Dairy One News from Dairy One - Where Information Creates Opportunity.

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Forage Laboratory

This issue will be devoted to some of the most frequently asked questions of us at the lab.

1. How is the energy content of my grain mix determined? Sometimes when I have added fat to the grain, the energy value appears lower than I would anticipate.

The NEl of grain mixes is determined by the following equation:

NEl, Mcal/lb = (((81.41 - (0.6 x (ADF % x .80))) x .0245) - 0.12) x .454

This equation (as well as the rest of our energy prediction equations) is based on the generality that as ADF% increases, the digestibility or energy value decreases. This relationship, however, can be influenced by other factors. Compare the feeds in TABLE 1. to shelled corn and soybean meal.

TABLE 1.

Feed	DM ADF%	DM NEl Mcal/lb	DM Fat, %
Distillers Grains w/ Solubles	18.0	.93	10.3
Whole Cottonseed	44.5	1.04	23.1
Roasted Soybeans	11.0	.98	20.0
Beet Pulp	33.0	.77	0.6
Soyhulls	50.0	.80	2.1
Shelled Corn	2.8	.92	4.3
Soybean Meal, 44%	9.0	.87	1.5

The energy value of soyhulls and beet pulp are much greater than anticipated. This is because they both contain a large amount of highly digestible cellulose in the fibrous fraction. Roasted soybeans, whole cottonseeds and distillers grains contain large amounts of fat, resulting in high-energy values.

These factors wreak havoc with the energy prediction equation. Compare the two 18% protein grain mixes in TABLE 2.

Please call us at 607.257.1272, if you have any further questions.

TABLE 2.

Ingredient	Percent of Fininshed Feed	ADF, %DM Basis	NEl, Mcal/lb DM Basis	Fat, % DM Basis
Feed A				
Shelled Corn	34.5	2.8	.92	4.3
Soybean meal, 44%	19.0	9.0	.87	1.5
Oats	15.0	14.0	.79	5.4
Gluten Feed	10.0	11.5	.87	2.4
Distillers	10.0	18.0	.93	10.3
Molasses	7.5	—	.74	—
Minerals	4.0	—	—	—
FINISHED FEED	100	7.73	.83	3.8
PREDICTED NEl			.81	
Feed B				
Shelled Corn	37.5	2.8	.92	4.3
Soybean Meal, 44%	18.5	9.0	.87	1.5
Soyhulls	10.0	50.0	.80	2.1
Beet Pulp	7.5	33.0	.77	0.6
Whole Cottonseed	5.0	44.5	1.04	23.1
Roasted Soybeans	10.0	11.0	.98	20.0
Fat	2.5	—	2.11	100.0
Molasses	5.0	—	.74	—
Minerals	4.0	—	—	—
FINISHED FEED	100.0	13.52	.88	7.8
PREDICTED NEl			.78	

Notice that Feed B. with the higher fiber value has the highest energy value. This is the opposite of what would be expected. The inclusion of high fiber and high fat feeds with high energy values generate more energy than what would be anticipated based on the ADF content alone. Note the difference between the actual energy value and the predicted one.

Feed A. is more typical feed and the actual and predicted energy values are much closer.

Thus, energy values are determined from the ADF content of the feed. Factors such as fat content and a highly digestible fibrous fraction of the feed will influence the energy result. If the percentages of the ingredients in the finished feed are known, a hand calculated energy value will always be more precise than a predicted one.

2. What is the average bound protein found in distiller's grain?

We are often asked this question with regards to a particular brand of distillers grain, e.g., from a whiskey or ethanol distiller. Distiller's grains are all classified into one category when they reach the lab and we do not keep records on individual brands. Distiller's grains come in a broad spectrum of colors, ranging from golden yellow to black. The amount of heat damaged or bound protein also covers a broad range. The average for 59 samples analyzed by DHI last year was 7.5 percentage units with a standard deviation of 4.6. This means that 68% of the samples fall between 2.9 to 12.1 percentage units of bound protein. Generally, the darker the color of distillers, the greater the likelihood that heat damage has occurred. It is important to note at this point that our sample of distiller's grains may not be representative of the entire population. It could be that these samples were sent in for analysis because they were suspected of having a large amount of bound protein.

Because of the prevalence of distiller's grains in rations and its contribution to total protein intake, starting February 01, 1989, unavailable protein will automatically be analyzed for at no additional cost. This applies only to the (05) Commercial Concentrate and Commercial Concentrate Basic (11) analysis. This does not apply to the guarantee analysis (06) or the CP, DM (09) only.

3. Is it important to know if samples have been treated with any additives?

Absolutely. Additives are classified as nutritional, preservative, or as fermentation aids. These include area, ammonia, organic acids (acetic, proprionic, lactic, formic, etc.), bacterial innoculants, etc. Urea and ammonia are nutritional aids because they increase the crude protein value of the feed. These samples require special handling prior to analysis. They also cannot be analyzed by the NIR.

To avoid erroneous results and unnecessary delays in turnaround time, please be sure to list the additives on the additive line or in the comment section of the information sheet.

