



by Steve Martin

Building solid forage testing protocols

I AM the only one in my family who is not a fan of sushi.

As I thumb through the normal menu of other Asian food choices, I note my family members looking through a long list of choices on a piece of paper. With tiny pencil in hand and expectant appetites, they discuss all the options and then put check marks up and down that long paper indicating their choices. When the food comes I have a somewhat enjoyable, but boring, traditional Asian dish, while the rest of my family is excited to receive their plate of various colorful sushi rolls.

If I were to take another go at becoming a sushi fan I think I would probably be overwhelmed by the paper menu and what looks like hundreds of choices and combinations. I would have no idea what to check with my little pencil.

I think this is the same feeling my clients have when they look at a forage analysis submission form. On it are what seems like hundreds of options, different types of analytical procedures, and various combinations. It is no wonder that we often get back results from the lab that either have nutrient analyses that don't fit the particular sample, or some of the key nutrients we need are not included.

We have attempted to help our clients with mocked-up submission forms to use as cheat sheets when submitting samples. This has helped, but the better way is to educate them on some basics about what the different options are and what analysis fits best. We don't want to forget the cost factor involved either. Some of the analyses are rather expensive, and we sure don't want to spend money on something we don't need.

Maybe we should start with this question: What is the basic goal in sending samples to the lab for analysis? The answer is simple – we need good information to formulate good rations. There are book values for most nutrients on nearly every ingredient we feed, but we know that variations in growing conditions and processing can bring different nutrient values to the bunk.

Each dairy's needs differ

Each dairy needs to develop an ingredient sampling protocol that meets the specific needs of its situation. The type and timing of sampling depends on several factors, so there is not a one-size-fits-all recommendation. A place for a dairy to start might be to look at the feed ingredients in four different groups. These are forages, by-products, primary grains and supplements.

Forages and by-products might be sampled and tested once or twice per month. Many dairies send in high feed rate corn silages weekly. This is helpful due to the significant portion



of the ration provided by this one ingredient. Other forages may be in big lots and can be sampled at delivery or post-harvest. If hay is being purchased from various farms and cuttings and the hay makes up a big portion of the diet, weekly samplings might be advisable.

When it comes to by-products like dried distillers grains, corn gluten, brewers and the like, they can vary based upon differing manufacturing plants. Monthly analysis on these might be advisable. Primary ingredients like corn grain and soybean meal are some of the least variable ingredients and have strict trading rules. With the exception of monitoring starch rate on various corn processing techniques, frequent sampling of these is not necessary.

The ingredients needing least frequent analysis are manufactured feeds and minerals. They are almost always manufactured under very tight quality control guidelines and protocols. What happens at nearly every feed mill is significantly better than the mixing that occurs at your farm and is tightly regulated by state feed control officials. Their scales are better, the mixers are better, and the tolerances are tighter.

However, if there is ever a question, samples can be taken or the feed company is often more than happy to send in retained samples for you.

Now for a little help with the submission form. This will not be complete because each lab has different options and every form is unique. I would encourage you to sit down with your nutritionist and your lab's form to review the process. In addition, most forage labs have nice instructions on their websites that can help make sure the submission form is completed correctly.

It is very frustrating to go through all of the trouble to gather numerous samples at the farm, package them up, drive to the local mailing store, and wait a few days – and then after all of that not get the analytical results you hoped for.

I know it must be frustrating for the employees at the lab to receive poorly marked and/or incomplete submission forms. With the volume

of samples some labs get, it is surely difficult for them to personally follow up on each ambiguous form.

I have to admit that I am preaching to myself here, too. I once dropped off a sample after hours in a used potato chip bag with my phone number on it. This is not the goal.

So how can we help this process? First, we should discuss the difference between traditional wet chemistry methods and NIR (Near Infrared Spectroscopy) options.

Most of the nutrients that are important in describing the content of a feed ingredient have basic lab procedures that are accepted by various academic groups. These are traditional lab techniques that would look a lot to you like high school or college chemistry labs, complete with reagents, beakers, flasks, heating plates and the like. Many of these have been significantly modernized and streamlined, but the basic chemistry is the same.

Wet chemistry versus NIR

Wet chemistry methods are usually more expensive and take more time. A few can actually take up to a week or more if they are timed digestibility procedures. Some of the common timed digestibility analyses take 24, 30 or even as much as 240 hours. If done as wet chemistry it takes at least that long. In view of that, it is no wonder NIR techniques dominate this field.

NIR is a term that most dairy producers are familiar with. To many it's just another acronym. But it is helpful to understand a little about it and how it can help move the process along and actually feed cows better.

NIR measures the way a particular material reflects light, and then compares the results to a database of known nutrient composition. Similar light reflectance techniques are used in many areas of science and produce dependable results.

The benefit is that with one subsample and insertion into the machine, the lab can generate as many nutrient results as that database is set up for. This is obviously a huge time saver, negates the need for harsh chemicals, and can save money.

But NIR results are only as good as the database that is used to provide results. If you are looking for the nutrient content of corn silage, alfalfa hay, corn grain and other common and high volume ingredients, the NIR results are useful, quick and can save money. However, if it is a less common ingredient it is unlikely that the database will be good enough to generate dependable results.

Odd feeds? Use wet chem

I had a client recently wanting to analyze Aspen bark as a potential cheap roughage source for heifer diets. Obviously, wet chemistry was the only choice since there is no such database in any NIR package. Cotton burrs may also fit into the category that requires wet chemistry. If you have an unusual straw or stalk residue that you want to know the feed value of, NIR is not the choice. You will have to run wet chemistry to be confident in the numbers.

As you go back to your dairy's ingredient analysis protocol, in addition to deciding how often each ingredient needs to be checked, you also have to decide if NIR or wet chemistry fits best the goals of the analysis. Using the details above, this is usually a pretty easy decision.

Another factor that perhaps incorrectly chooses wet chemistry over NIR is the "importance" of the results. If samples are taken in routine fashion, NIR seems to feel good. But if you are managing through a crisis it seems that wet chemistry gets the nod. This may be warranted, but I might add that studies have shown that more frequent sampling with NIR compared to less frequent sampling with wet chemistry resulted in more days of correctly formulated rations. So instead of doing one sample for wet chemistry to solve a crisis, three samples over three days for NIR may be better and quicker.

This subject is too big for just one month's column, so we will hold the rest for next time. There needs to be a discussion about what nutrients are most important for what types of ingredients. We need to avoid marking a form for alfalfa hay the same way as we might mark for corn silage or distillers. Some nutrients are more descriptive of overall quality and usability in one ingredient than they are in another. In next month's column I will review the various nutrients and what to pick for hays, silages, by-products, etc.

In the meantime, how good is the sampling protocol at your dairy now? Do you struggle with how to fill out the form? After being reminded of the importance of this process and more information on NIR versus wet chemistry, perhaps your protocols need to be freshened up. After next month's information on what nutrients match what products, this part of the dairy should be in good shape, and in doing so you can be sure you are correctly formulating and truly feeding for the bottom line. **WEST**

The author is the founder of Dairy Nutrition and Management Consulting LLC, which works with dairies and heifer growers in Texas, New Mexico, Kansas, Colorado, Washington and California.