



by Steve Martin

Finding the sweet spot

I HAVE lived in four different land-grant college towns in my life, and have always felt at home in the atmosphere that surrounds them. In addition to the culture of college sports, land-grant institutions also have an abundance of ag folks and a vet school. These type of people make for good neighbors.

Not only do you have an agricultural faculty, students, university farm employees and the like in most land-grant college towns, you also have a bunch of engineers. They are the reason for the M in A&M. Well, “mechanical” to be precise, but I suppose engineering is the more modern word. With these folks I like to discuss the different worlds of the engineer and the agriculturalist.

This difference is best described when attempting to explain the various uncertainties that exist in nature, and thus in agriculture.

Unlike physics and engineering where 45 degrees plus 45 degrees always equals 90 degrees, and where one pound plus one pound always equals two pounds, agriculture scientists work in a world where things are a little less certain.

To be sure, there are laws that exist and govern the biological realities that we try to predict, but it’s safe to say we are a long way from really understanding it all.

Is it all just random?

I made a comment to a client recently that I am not sure was very well received. When reviewing rations and then studying records that would partially judge the success of those rations, I made the following comment: “At times I feel like if at the end of my life someone said to me, “all of the work you did on rations really had no substantive impact on the cows. It was all just random. All the work you did was just to manage inventories and keep you busy.”

A shocking thought. But really, don’t we all wish we knew the variables and unexpected changes that are having a big influence on the success of our diet formulations.

I often describe the way we manipulate cows nutritionally would look like a cow with an abundance of knobs under her hide. As a nutritionist, we slip our hands inside to tweak and adjust some of the knobs with great accuracy; often just one click at a time. We spend a tremendous amount of time keeping maybe 20 or so knobs in perfect balance.

But since we really can’t see under her hide, there are numerous other knobs that we don’t even know ex-

ist, much less how to adjust them for maximum performance. This should be humbling even to the most confident among us.

This is all a bit hyperbolic and I don’t want to disregard the volume of dairy nutrition research that has been done over the last 100 years or so. The significant gains in production per cow that have greatly reduced the number that are needed to supply milk are a testament to this.

Even so, I still can’t put a 79 net



energy of lactation (NEL) ration in front of my client and promise that it will gain them the two extra pounds of milk needed to cover the cost and offer a decent return on investment compared to the 77 NEL diet that is in the bunk today.

It’s just not that simple.

That’s the bad news, but as always there is an upside. The good news is the cow’s biological momentum is to make milk – exactly what we want her to do. What we have to do as nutritionists is to come alongside and support this effort. We don’t need to know every detail, but we must work hard to, above all, do no harm.

Since we are not blessed with the exact math and laws of physics enjoyed by our engineering friends, we are in constant search for what you might call the sweet spot.

It is often said that feeding cows is both an art and a science. The science side leans on and is governed by the nutritional principles, and is applied to the cow through the series of knobs I mentioned earlier. The art side is what experience has taught us about the situation with the other knobs that we don’t know exactly how to dial or even know what or where they are.

In dairy nutrition, and in ruminant nutrition in general, the sweet spot usually has to do with fine tuning the

fermentation process that is ongoing in the rumen. The great thing about looking for this in a dairy cow is that she can give us feedback as quickly as tomorrow.

Rules perpetually change

In a modern dairy where we measure nearly everything every day, we can really learn about the little tweaks we make in search of the perfect diet. But unlike the unchanging realities, laws and principles that

pounds of intake of a 79 NEL diet and 80 pounds of energy-corrected milk in a pen of early to mid-lactation cows. This isn’t a bad situation, but you have the feeling the cows could give a little more from such a high energy ration.

Upon further inspection after spending some time in the cows, you decide the manure is okay, but it is a little looser than ideal. And when you go the extra mile and do a manure screen and shaker box, you find an abundance of undigested corn and whole cottonseed on the screen and the shaker box is a little lacking in the top two shelves.

Your gut tells you to add a little straw or maybe some medium quality hay instead of the candy alfalfa now in the diet. But what will that do to your impressive 79 NEL?

Along with the help of the nutritionist, you decide to slow down the cows a little. In general, the team suggests adding one pound of straw and replacing three pounds of the candy alfalfa with three pounds of medium quality alfalfa that has a little stem to it. After putting these ideas into the computer model you find that NEL has dropped from 79 to 77.5.

Hmm, is this okay?

The decision is made to make the change and let the cows give their opinion. A week later the result is slightly lower intake, two pounds more milk, and nicer, more consistent manure. But how can this be with a lower NEL? Wasn’t there a reduction in energy intake?

Yes, if you measure it simply from a gross energy standpoint. But the cows told you the truth about the net energy that is available for them to make milk.

In short, the addition of straw and “cooling down” the alfalfa made the rumen a happier place. The positive associative effect of the roughage change improved the rumen environment and allowed for more complete fermentation of all the other ingredients in the ration. The next time you do a manure screening you should not be surprised to see less undigested corn and whole cottonseed.

As we look for the sweet spot when building dairy diets, much of the wisdom comes from previous experience that could be describes as art not science. But when looking a little deeper, maybe there is more science in that art than you first thought.

Understanding how different combinations of ration ingredients impact each other is not as much art as it is leaning on the science of positive associative effects. Respecting both the science and art of building rations will insure that you are truly feeding for the bottom line. **WEST**

guide the engineering world, the rules in feeding dairy cows are in a state of perpetual change.

You may have finally found the sweet spot and what you think is the perfect ration, just in time for a silage pit change, or all of your hard work is being overwhelmed by the onset of heat stress.

There is a sound nutritional principle that may be the inter working of the coveted sweet spot. It is called associative effects.

As we build diets in a dynamic environment, we always keep in mind what impact one ingredient has on the value of another ingredient. These relationships between ingredients are mostly related to how they work together to maximize rumen fermentation and kinetics.

Most dairy producers understand the fermentation part. The kinetics part is a bit more elusive. In short, rumen kinetics describe the amount of time feed ingredients stay in the rumen and how they move around before being fully fermented and washed out. The best example of these positive associative effects have to do with roughage in a high producing milk cow ration.

Could they give a bit more?

Let’s say you have a reasonably successful ration situation with 55

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