

DAIRY SOLUTIONS

Decreasing TMR variability to maximize ration cost savings

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Feed costs represent the single greatest cost for milk production. Total mixed ration (TMR) variability can significantly impact milk production and components, feed efficiency, and ration costs. This should come as no surprise, as cows thrive on consistency. However, because TMR variation can come from many different sources, it can be difficult to determine the exact cause and full impact. Because of other factors affecting production, TMR variation is often overlooked as a source of milk production changes. During times of rising feed costs, it may be beneficial to be aware of potential sources of TMR variation and strive to reduce them.

It can be said that there is the ration on paper from the nutritionist, the ration that is mixed and the ration that the cow actually consumes. Research suggests that herds with more consistent rations have greater milk production. However, an inaccurate dry matter, a TMR wagon that is worn, or improper feed mixing can result in TMR variabilities and an inconsistent ration at the bunk. Reducing TMR variability typically has an immediate impact on cow performance, especially if there is sorting at the bunk. Because high feed costs have decreased income over feed costs (IOFC), any changes to improve TMR variation will improve profitability on-farm.

Potential sources of TMR variation include:

Loading and mixing errors

Errors incurred while loading feedstuffs into the mixer wagon or mixing the TMR can cause variation between the formulated ration and the ration fed to the cows. Feed management software is a great tool to track variability in individual ingredients between mixes to reduce differences between loads of TMR. There are several different feed management software programs on the market that are designed to record feed inventory, weighbacks and ingredient dry matter changes, among others. Many times, a feed management software is utilized on-farm, but not to its full potential, with data not entered consistently or the data entered not being routinely reviewed.

Ensuring that the mixer wagon has the proper capacity is important. Mixer wagons that are over- or underfilled do not allow for adequate mixing and can lead to a variable TMR at the bunk. This can lead to sorting and inconsistent nutrient intake between cows. Sorting also opens the door for other health issues, such as sub-acute ruminal acidosis (SARA), which can negatively impact cow performance.

Proper ingredient loading order and mixing time also affect mix accuracy. Overmixing causes a reduction in particle size, which can lead to SARA, decreased dry matter intake, and compromised milk production and components. Ingredient mixing order is also crucial and depends upon the type of mixer (vertical versus horizontal) and if forage processing is required. Typically, any hay or straw that needs processing would be added first, then fine, dry ingredients and feed additives, followed by any wet byproducts, silages, and lastly any liquid. Pre-batching on-farm concentrates can also ensure more consistent mixes and rations while increasing efficiency in batch-to-batch mixing time. Work with your nutritionist to develop an ingredient loading order and/or pre-batching strategy that is specifically tailored to your farm's ingredients.

Hay and straw processing

If feeding long-stem dry hay or straw, make sure that it is well processed to decrease particle length before adding it to the mixer wagon, or allow adequate time for the hay or straw to process within the mixer. Grinding the hay or straw with the mixer wagon could take a significant amount of time, but it is essential to ensuring a TMR with consistent particle length is delivered to the bunk. Decreasing the particle size and maintaining consistency will decrease sorting at the bunk, allowing for consistent intake. The rule of thumb is to strive for particle size of less than 1 inch for straw and 1.5–2 inches for alfalfa. Reassess mixing and particle length when switching between round and square bales. It is important that you work with your nutritionist to conduct a Penn State Particle Separator (PSPS) analysis regularly to help track any inconsistencies in particle length.

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Dry matter variation

There can be variability in the individual feedstuffs that affect the final mixed TMR. Inconsistency in higher inclusion ingredients and wet silages can have a large impact on the ration. Other sources of error can be the result of environmental factors, such as significant rain or snowfall, frequency of sampling and sampling error, or silage face management. Significant rainfall has the potential to impact the dry matter of affected ingredients for up to a week following the event. Sampling protocol and frequency can also result in irregularities. Sampling directly from a silage face may not be accurate, as the dry matter may vary across the face of the pile, and a representative sample may not be attainable.

Some farms may monitor the dry matter of feedstuffs themselves using Koster testers, microwaves or air fryers, while others rely on their nutritionist. Work with your nutritionist to devise a sampling protocol and schedule that meets your farm's needs. Even small differences in dry matter can have a significant impact. Table 1 shows the savings incurred as the result of dry matter concentrations for corn silage, haylage, dry, ground corn and soybean meal on a 500-cow dairy.

Nutrient changes in ingredients

Dry matter is not the only nutrient that can cause variation in the ration. Crude protein, starch and neutral detergent fiber (NDF), along with starch and NDF digestibility, can vary. Because of growing and harvest conditions, as well as changes during the ensiling process, these changes are most often seen in silages but can be found in other on-farm commodities as well. While these other commodities may not need to be sampled as frequently as forages, taking yearly samples may be beneficial to determine any changes in starch content and digestibility. Book values for nutrient values for commodities and byproducts will not reflect these changes or regional growing condition variability.

Under- or oversupplying nutrients in the TMR can be costly to the farmer. Undersupplying nutrients typically results in decreased profits through decreased production, and oversupplying nutrients results in increased feed costs and decreased IOFC, as well as significantly increasing nutrients that end up being applied back on cropland in manure.

Equipment wear

Regular wear and tear on mixer wagons can affect how well the TMR mixes. If the mixer wagon has dull knives, this could affect the mixer wagon's ability to process long-stem hay or straw. Worn kicker plates in the mixer wagon can cause feed to build up and not mix properly, while worn augers also prevent feed from mixing well and inhibit a uniform mix from being fed to the cow. In order to stay ahead of equipment wear, check wear points monthly or quarterly, at a minimum, and replace as needed.

Many factors can cause TMR variation, and pinpointing the exact source of error can be difficult. However, any changes made to improve TMR variability typically improve milk production. Work with your [Hubbard Feeds representative](#) to investigate ways to decrease variation in your TMR, strive for enhanced production and improve your IOFC.

	Expected dry matter intake, lbs./cow/day	As-fed intake with inaccurate dry matter, lbs./cow/day	Updated as-fed intakes with corrected dry matter, lbs./cow/day	\$/cow/day savings due to better dry matter accuracy
Corn silage ¹	20.0	57.1	54.1	\$0.07
Alfalfa haylage ²	10.0	25.0	23.8	\$0.05
Dry, ground corn ³	10.0	11.8	11.5	\$0.04
Soybean meal ⁴	2.00	2.35	2.30	\$0.01
			Total savings, \$/cow/day	\$0.17
			Added savings over a year: 500 cows * \$0.17/cow/day * 365 days = \$31,025	

¹Corn silage valued at \$45/ton; expected dry matter of 35%; actual dry matter of 37%.

²Haylage valued at \$80/ton; expected dry matter of 40%; actual dry matter of 42%.

³Dry, ground corn valued at \$240/ton; expected dry matter of 85%; actual dry matter of 87%.

⁴Soybean meal valued at \$450/ton; expected dry matter of 85%; actual dry matter of 87%.

Sources:

"Assessing the true cost of TMR variability. Progressive Dairyman 07 October 2021. Assessing the true cost of TMR variability - Progressive Dairy. Accessed 17 February 2022.