

Sources of Discrepancies between Predicted and Actual Dry Matter Intakes

Introduction

The level of dry matter intake (DMI) is very strongly related to milk production and profitability in lactating dairy cows. Therefore, in most cases management will be attempting to encourage maximum dry matter intake of correctly formulated diets while avoiding excessive overfeeding.

Many prediction equations have been developed over the past 50 years and are the basis of modern dairy diet formulation. Different equations utilize different variables, but nearly all include milk production level and body weight. Depending on the equation, additional variables that may be included are butterfat, protein/nonfat solids, days-in-milk, age, lactation, breed, environmental variables, exercise, and so forth.

Some equations may predict intakes better than others, but none of them are perfect in all operations and for all groups of cattle. Beyond ration formulation, predicted dry matter intake estimates can be used in a diagnostic role to compare to actual dry matter intakes.

This article will discuss some potential errors in measurement of dry matter intake and some uses for comparisons between predicted and actual dry matter intakes. It will also discuss roles that VAS is now playing or are under consideration.

Measurement of Group (Pen) Dry Matter Intake

At minimum, the measurement of total group dry matter intake requires these two variables:

- Dry matter (DM) amount presented to the group of cows in previous 24 hours
- DM amount remaining (weighback or orts) at the end of the 24 hours

Additionally, there may be additional feed that goes unconsumed, but is not present in the feedbunk at the end of the day. Examples would be feed that gets tossed by cows or is otherwise removed from the bunk in ways other than consumption. Usually this source is ignored.

There are several factors that can influence the accuracy and/or precision of the measurement of the group dry matter intake, including:

- *Inaccurate or mis-calibrated scales*
TMR mixer scales require periodic checking and adjustment. VAS suggests at least monthly checks.

The VAS tech support staff can offer suggestions on various options to perform these checks and make proper adjustments.

- *Failure of measurement (or at least estimation) of amount of remaining feed*
Unless these amounts are at least estimated, in most cases the result will be an overestimate of the group dry matter intake by a few pounds.

The FeedWatch software and scaleheads have the ability to allow easy measurement of the weighback at the pen level.

- *Inaccurate assumptions about the dry matter content (DM%) of one or more feed ingredients, especially silages and other wet feeds.*

For example, when feeding 1,000 pounds AsFed (AF) of corn silage at an assumed DM% of 33%, the assumed DM amount is 333 pounds. If the true DM% of the corn silage is 30%, only 300 pounds of DM will be fed when feeding 1,000 pounds AF of corn silage.

The FeedWatch software is built around the correct use and tracking of dry matter of each feed ingredient. VAS has built the ability to enter dry matters of ingredients into both the desktop software and the scaleheads.

- *Mistakes in identification of actual site of delivery of feed*
Sometimes mistakes are made and feed that was supposed to go to one pen gets delivered to a different pen.

Another situation is the case of batch feeding where a load is prepared prior to the decision of the target pen. The person delivering the feed must then inform the scalehead where the feed was dropped. Although the scalehead has the ability to record the location, mistakes are possible.

VAS has been researching various options to automate identification of locations and is hoping to have some abilities in the future to help better identify these errors.

Calculation of Average Dry Matter Intake per Cow within a Group

- *Mistakes in counts of cows*

In addition to the above sources of error for measurement of group dry matter intake, mistakes can be made in the count of actual cows within a group for a given 24 hour period. This error can be a major source of discrepancies between predicted and actual dry matter intakes.

This error is commonly present in these situations:

- Groups that have frequent turn-over (dry, closeup, and fresh groups)
- Groups with small numbers
- Herds with pen movements not coordinated with feeding times

In the above scenarios, it can be difficult to know what value to use for the count of animals: Should it be the beginning number, ending number, or the average number?

VAS can utilize data export capabilities between our software packages to help decrease this error. Also, RFID eartag technology has the potential to help immensely in this area via use of both handheld and panel readers.

Mistakes in Prediction Equation Estimates

- *Mistakes in input variables used to estimate dry matter intake*

Sometimes the variables that are used to estimate dry matter intakes for a group do not reflect the actual animals being fed accurately enough.

VAS is exploring options to provide more accurate inputs for a group based on the actual data for a given group of animals.

- *Mistakes in the prediction equation*

As noted above, some equations may predict intakes better than others, but none of them are perfect in all operations and for all groups of cattle.

Using Predicted Dry Matter Intakes as a Diagnostic Tool

Predicted dry matter intakes can be used in two general ways:

- *As a method to spot the errors listed above*

The use of predicted intakes to spot and correct the above mistakes can be of much value. This use should allow more precise targeting of feeding for a group, leading to:

- Decreased times where there is either too much feed or too little feed left over.
- Better use of labor and equipment resources

- *As a method to diagnose formulation or loading/mixing problems*

In addition to identifying the above sources of errors, a comparison of the actual and the predicted dry matter intakes can be used as a diagnostic tool. A discrepancy that cannot be explained by one of the preceding mistakes can be investigated further by examining the feed, cattle and manure.

Example situations where predicted intakes do not match actual intakes due to diet issues

- Improper level of physical fiber in diet

Inadequate physical fiber can result in a higher than desired “rate of passage” for the diet. The end result is the animal does not derive as much total nutrients as it could from the diet, leading to lower than expected production for a given level of intake.

Inadequate physical fiber can result from improper formulation, insufficient physical fiber in the original ingredients, mistakes during loading, excessive reduction of physical fiber due to overmixing, and (paradoxically) undermixing in the presence of longer particle sizes.

Methods of diagnoses include:

- Visual inspection of the bunk
 - What does the feed look like?
 - Properly mixed?
 - Spoiled or heating?
 - Is the feed uniform over the length of the feedbunk?
 - Is there evidence of sorting?
 - What does the feed look like at the end of the feeding period
- Cow eating behavior
 - What is the eating behavior of the cows? How aggressive?
 - Is sorting excessive?
 - What is the level of undesirable behaviors (sorting, feed tossing)?
- Manure and cow
 - Is manure more liquid than desired?
 - Is manure inconsistent than desired?
 - Is cud chewing at a high level? How aggressive is cud chewing?
 - What is the level of lameness and other metabolic issues?
- Penn State Particle Separator
 - What are the various percentages on each screen?
 - Does the feed on the top screens look like something a cow would eat?
- FeedWatch feeding records and discussions with feeders
 - Were there mistakes during the loading process?
 - How long is the feed being mixed?

There may also be cases where there is excessive physical fiber, leading to decreased intakes and slower rates of passage. Often these situations result in manure that is less liquid than desired and decreased productivity.

- Problems in diet other than physical fiber

Issues are sometimes present due to problems in diet formulation of mixing other than physical fiber. These issues include improper levels of starch, nonfiber carbohydrates, or proteins, improper synchronization of rumen degradability of carbohydrates and proteins, improper amounts of dietary fats, and improper amounts of dietary minerals.

Many of the same methods of diagnoses listed for improper physical fiber apply, including close observation of feeds, cattle, and manure.