"What is my ration balanced for?"

by Steve Martin

I OCCASIONALLY get a question from a client about what level of milk production their ration is balanced for. It is a reasonable one.

Dairy producers should be concerned about how the level of milk support in the bunk meets both their current reality and their future goals. Even so, it is a very difficult question to answer correctly.

In my first few months as a dairy nutritionist, I pulled into an old dairy outside Stephenville, Texas. This was in the early 1990s and that part of the state was in a transition from low-input, traditional dairies to newer, more modern dairies that were adopting various new technologies to support higher levels of milk. This dairy was in the older style group.

After finding that the owner was receptive to my search for dairy cows to feed, I began the interview process. After a short conversation I learned he was getting 45 pounds of milk per cow. Looking back now, it's amazing the things I didn't even know to ask to learn more about the factors contributing to such low milk flow.

Rations were much more simple in those days. I recall him reciting from memory how many pounds of ground corn, protein mix, and grass hay he was feeding. He had a grind-and-mix setup and he fed free choice grass hay. He was sure, though, of the pounds of each.

So with information in hand I went home and put his diet into my ration program in hopes of finding some opportunities that might make him more milk and gain me a customer. After entering the diet, though, I was perplexed. The program suggested his milk production should be around 65 pounds per cow.

An early embarrassment

This next part is a bit embarrassing and I am sure that young dairy nutrition professionals today would not make this mistake. Using my ration program I built a diet that I was sure would support 45 pounds of milk flow. Some 27 years later, I still remember handing him a printout that showed a diet with around 35 pounds of intake that easily had enough energy and protein to do it.

I also remember him telling me I had a lot to learn. "I can't feed my cows only 35 pounds of feed! They will starve to death." He was right, and it's no surprise that I did not pick up a new customer that day. Instead I learned a lesson.

To be technically correct, I handed him a ration that supported the milk he was producing. But many variables of information input in my ration program must have been incorrect. This is an example of how the lower-end of milk production is difficult to model. But the same problem is found when trying to identify milk support for a ration fed to cows with high levels of production.

What are those variables and why are they so important in describing target milk support? When beginning to build a ration you must tell the computer many pieces of information. Working hard to enter this information accurately can help answer the question.

The first one is what breed of cows are we feeding? Closely behind, and of more importance, is how much do the cows weigh and for what level of intake is the ration built?

I have written at length about how our industry needs to know more about how much our cows weigh. It is crucial in modeling. The problem, though, doesn't end there. We also need to know about animal weight gain or loss. In that Texas producer's situation – 50 pounds of intake and 45 pounds of milk production – his cows were most certainly gaining weight. In that situation I didn't know to ask and he would have had no idea how to answer.

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If we have the animal breed, approximate body weight, and some reasonable estimate of weight change, we have made real progress in answering the question about milk support. So, what is left?

In the past (and in some ways in the present), we talk way too much about milk flow and not near enough about pounds of butter and pounds of protein. In my Texas producer's case, he may have had a 4.0 percent butterfat and a 3.5 percent milk protein with that type of flow. And I bet I entered just 3.5 and 3.0 percent in my computer that day.

Having correct component values is very important. His energy corrected milk was probably way over 50 pounds and if there was some weight gain occurring then perhaps a 50-pound intake might truly support 45 pounds of 4.0/3.5 milk. Reproductive success, seasonal breeding, and the average stage of lactation (days in milk) must also be considered.

With the information we have today to describe body weight and weight change, as well as milk component information, we are getting much closer to being able to nail down a milk support level. Using this information we might say that a ration supports 75 pounds of milk on heifers and 95 pounds of milk on more mature cows, assuming the weight change and components are similar between the two groups.

When herds are fed multiple rations, say a high and a low, or an early or late lactation, or maybe lactation one versus older cows, the ability to identify a milk support level is much better. The problem with attempting to describe a one-group TMR is that the average of various animal types across the dairy can represent a very wide swath of situations.

When considering how one ration matches an entire milking herd, you have a range of cattle that may vary by 300 pounds of body weight and 10 pounds of daily intake. At the same time, early lactation cows may be losing weight at an alarming rate, while long days in milk cows are gaining like feedlot steers.

Once you have accounted for the basics like body weight, actual intake, and components you have accounted for the majority of variation in how much milk is supported by a particular ration formulation. But even more details are needed to really nail down a better answer to our original question.

The first of these finer details relates to differing digestibility of the same diet fed at high versus low intakes. As intakes increase so do rates of passage. If a diet moves through the digestive track at a higher rate, the ability for the cow to absorb usable nutrients goes down.

This variability of intake represents a significant opportunity for changes in milk support. Much of this principle is loosely described by the way dairy nutritionists and dairy owners spend a lot of time discussing the loose versus tight status of manure. We all think we know what the perfect manure status is. What we are certain of is that if the rate of passage is too high then milk support will be reduced.

More is not always better

There are a couple of principles that primarily drive the variability in intake and thus milk support. The first of these relate to various animal husbandry techniques like bunk management, pen density, feeding frequency, etc. As dairy people, we tend to think that more intake is always better. This is usually the case, but there is a sweet spot above which the rate of milk support in relation to intake does go down. More is not always better.

The second principle relates to chop length, mixer-box knives, revolutions per minute, mixing time, and the shaker box.

We use physically effective neutral detergent fiber (peNDF) to describe the result of all of this. We know that rations which are "too short" move through cows too fast and produce loose manure, which results in decreased milk support levels.

The same ration that is mixed to perfection that shakes out nicely, looks great in the bunk, and results in nice, healthy manure piles supports more milk than when chopping and mixing are overly aggressive and particle length is very short.

The last point to be made is that not all situations have the same maintenance requirement. The first 30 pounds or so of a Holstein's diet probably supports the maintenance needs of the cow. But if that number is actually only 27 pounds, the ration will support more milk.

Likewise, if the true maintenance support needs are 33 pounds of intake, milk support may drop sharply. In this example, the six pounds of maintenance support difference between these two levels could move the support of the same diet by as much as 15 pounds of milk.

Best guesses can help

Many things impact a cow's maintenance requirement. Chief among them are weather, pen conditions, laying time and walking distance. Being sure that you tell the model your best guess about these variables; it will help fine-tune the target milk support.

The result of the complexities of this question is that since we usually feed lactating dairy cows to their intake desires, the physical form and nutrient density of the diet usually describe how the ration matches milk support realities or goals. In this approach, formulators have a feel for what energy density and metabolizable protein flow is needed for various diets.

As an example, I know that high lactation diets need to be in the upper 70s for net energy of lactation (NEL) and metabolizable protein (MP) should be in the low 50s. For later lactation cows with reduced nutrient needs, these goals might drop to 75 and 48. (These are concentration values, not actual amounts.)

Among my current clients' milk production results, the dairy with the most milk does not have the highest NEL. But its intake is higher, thus the cows are well served with nutrients to support the impressive milk. We don't get overly hung-up on the absolute values of these nutrients, but what is important is directional changes in nutrient flow to achieve goals for production and breeding. And as ration changes are inevitable, we must be sure to not reduce nutrient flow as ingredients change.

These multiple moving parts are the reason you will never see a "milk support" value printed on any of my ration reports, because it depends on way too many things. I work with my clients to look at NEL and MP values to maintain a high nutrient supply, while giving the needed respect to forage/fiber minimums to support good cow health. In TMR-fed systems, it's more about nutrient density and particle length of the diet. Being sure that these match the animals being fed will insure that we are truly feeding for the bottom line. *WEST*

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