Agriculture's CowBytes Program, with assumptions including breeding for June 1 calving, typical Canadian winters, access to shelter from wind and a daily gain of 1.25 pounds for bred heifers in addition to weight gain from pregnancy.

### Interpreting Lab Results

Most labs provide basic information on moisture content, protein, energy, total digestible nutrients, fibre, and some vitamins and minerals. More specialized tests may include results for nitrates, toxins, relative feed value (RFV), and other parameters.

Laboratory results are often reported on both **“Dry Matter”** and **“As-Fed”** bases. Dry Matter (DM) refers to the moisture-free nutritional content of the sample. **Always formulate rations based on a DM basis.**

**Dry Matter (DM):** reported as a percentage, this refers to the moisture-free content of the forage sample. The water content of forage will dilute nutrients, yet doesn't usually have a great impact on animal intake, therefore it's important to balance all rations on a dry matter basis.

**Crude Protein (CP):** reported as a percentage, this refers to both the amount of true protein and non-protein nitrogen in the sample.

**Neutral Detergent Fibre (NDF):** reported as a percentage, this indicates the amount of structural fibre content in the plant. More mature forages will have higher NDF levels, however ideally, the values are low so as to not restrict an animals' intake.

**Acid Detergent Fibre (ADF):** reported as a percentage, this value measures the least digestible portions of the forage plants, such as cellulose and lignin.

**Total Digestible Nutrients (TDN):** reported as a percentage, TDN indicates the energy of the forage and refers to the total amount of digestible fibre, carbohydrates, fat, and protein in a sample. It's most useful and accurate for rations comprised primarily of plant-based forages.

**Relative Feed Value (RFV):** this is a prediction reported as an index that estimates intake and digestibility and is useful for evaluating *legume hay only*. It is often used for price discovery, however it is not helpful when balancing rations.

## Preventing Problems

One of the major benefits of feed testing is preventing costly and devastating problems before they start. Every season is different and some years there is an abundance of high quality forage. Other years, there is a lack of available feed, or perhaps there is an abundance of low quality forage, grain, or grain by-products available that may appear to be economical however can pose potential issues if feed analysis has not been performed or understood.

## Moulds & Toxins

Mould can occur in forages, grains, clover, corn, and by-products or derivatives of those feed ingredients. Moulds occur due to plant diseases such as ergot, fusarium head blight, *Aspergillus*, and many others. Although they can occur at any time, the incidence of these plant diseases increases during cool and wet growing conditions, or in crops left standing throughout the winter. Mould will reduce the energy content and palatability of feed. Mouldy feed can also cause production problems including abortions and respiratory disease and can cause the development of mycotoxins in feed. Mycotoxins, such as alkaloids, vomitoxin, and aflatoxin, when present in high levels, can lead to reproductive failure, reduced milk production, depressed gains, convulsions, gangrenous symptoms (i.e. sloughing of hooves, tail), and death.

Avoiding moulds in feed isn't always possible, so it's important to test feed to determine how much and what type of mould may be present so producers can realistically deal with the situation. Avoid feeding mouldy feed to young or pregnant animals, and obtain guidance from a nutritionist about safe ways to blend potentially problematic feed to dilute the contaminants. The Saskatchewan Ministry of Agriculture has a helpful **mycotoxin calculator** available online to assist producers with determining their risk level. [Access the calculator online at www.publications.gov.sk.ca](http://www.publications.gov.sk.ca)



## Mineral Nutrition

Mineral nutrition as provided by forages depends on:

- Feeding situation (i.e. grazing pastures vs. winter-feeding);
- Plant species;
- Forage management;
- Stage of plant growth;
- Soil type and zone;
- Weather, and;
- Available stock water and water quality.



Trace minerals, particularly **copper, zinc, and manganese**, are important for the reproduction, health, and growth of an animal, and **almost always require supplementation**. Other minerals, such as molybdenum and sulfur, have antagonistic properties that work against an animals' ability to absorb these minerals. Stock water that contains high levels of sulphates, or forages that contain high levels of sulfur, such as Brassicas (i.e. canola, radish, turnip), can interfere with copper absorption and cause deficiencies. Soils and/or forages high in molybdenum can also lead to copper deficiencies, so producers must consider all sources of minerals when consulting on their supplementation needs.

In most cases, **minerals must be supplemented year-round**. Producers should work with a nutritionist to ensure they understand how their mineral supplementation program works, that they are meeting the needs of

their cattle depending on the stage of breeding or gestation. It's also critical to determine whether the products they are purchasing are being consumed (and minerals are being absorbed) at appropriate levels, by all cattle.

