Are you getting the most out of your ration?

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Evaluate ration consistency to ensure you’re delivering every animal the same ration in each bite of every feeding.

Just like a business that’s only as good as the people and business plan behind it, the same goes for feed formulations and a person’s ability to deliver it to the bunk. Any inconsistencies between what’s on paper and the actual formulation can set cattle up for nutritional issues or lead to your disappointment when performance suffers. Either outcome has its own economic consequences. Mixing efficacy, or lack thereof, can have just as much impact on the outcome of the ration as the formulation.

How consistent is your ration?

Ultimately, the main goal of mixing a ration is to blend ingredients in a way that delivers the same amount of ingredients and nutrients to every animal in each bite of every feeding. Evaluating variation in nutrient or ingredient levels is one of the most cost-effective and reliable means of monitoring ration consistency. This practice uses a measurement of coefficient of variation (CV), both within and across batches to quantify consistency.

To use CV to evaluate ration consistency, begin by collecting three to five samples from the bunk, spaced evenly from the beginning through the end of distribution. These samples should be collected as soon as possible (within minutes) of delivery to the bunk, and sample collection should be replicated across three to five separate batches or feedings.

If possible, have someone follow the mixer through feedout. Avoid collecting samples after cattle have had a substantial period of time to eat, as the results obtained from these samples will mislead you to believe there is an issue with mixing efficacy when there may not be.

Once the samples have been collected, they should be submitted to a laboratory for analysis. Certain analytical laboratories, feed companies and consulting groups offer ration consistency or mixer efficacy analysis as a service. If these specific services are unavailable, crude protein and one of the fiber fractions (neutral detergent fiber or acid detergent fiber) can serve as your “marker.”

Another marker often used is an ionophore, such as Rumensin or Bovatec, or a micronutrient such as a specific vitamin or trace mineral with a known target concentration. After receiving analysis results that contain the concentration of your markers, a number of online calculators and spreadsheets are available that can be used to determine CV of the mix. In a nutshell, CV represents the standard deviation from the mean value, expressed as a percentage.

A low CV represents low variation across samples, while a high CV represents high variation. As a general rule of thumb, a CV of less than 5 percent should be the target when using macronutrients such as protein and fiber fractions, while a CV of less than 5 to 10 percent should be the target for the concentration of a drug or micronutrient due to much lower levels of inclusion in the ration.

Each bite – every animal

As the saying goes, “If it ain’t broke, don’t fix it.” But if there is an issue with ration uniformity, the issue can almost always be addressed by troubleshooting any combination of three areas: level of ingredient addition, order of ingredient addition and mixing times.

A high CV within a batch (single feed delivery) is an indicator of an issue with mixing efficacy, whether it’s undermixing or overmixing. The most common driver of this problem is addition of ingredients to the mixer in a sequence that does not allow them to blend sufficiently.

Often, we base order of addition on convenience rather than the kinetics of blending. If the goal is to create a uniform ration, ingredients should be included in the order and blended for the amount of time necessary to disperse them throughout the entire mixture, without causing them to re-segregate or “settle out.” This is a fairly complex topic dependent upon a combination of many factors. But for now, consider the physical characteristics and inclusion level of each ingredient and how that may contribute to ease or difficulty of dispersion throughout the ration.

One of the most common areas of concern is the dispersion of micro-ingredients, such as drugs or other additives. If lack of dispersion of these ingredients is leading to a high level of variation, first...
consider the level of inclusion. It is nearly impossible for most mixers to disperse a very small amount of these ingredients throughout a batch without a micro-machine. If this is the issue, and a micro-machine isn’t an option, premixing is likely the solution.

As a general rule of thumb, all micro-ingredients (those included at a level of a few percent or less of the total ration) should first be mixed as an initial premix and then blended with a carrier such as finely ground corn or dried distillers grains to produce a final premix. Ideally, this premix should be formulated for inclusion at a level of approximately 5 percent of the final ration in order to increase the likelihood of consistent and complete dispersion. Keep in mind, the premix needs to be added to the ration in a sequence that will allow for its dispersion into the existing contents, then further dispersion through the addition of the remaining ingredients.

Each bite – every animal, at each feeding

A high CV across batches (multiple feed deliveries) is an indicator of inconsistencies in ingredient inclusion, mixing order or mixing duration each time the ration is mixed. The first of these could be caused by an issue with accuracy or precision. Think of accuracy as your ability to hit a target at the exact location you’re trying to hit and precision as your ability to do it over and over again.

If a high CV across batches is the issue, first ensure your scales are measuring accurately and consistently. If they are, then ensure the correct amount of each ingredient is being added and the ration does not call for an amount more precise than you can measure or effectively add to the mixer. Rations should be formulated only to that degree of precision. If they’re formulated to a degree of precision greater than that, you’re essentially trying to hit that target while blindfolded. You may hit it every once in a while, but the majority of the time, you won’t. To address the latter two, ensure the ration is mixed in the same order and the duration of mixing is consistent for each and every batch.

As simple as it may seem, small inconsistencies in any of these can have a substantial effect on uniformity. And keep in mind, a high within-batch CV can lead to a high across-batch CV. Before troubleshooting high across-batch CVs, make sure within-batch CV is not the major underlying issue.

At the end of the day, mixing ingredients to provide cattle with a consistent and uniform ration is a combination of art and science. These are just the initial steps that can be taken and common concerns that can be addressed to help ensure ration uniformity. But at the end of that same day, the steps you take to ensure ration uniformity have to work into your operation. And when in doubt, your nutritionist or extension personnel are great resources for tips on ensuring you deliver the desired ration to every animal through each bite of every feeding.

Mixing a uniform ration is a combination of both art and science.