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MONITORING

FEED EFFICIENCY

IN DAIRY HERDS

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Many industries use various production controls as part of their daily management practices. On dairies, evaluation tools have typically included Dairy Herd Improvement Association (DHIA) testing, forage testing and ration formulation. Although these tools provide meaningful data for management decisions, they generally occur infrequently (particularly forage testing and ration formulation). Monthly data may not be timely enough for routine management decisions at many dairies.

Cows often sort, or selectively choose the palatable parts of the ration and leave the coarser parts that have plenty of effective fiber.

To improve feeding and production efficiency, large operations should frequently monitor:

- Ration particle size;
- Feed inventory; and
- Milk production

Feeding management tools

Ration and particle size evaluation: High-producing cows require an energy-dense ration. But they also need enough fiber to maintain rumen health. Although balancing these competing requirements is difficult, production and long-term health implications warrant it.

Effective fiber is a term describing the ability of a feed to promote chewing activity and saliva production. The feed's particle size, along with fiber content, dictates the amount of chewing and saliva produced. Reducing the particle size may alter the fiber's physical nature, making it less able to stimulate rumination and saliva flow.

When early-lactation animals are fed a high-grain diet with low dry-matter intake, they may not consume enough forage. Normally, nutritionists recommend supplying minimum amounts of fiber (acid detergent fiber, ADF; or neutral detergent fiber, NDF) to promote rumination and saliva production. Inadequate effective fiber in lactation rations may cause acidosis (subacute or acute), erratic dry matter intakes, decreased milk yields, lowered milk fat production, and health problems (laminitis, ketosis, displaced abomasum).

The importance of adequate effective fiber has generated interest in developing ways to assess it on the farm. Analyzing particle size distinguishes the rapidly digestible portion of the ration from

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that which effectively stimulates cud chewing and buffer production. Many forage labs analyze particle size when they conduct routine forage tests.

To evaluate particle size on the farm, nutritionists and veterinarians often use NASCO's Penn State Particle Size Separator (C15924N, Fort Atkinson, WI, and Modesto, CA). It is simple, easy to use, and practical for routine use on the farm. It separates particle size into three categories: less than 5/16 inch, 5/16 to 3/4 inch, and more than 3/4 inch. Particles smaller than 5/16 inch are considered rapidly digested; those larger than 3/4 inch are considered effective in stimulating cud chewing and buffer production.

A particle size separator (above) divides forage particles into three categories (below, from left): more than 3/4 inch, 5/16 to 3/4 inch, and less than 5/16 inch.

It is important to evaluate particle size at the bunk where cows are eating feed. Many factors may cause inadequate particle size at the bunk, including finely chopped forages and inadequate ration forage. The particles may also be too small in rations that are overmixed or that include high levels of processed forages and by-product feeds.

In evaluating particle size, producers should consider mixing time, loading order, bunk management and animal sorting. Cows often sort, selectively choosing palatable portions of the total mixed ration (TMR). The coarser particles with plenty of effective fiber are often the least palatable part of the ration. It is critical to evaluate the ration that the cows are actually eating.

Another challenge is bunks that are not cleaned regularly. Fines can accumulate in the bunk if not cleaned routinely (daily is preferred). Otherwise, the particle size of what the cows are actually consuming will be reduced.

Feed inventory: Even though feed is the single largest operating expense on dairies, few producers track feed inventory closely to determine shrinkage and inventory discrepancies. Shrinkage on individual ingredients can vary from 0.5 to 20 percent. Producers who track inventories can monitor and evaluate excessive losses from scale errors, rodent or pest damage, wind, weather, etc.

Tracking feed inventory can help eliminate over- or underfeeding of ration ingredients. For various reasons, feeders may not always feed the ration they've been given. Often milk production is lowered not because of an inadequate ration "on paper," but rather from poor feeding management. Thus, although the ration may be fine "on paper," the ration the cows actually consume may be inadequate.

Tracking inventory can also aid in feed pricing. Feeds with high shrinkage should be discounted when determining their value. For example, suppose that inventory tracking reveals that shrinkage for ground shelled corn is 10 percent. If ground shelled corn is selling for $100/ton, what would the "true" cost be? If there was zero shrinkage, the cost would be $100 for 2,000 pounds. With 10 percent shrinkage, the true cost is actually $100 for 1,800 pounds. [2,000 pounds x (100%-10%)], which equates to an actual cost per ton of $111.11 [$100/1,800 pounds x 2,000 pounds]. Thus, the true cost of the $100/ton corn in this example is $111/ton. Tracking helps producers determine actual or true feed costs when making buying decisions.

Feed inventory can be tracked in several ways. None of the methods is 100 percent accurate; greater accuracy is developed over longer periods. The easiest, most common (but least accurate) method is to inventory feeds regularly and compare to what was supposed to have been fed. Another method is to track inventory based on what was actually fed. A simple spreadsheet can be developed to do this; software programs are also available.

The most sophisticated and costly way to track inventory is to use a computerized feeding management system. These systems generally include a scale interface mounted on the feed truck or mix wagon, a hand-held portable computer, and soft-

ware. A properly programmed system receiving accurate information can provide valuable output, such as inventory tracking. This calculation, based on what is actually loaded in the wagon, accurately estimates inventory changes.

These systems also allow managers to track and evaluate feeders. Most systems track how close a feeder comes to adding the correct amount of feed. Dairy managers report that top feeders can stay within 1 percent for concentrate ingredients. Poor feeders can be eliminated quickly by monitoring deviations.

Most computerized feeding management systems can also be used to determine dry matter intake (including refusals) by pen. Coupled with milk production data, this information can be invaluable for producers.