## Nitrates

Annual crops such as oats, barley, corn, or millet can accumulate nitrates under certain growing conditions, including severe drought, hail storms, or frost. While cattle can metabolize a certain level of nitrates, if they consume diets where the nitrate level in forages is greater than approximately 0.5% Nitrate (NO<sub>3</sub>) or less than 0.12% Nitrate-nitrogen (NO<sub>3</sub>-N), production problems, and even mortality, can occur. Mature cows and replacement heifers are most at risk and can have symptoms such as abortions, premature calves, newborn calf mortality, poor growth and reduced milk production.

A simple and cost-effective feed test can rule out potential problems due to nitrates. Depending on the level of toxicity, the feed may be blended off and diluted to safe levels.

## What about Water?

Feed testing is critical however beef cattle obtain nutrients from sources other than feed as well. Producers must consider regularly sampling stock water to prevent nutritional problems. In many cases, forage alone or water alone may not cause toxicities in beef cattle, however when the two are combined, the cumulative effects may lead to problems. This may be particularly true for sulphates or nitrates and can occur in either grazing or winter feeding situations.



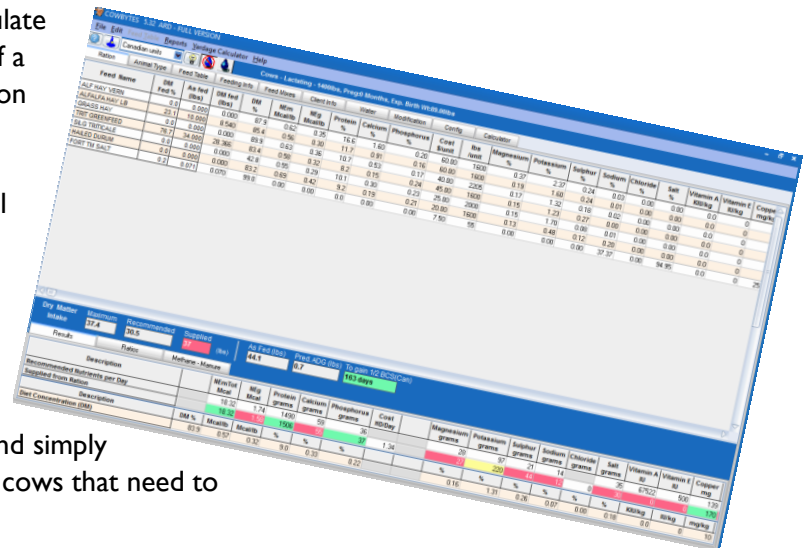
Testing stock water quality may be particularly important during a drought, when minerals and nutrients may become concentrated as water tables drop in surface or ground water, or evaporation occurs in stock ponds.

## Formulating Rations

Once feed test results are available, producers can formulate an appropriate ration for their cattle using the services of a qualified nutritionist, the assistance of agriculture extension staff, or through a software program such as CowBytes (Version 5). CowBytes is currently available for purchase at [www.agric.gov.ab.ca](http://www.agric.gov.ab.ca). There are also several free, useful online tutorials available.

Different rations need to be developed for as many separate classes of cattle as necessary. Producers may choose to group their herd according to needs. For example, a breeding herd may be split into one group of mature cows that have a good body condition score and simply require maintenance, and another group of older or thin cows that need to gain weight.

Minerals and salt most often need to be supplemented during the winter feeding period according to feed results. For rations comprised mainly of alfalfa, grass, or a mix of the two, calcium and phosphorus typically needs to be supplemented in a 1:1 mix. For rations that contain more cereal-based forages,



Producers may wish to use software such as CowBytes, a low-cost program available to producers, to help formulate rations.

including pellets, straw, or greenfeed, supplementation of a 2:1 or 3:1 mix may be required. As animals move through gestation and lactation, their needs will also change.

### **What are some things producers can do if they are interested in feed testing?**

- Assess your **feed resources**. What types of feeds are you planning to use and which tests best suit your forage types?
- Do you have the right tools including a forage probe? Are the samples you've collected representative of your feed types?
- Evaluate your **goals** for feed testing. What is motivating you? How do you plan to use the results? Have you contacted a nutritionist, agronomist, extension specialist, or veterinarian that you can work with to interpret the analyses?
- Are there potential problems you want to avoid? For example, are you concerned about the risk of vomitoxins in barley, or nitrates in a crop that was stressed? Have you had particular problems in the past?
- Understand the **realities** of potential results and study your **feeding options**. If your feed is poor quality or contains potentially dangerous toxins, how can you utilize it best? Do you have experience utilizing poor quality feed? Do you understand the risks of using potential problem feeds?

The Beef Cattle Research Council, a division of the Canadian Cattlemen's Association, sponsors research and technology development and adoption, in support of the Canadian beef industry's vision to be recognized as the preferred supplier of healthy, high quality beef, cattle and genetics.

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RESEARCH AND TECHNOLOGY DEVELOPMENT FOR THE CANADIAN BEEF INDUSTRY