Unlock the secrets of your nutrient analysis

DAIRY and beef markets have been exceptionally high recently. As a result, your dairy has an extra incentive to improve animal health and performance. Your return on investment can be substantial. Animal nutrition is a core, yet complex, element of your herd's performance. Many nutrition aspects can be discussed, but understanding forage and commodity feed nutritive values are the backbone to your nutrition program.

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Similar to the nutrition facts' label on your favorite cereal, each forage and feed in your total mixed ration (TMR) has a nutritive breakdown. Yet, the two differ because, while nutrient availability is relatively constant for humans, it varies greatly within dairy cattle. Feed nutrient availability is difficult to forecast because of complex dairy cattle rumen metabolism.

The protein and energy supplied to cattle are a result of combining both feed nutrient amount and nutrient digestion. Total digestible nutrients (nutrient x digestibility) actually fuel production. Many great researchers have forged a fantastic path for us to continue learning about digestion.

Complex computer models are evolving with sophisticated rumen models to optimize diets, but greater model complexity has also led to more confusing feed analyses. Nutritive reports list many measures, and I often field these questions: Which results should I focus on? What do all these numbers mean relative to herd performance?

What to look for

As a nutritionist, I incorporate all of the complex feed analysis to fully assess herd or pen nutrition status through computer ration models. Yet, when I practically assess feed quality, I focus on several core nutrients and digestion measures. While subjective, here is a breakdown of how I quickly assess feed nutritive results, in a prioritized order:

1. Neutral Detergent Fiber (NDF, % of DM)

I start here because fiber is an essential but limiting nutrient. Fiber is needed to maintain cow health, but NDF always supplies less energy per pound relative to other core nutrients.

Based on four years of data from the Northeast to the West, consider the averages and corresponding guidelines built on percentile ranks as seen in Table 1.

2. Starch or protein (% of DM)

After evaluating NDF content, evaluate starch (Table 2) or protein (Table 3), depending on the feed type. Focus on crude protein with legumes and grasses, including sorghum, sudan and small grain silages.

Note: In the next several years, we'll be focusing more on amino acids, which are the building blocks for crude protein.

3. Ash

Ash content in forages has linearly increased the past five years. While offering support in the field, I have found ash to negatively affect fermentation and forage quality in several cases.

• Ash directly detracts from total digestible nutrients (TDN) and energy value.

• Ash can bring in soil-borne anti-nutritive factors (yeast, mold and *Clostridium* spp).

In Table 4, general guidelines are shown to help you evaluate your ash level.

4. NDF and starch digestibility

After evaluating nutrient levels, consider carbohydrate digestibility. Regardless of the digestion measure used, compare your result to the lab average.

NDF and starch digestion are very important to animal performance but can be challenging to interpret because feed analysis laboratories use various techniques to predict cow level digestion. Laboratory digestion results may not be accurate and rarely are validated against real dairy cattle in vivo digestion.

For sound (accurate) benchmarks to compare against, I recently summarized several meta-analyses that reported in vivo (through the animal) digestion. After summarizing the published work, I found starch and NDF digestion through lactating cows as follows:

Nutrient	Digestion site	Digestion, %	+/-
NDF	Rumen	42.0	24.0
NDF	Total tract	48.5	22.0
Starch	Rumen	59.3	31.0
Starch	Total tract	92.4	6.5

Based on this, we have a substantial amount to learn. While 30 and 48 hours in vitro rumen NDF digestibilities (NDFD) were good advancements, our industry will continue to move toward more accurate tools.

Striving for enhanced accuracy, David Combs, University of Wisconsin-Madison, recently developed an NDF digestibility tool named Total Tract NDFD (TTNDFD), which has recently been validated against total tract dairy cow digestion (Table 5).

5. Moisture and fermentation

Limin Kung, University of Delaware, and Randy Shaver, UW-Madison, and others have given us sound guidelines to evaluate moisture and fermentation results. Work

with your consulting team to better understand how these results relate to your feed preservation efficiency, stability and quality.

6. Anti-nutritive measures

The aim in evaluating these microbes and compounds is to find as few as possible. Again, work with your consulting team to best understand these:

• Yeast and mold
• Mycotoxins
• *Clostridium* spp

Complex reports can be broken down into a shorter list of core measures to more quickly assess forage potential. Of course, the entire report has useful information under different scenarios. As mentioned previously, work with your consulting team to include other measures.

As a final example of how to quickly assess forage potential, I'll share this recent summary for 2014 hay and haylage quality (Table 6). Based on just a short list of core nutrients and digestibility, you be the judge, and speculate what impact these recent forages may have on performance this coming year. 🐄

Table 1. Fiber is an essential, but limiting, nutrient

Feed (silages or hay)	Average	Aim (85th %)	Poor (15th %)
Legume and mixed forage	44.3	38.5	50.2
Grass	59.2	52.0	66.2
Corn silage	44.6	38.8	49.6
Sorghum or sudangrass	58.5	51.2	64.5
Small grain	57.3	49.0	65.4

Table 2. Focus on starch in corn silage and headed-out grasses

Feed	Average	Aim (85th %)	Poor (15th %)
Grass	8.4	17.8	1.5
Corn silage	30.3	37.9	22.9
Sorghum or sudangrass	6.7	13.7	0.8
Small grain	9.0	17.0	1.3

Table 3. Evaluate crude protein for legumes and grasses

Feed	Average	Aim (85th %)	Poor (15th %)
Legume and mixed forage	20.0	22.8	17.1
Grass	12.6	16.3	9.1
Sorghum or sudangrass	11.2	14.9	7.8
Small grain	12.0	16.5	7.6

Table 4. High ash levels may dampen forage quality

Feed	Average	Aim (85th %)	Poor (15th %)
Legume and mixed forage	10.0	8.3	11.6
Grass	9.1	7.0	11.2
Corn silage	4.2	3.4	4.9
Sorghum or sudangrass	10.5	7.2	13.8
Small grain	10.1	7.3	13.0

Table 5. Digestibility makes a difference

Feed	Average	Aim (85th %)	Poor (15th %)
Legume and mixed forage	42.2	49.9	34.6
Grass	44.0	51.7	35.4
Corn silage	43.4	49.3	37.5
Sorghum or sudangrass	47.4	53.8	40.5
Small grain	47.5	56.2	37.9

Table 6. Hay crop digestibility may be lower than normal this year

Hay and haylage	2011	2012	2013	2014
CP	19.37	18.61	20.32	21.16
NDF	45.07	43.30	47.00	41.24
Ash	9.19	9.61	9.98	10.05
TTNDFD	42.09	48.40	42.50	37.61