# Assessing the true cost of TMR variability

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**AT A GLANCE**

Changes in TMR nutrient content can be attributed to a variety of sources including feeder and mixing errors, feed sorting, nutrient and DM changes in ingredients.

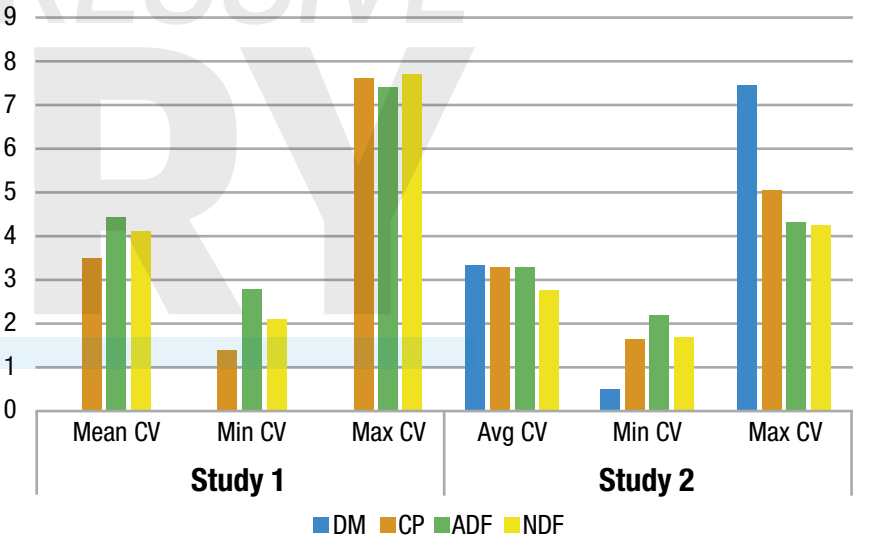
Total mixed ration (TMR) variability: We know it exists, but evaluating the true extent and impact of this phenomenon can be a daunting task. Cows love consistency, so when looking at inherent TMR variability, we may often wonder about the impact on animal performance. Research has shed some light on this topic – and although there are many conflicting results, some studies have shown minimal performance impact in response to transient nutrient changes. Others have highlighted that herds with more consistent rations also exhibit higher milk production. Regardless of production, rising feed costs and lower milk price have decreased the income over feed cost (IOFC) statistic, highlighting the economic impact of these changes.

## So how much variability is there?

Looking at two different studies that analyzed the day-to-day variation over seven days on commercial farms, results showed the coefficient of variation (CV) for nutrients such as crude protein (CP) ranging from just over 1% to well over 7%. CV is a metric used to quantify variance, where a lower CV indicates a lower level of variation. **Figure 1** summarizes the TMR variance for several major nutrients in these two studies.

Another study evaluated the accuracy of TMR mixing by comparing lab analysis of TMR mixed on-farm to the formulated ration on five commercial dairies. They found tested rations were 4.6% lower in dry matter (DM), 1% higher in CP and 2.5% higher in neutral detergent fiber (NDF) than what was formulated. This highlights how different mixed TMRs can be compared to their intended formulation.

**FIGURE 1** CV in nutrient content of TMR on commercial dairies



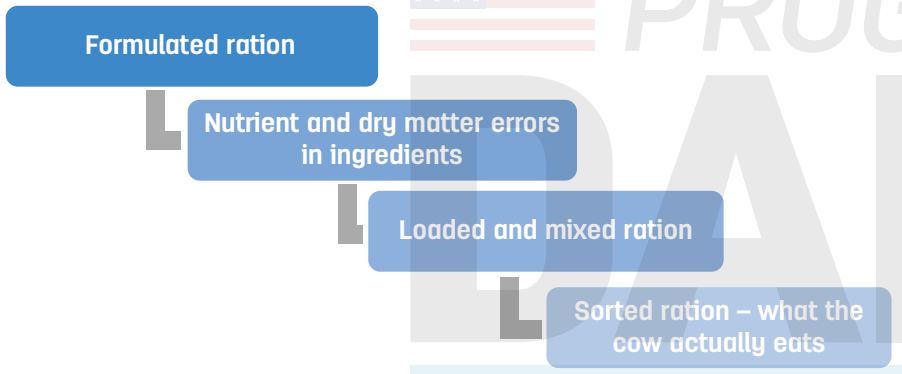

## Where does variation come from?

These transient changes in TMR nutrient content can be attributed to a variety of sources including, but not limited to, feeder and mixing errors, feed sorting, nutrient and DM changes in ingredients. With so many areas for variation to be introduced, tackling these discrepancies can feel overwhelming. However, taking them step by step can help managers understand the nature of this variance and implement changes to increase overall ration consistency (**Figure 2**).

## Nutrient and DM errors

The feeds we add in to the ration are also subject to nutrient variability, and this variability can impact the outcome of the final mixed ration. Higher-inclusion feeds usually have a larger impact on variability, as even small changes in

**FIGURE 2** Steps to help managers implement changes to increase overall ration consistency




these feeds can largely impact the ration. Environmental events such as significant rainfall, harvest timing in silage fields, processing or natural inconsistency can affect nutrient variability in feeds. Feed analysis shows evidence that a rainfall event can impact silage DM for up to a week following the end of rainfall – impacting the entire ration nutrient content and cost. Natural variation in DM of ingredients, both forages and commodities, can also be quite large and should be accounted for when making ration decisions. This variation goes beyond DM to core nutrients such as CP, starch and NDF. Knowing and understanding this variability can help the decision-making team to establish a sampling protocol for individual feed ingredients and better account for the impact of variability in the total ration. For instance, things like canola meal and dry distillers may be more consistent in DM content and may require less frequent DM analysis than wet distillers or corn grain (**Figure 3**, page 74).