Production management tools

Flow meters: Milk production is often monitored by calculating herd average from the bulk tank, by having monthly DHIA testing, or by recording daily milk weights electronically in the parlor. Although these traditional production monitoring methods provide needed data, they have weaknesses. Bulk tank data is too general for many management decisions, particularly if more than one ration is fed or if cows are grouped by stage of lactation. Monthly DHIA tests may be too infrequent for timely management decisions; most producers need weekly or daily information. Problems are also detected sooner with frequent monitoring. Individual electronic parlor meters provide a wealth of timely data, but are costly to install.

Monitoring production of groups is an ideal tool for large dairies. It has several advantages over bulk tank, DHIA or daily electronic production monitoring. It is relatively inexpensive for large dairies, and can provide daily information. If cows are grouped by stage of lactation, producers can daily track group performance by lactation stage. The fresh- and early-lactation pens are critical groups, and daily production information can be invaluable in discovering problems quickly, before they become a crisis.

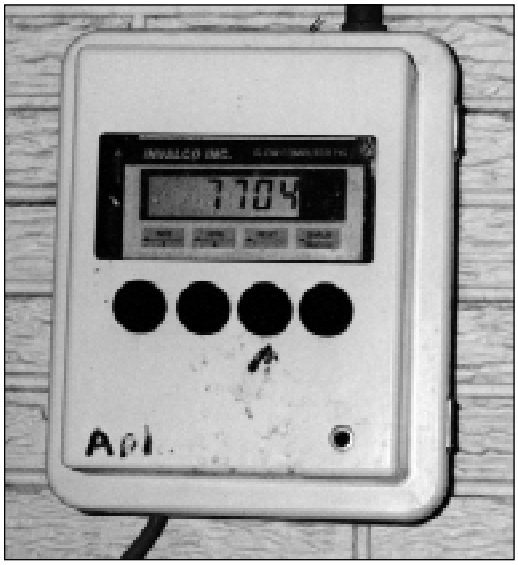
Recently, dairy producers have begun using flow meters to more frequently monitor milk production of groups or strings. Flow meters that monitor flow of water and other liquids have existed for years; adapting them for use in dairies allows producers to monitor milk production daily. Several types of flow meters are available; most milking equipment dealers can install them.

Producers should track feed inventory closely to determine shrinkage and inventory discrepancies.

Flow meters are generally installed near but past the receiver jar. Those placed well past the receiver jar near plate coolers or the bulk tank may be less accurate because of the volume of milk in the lines.

A "basic" flow meter package has a display terminal in the parlor. Milkers must write down from the display the milk weights for each group, and manually reset for the next group. Small printers are available to print milk weights instead of manually recording. Advanced systems automatically record data into software that merges with feed information.

Milk urea nitrogen (MUN): Another tool for evaluating dairy feeding programs is MUN testing. It is one of the few on-farm tools that provide insight into a cow's internal processes.



The display for a flow meter must be reset after each group or pen.

Monitoring the urea level in milk can crudely indicate ammonia production in the rumen. The causes of excess ammonia production are generally two-fold: overfeeding of protein, or an imbalance in carbohydrate/protein availability in the rumen. High MUNs can indicate that the cows are being fed too much protein, which is expensive. It also can deprive them of needed energy, as the process of forming urea in a cow uses energy. High MUNs resulting from carbohydrate/protein imbalances imply that rumen function is inefficient. Correcting the imbalance will probably improve production and efficiency. Research also suggests that high MUNs may impair reproductive performance.

What is the target MUN for high-producing dairy herds? Most research suggests that the normal range for MUNs is 10 to 16 milligrams per deciliter (mg/dl). Intervention is generally considered when herds average more than 18 mg/dl. MUN data is most useful when used to evaluate groups or a herd; do not use values for an individual cow as culling criteria.

MUN data is valuable only if MUN is tested regularly. Establish a baseline, then monitor regularly to help identify ration problems quickly. Most DHIA labs offer tests on individual cows. However, monthly numbers may not be timely enough. Many producers have adopted weekly programs, testing groups and not individuals.

Most DHIA labs will accept bulk tank or group samples for MUN analysis. Bulk tank testing is inappropriate if more than one ration is fed. String samplers (available through some DHIA affiliates) provide a cheap, simple way to collect group samples. Fat, protein and somatic cell count (SCC) can be tested weekly along with MUN using string samplers.

Using the data

Although many dairies gather data — milk weights, dry matter intakes and MUNs — few act on the information they record. This is surprising, considering that feed is the largest expense, and milk accounts for the majority of gross revenue. Closely monitoring variables relating to milk and feed (ration efficiency, dry matter intake, inventory control, milk production) can greatly influence net farm income. By developing an on-site system for recording and evaluating this data, producers can generate information for routine management decisions. Sophisticated systems that generate much of this information are available commercially.

A spreadsheet can also generate data from production information. Although spreadsheets lack some of the sophistication of commercial systems, they are inexpensive and easy to adapt to individual needs. Spreadsheets can be used to calculate daily feed inventory based on what was fed.

Monitoring this data monthly and weekly provides timely information for management decisions. This information can help a manager quickly discover forage quality changes, labor problems in the parlor, feeding problems, transition cow difficulties, etc.

Summary

Many dairies have the ability to track and monitor feed and milk production. However, too often the data is underutilized. Considering its economic impact, effective use of this information is critical. Using spreadsheets or obtaining commercial software is necessary to take full advantage of the data generated. Obtaining group information daily and weekly provides timely data producers need to make routine management decisions.

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