4. Should TMR's be classified according to production group?

Yes. TMR's are amongst the most difficult samples to collect, subsample and analyze. Factors responsible for this include differences in particle size, mixing time and sampling technique. Vast differences in particle size between forages, grains and minerals require adequate mixing time to ensure a uniform blend. Manufacturers instructions should be followed. Poorly blended TMR's result in poor subsamples.

At least a dozen grab samples should be collected from the feed bunk, mixer or from in front of the cows in a stanchion burn. Thoroughly combine these in a clean plastic bucket. Take a grab sample from the bucket for analysis.

Identifying samples according to production group helps us during the editing process. Due to the great variability in TMR's, they almost always appear on our edit list. The edit list identifies samples that do not fall within normal ranges. Labeling samples as high, low, dry, heifers, beef, etc. helps us to decide if the sample requires retesting. It may also save a day or two on turnaround time.

5. The sodium (Na) content of my water sample is higher than average. How concerned should I be with this?

The Penn State Dairy Reference Manual lists an average of 350 water samples as 21.8 ppm Na. We sometime see samples that contain from 100 to 300 ppm of Na. Sea water contains 1.04% Na (10452 ppm). What impact does water content have on the total daily Na intake? A typical ration for a 1300 lb. cow producing 50 lbs. of milk per day is outlined in TABLE 3.

TABLE 3.

Feed	lb. as fed	lbs. DM Basis	% Na*	Na grams
Corn Silage	35	12.25	.003	0.17
Hay	15	13.35	.010	0.61
Grain Mix	16	14.24	.521	33.65
Total		39.84		34.43
*DHIA averages				

The 1988 NRC publication for dairy cattle suggests a dairy intake of Na as 0.18% of the total dry matter. The requirement for this cow is 32.53 grams. This diet satisfies the daily allowance providing 34.43 grams or 0.19% of dry matter as Na.

The average dairy cow will consume 4 lbs. of water per lb. of milk production. This cow will consume roughly 200 lbs. of water (24 gallons) per day. An average level of 21.8 ppm Na in the water would contribute 2 grams of sodium to the total diet. At 250 ppm, an additional 23 grams of Na would be provided. Compare this to a daily top dressing of sodium bicarbonate that would contribute 31 grams of Na to the diet.

Examine TABLE 4. to see how this all adds up.

TABLE 4.

Dietary Component	Na, grams	Na, % of total DM intake
a) Forages*	0.78	
b) Grain Mix*	33.65	
c) Water, 21.8 ppm Na	2	
d) Water, 250 ppm Na	23	
e) Bicarb 4 oz.	31	
a + b + c	36.43	.20
a + b + d	57.43	.32
a + b + d + e	88.43	.49
Requirement	32.53	.18
* From Table 3.		

The NRC reports that high producing cows offered water with 2500 ppm salt (975 ppm Na) for 28 days showed no changes in feed intake or blood concentration of certain elements, but did drink more water and produced less milk. In another study, beef heifers were unaffected by 1.0% salt (3900 ppm Na) in the water but were adversely affected by 1.2% (4680 ppm). NRC recommends a maximum of 4% salt (1.56% Na) in the total dry matter for lactating cows and not more than 9% (3.51% Na) for non-lactating animals.

Thus, based on current knowledge, the 250 ppm level of Na in the water (even if fed along with 4 oz. of bicarb) should not present any major problems in lactating cows.

Interest is growing concerning the relationship of Na to other elements including potassium, sulfur and chloride. As more information becomes available, there may be recommendations concerning not only the total amount of Na intake, but also its amount in relation to these other elements.

6. Shouldn't you be able to tell me what's in my mineral mix without seeing the guarantee tag?

Yes, but we could use your help. When forages come into the lab, we have a fairly good idea where the results should fall based on forage type. If it falls outside normal ranges, the sample is retested. Mineral mixes (and grain mixes) vary considerably in their mineral composition. Any additional information that you can provide will help us during the editing process and avoid unnecessary delays.

There is also the instrumentation to consider. Minerals are analyzed on an Inductively Coupled Plasma Emission Spectrometer (ICP). The ICP has upper and lower detection limits for all elements. This means that it can only accurately detect between a given high and low value. Detection limits vary between elements. All mineral mixes are diluted before analysis to help avoid exceeding detection limits. If we have an idea of what the theoretical concentration (from the guarantee tag) of the mineral should be, we can determine beforehand if additional dilutions will be necessary. This helps to cut down turnaround time. Everyone benefits.

7. What is MOATLAGE?

Last fall we received a sample labeled moatlage. We had no idea what it was, except that it looked terrible, but smelled great. After some intense investigation (I felt like Mike Wallace), we finally discovered what it was. If you can guess what Moatlage is, we'll send you a free NIR analysis. Here are some clues:

- Color – black
- Texture – coarse, variable, basically non-descript
- Odor – citrus-like
- Fermented
- <u>May be</u> a mixture of two or more things
- Origin – California

If you have a guess, call Gaye, Nancy, or Evie in the Forage Lab Customer Support Area. Their decision about the awarding of prizes will be final. This offer will be good until February 17, 1989. The answer will appear in the next issue. Good Luck.