## Mixing and loading errors

Mixing and loading errors are also a culprit for variability between formulated and fed ration. One study found that among five commercial dairies, the largest errors in ingredient loading were seen in alfalfa hay, corn silage and canola. Difference between actual and target amount varied from 2.1% to 12.9% on alfalfa hay, 2.2% to 5% on corn silage and 2.3% to 7.3% on canola. This study noted that rolled corn and almond hulls tended to see less variability. Feed management software is an excellent tool to track loading variability for individual ingredients and set goals to help decrease these errors. Goals should be routinely evaluated and communicated with feed mixers to help ensure success.

Ensuring loaded feed is mixed properly is also a critical component of ensuring a consistent TMR. Not only can an improperly mixed TMR impact nutrient distribution and consistency, but it can also have an impact on particle size and sortability of the ration. A highly sortable ration can lead to inconsistencies in nutrient intake between cows, as

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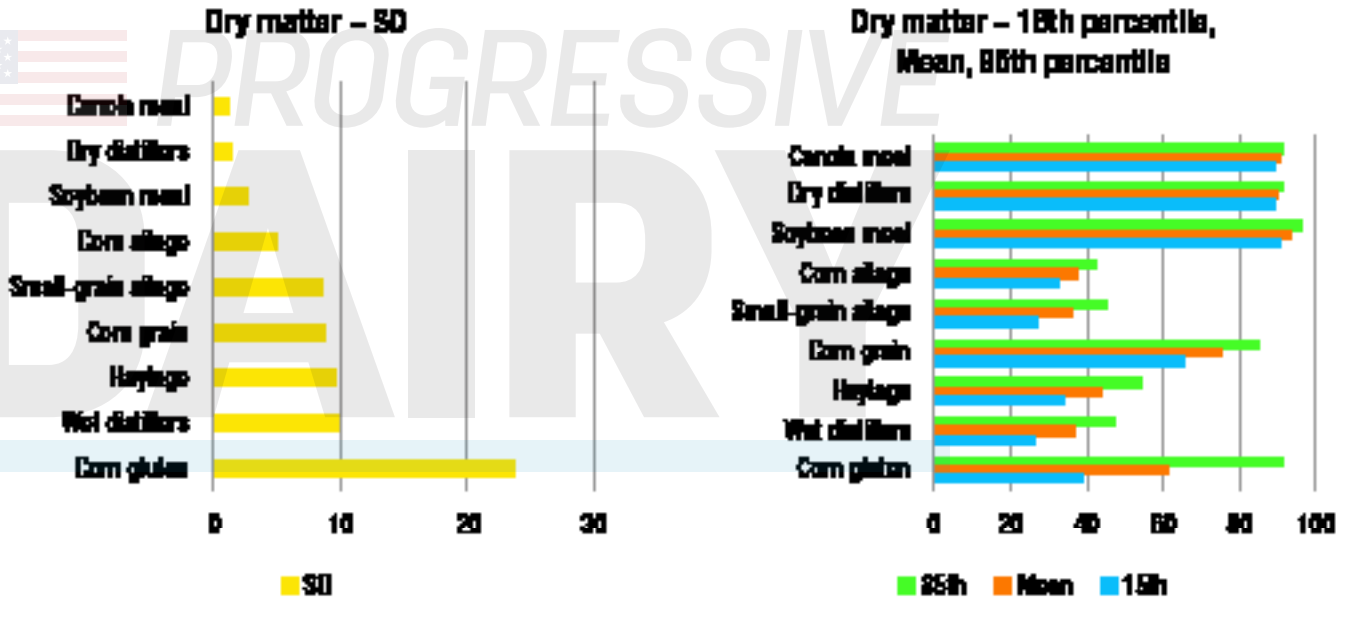
each cow may sort and eat differently. This results in each cow essentially eating a different ration than the next. Sorting can also increase risk for other health factors, such as subacute rumen acidosis, which can have impacts on animal performance. Ensuring proper loading order, loading position, mixing time, power take-off (PTO) speed and mixer maintenance will help to improve mixer accuracy. Well-placed cameras can help determine areas that may be contributing to inaccuracy in mixing.

**FIGURE 3** DM content and variability of common feeds




## Economic impact

Although studies have found differing impacts of TMR variability on production, one thing is certain: Differences between formulated and fed rations come at a cost to the dairy. When nutrients are undersupplied, there is a risk of production loss, and when nutrients are oversupplied, this can lead to increased ration prices, decreasing IOFCs. In one of the studies mentioned above, they aimed to assign cost to inconsistencies in mixing. They found that day-to-day mixing errors accounted for 1.5 to 3 cents per head, per day. When we isolate the cost of nutrient oversupply and today's feed prices, 1% oversupply of CP is equivalent to half a pound of CP. Depending on protein source, this can increase ration costs as much as 17 cents per head, per day – greatly impacting the bottom line. As margins get tighter, farms and their decision-making teams need to evaluate ways to save money without impacting performance. Decreasing feed cost does not always mean cutting back valuable nutrients or additives, but instead using feeds to their full potential to yield the same result.

## Make a plan

Start with aiming to understand the current TMR variability. TMR testing can easily and economically be achieved by NIR methods to help set a baseline. Ideally, testing TMR over seven days for two separate periods will help to understand day-to-day variability as well as the difference from formulated ration. Once a baseline is established, set goals for achievable targets and a routine protocol to help follow through and ensure those goals are being achieved. Then, readjust as necessary. Using the tools listed above, a more consistent TMR can be achieved – improving IOFC and herd performance.

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