Monitoring and Managing Feeding, Inventory, and Shrink

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Economic Opportunity and Implications

Feed is the single largest operating expense on dairy farms, and should be considered one of the most important variables behind successful production, animal health and profitability of a dairy. Despite this fact, only a minority of dairies closely track feeding, feed inventories, and closely monitor feed shrink.

Annual feed costs per milking cow can average $1000 - $1200 per year, or $100,000 - $120,000 for every 100 milking cows. Feed shrink can vary considerably from dairy to dairy depending on ingredients. Shrink on individual ingredients has been reported to range from 0.5% to 20% (Dutton, 1998; Gaige, 1998), with forage shrink often well in excess of 20% (Holmes, 2000a). Assuming that a minimal realistic reduction of 3% could be made in feed shrink, with an annual feed cost of $1100 per cow, the net annual financial impact would be $16,500 that's recouped for a 500 milking cow dairy. In some cases, shrink reduction has approached 5-8%, which would amount to $27,500 to $44,000 for a 500 cow dairy averaged across the same $1100 per cow annual feed cost figure. The bottom-line is as dairies get larger, there's a large amount of dollars at risk when dealing with feed shrink and inventory control. Keep in mind, these figures strictly represent the income "recouped" that otherwise would have been lost. This gives no additional financial considerations to the merits of having a more consistent nutrition program, which in turn supports better cow health and improved feed efficiency (defined as milk produced per unit of feed intake).

Most dairies are challenged to quantify the financial impact of feed related shrink on profits. Simplistically, we all know feed shrink is occurring. Just look at any bunker silo, commodity bay, or round bales of hay being stored….shrink does occur! A more challenging question might be at what control points should management make interventions, and how many resources should be allocated to improve the current level of feed shrink and mixing errors that are occurring? It's

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tough to know whether to make management interventions unless one knows what is actually occurring. Developing a management plan for the feeding program that includes monitoring and tracking of feed shrink, mixing and inventory has proven to have large paybacks on several dairies. While some feed shrink and mixing errors are inevitable, monitoring and control are critical given the significant amount of "lost" dollars associated with feed disappearance and inaccurate rations being consumed caused by mixing errors.

Focus on Forages

Without question, one of the greatest areas of feed quality variation and shrink is with forages. Variation and shrink in forages occurs by two modes: 1) forage loss as it moves through different handling and storage processes, and 2) microbial deterioration and fermentation dry matter losses. The obscurity of microbial deterioration has led many to believe they have relatively modest forage losses and quality issues. In fact, dry matter losses of 5-20% may be occurring before one actually sees visual evidence of molds on forage (Holmes and Muck 2000a). Actual forage losses and shrink are highly dependent on harvest and storage structures. Data adapted from Holmes and Muck (2000a) indicates total forage dry matter losses can range from about 10% to 50%, including the losses associated with filling, seepage, fermentation gasses, surface spoilage, and feed-out losses.

Holmes and Muck (1999) clearly showed there was a large variation in bunker silo compaction density for both hay crop and corn silages, which would contribute significantly to variation in dry matter losses from dairy to dairy (table 1).

Table 1.

Characteristic	**Hay crop Silage** (87 silos)			**Corn Silage** (81 silos)		
	Average	**Range**	**SD***	**Average**	**Range**	**SD***
Dry matter, %	42	24-67	9.50	34	25-46	4.80
Wet density, lbs/ft^3	37	13-61	10.90	43	23-60	8.30
Dry density, lbs/ft^3	14.8	6.6-27.1	3.80	14.5	7.8-23.6	2.90
Avg.particle size, in.	0.46	0.27-1.23	0.15	0.43	0.28-0.68	0.08

* SD = standard deviation.

Minimizing Feed Shrink

You are never going to eliminate feed shrink completely. The focus should be on controlling it rather than eliminating it. Most dairies can live with average shrink values ranging from 2 to 5 percent. However, shrink often reaches double digits where opportunities to recoup large investments exists.

Feed shrink can be defined as the loss of feed that occurs from the point of harvest or purchase to what is actually consumed by the animal.

Again, the question is not whether a dairy has shrink, but rather the extent and value of the shrink. Controlling and reducing shrink typically does not require a large capital expenditure, and the dollars returned go directly to the bottom-line of the financial statement. Remember, reducing feed shrink is about recouping dollars and money already spent and invested in feed. These are feed dollars spent on a dairy that may never have the opportunity to generate revenue, unless recouped and fed to the cows or youngstock.

There are several reasons to develop and implement a feed shrink management plan, including:

1. The investment in the feed has already been made.
2. There's a sizeable investment at stake.
3. It's relatively easy to make incremental improvements.
4. Allows better inventory control, feed forecasting, purchasing and contracting.
5. More consistent and productive rations are fed each day.
6. Better tracking of feed intake, an effective daily monitor.
7. Using feed intake records allows opportunity to measure IOFC.
8. Supports better on-farm biosecurity and cleanliness.

Sources of Feed Shrink

It's already been mentioned there are several major "control points" where feed shrink occurs. This includes harvesting, storage, handling, mixing, feeding, processing, delivery, and any discarded feed. Within each of these areas there are several factors that can contribute to feed shrink, including: wind losses, birds, rodents, tires and tracking feed, seepage and silo run-off, bunk disappearance due to tossing of feed, hot or spoiled feed, moisture loss, mixing errors, and scale inaccuracy. A real challenge is the fact that much of the feed shrink is almost invisible during daily activities.

Consider shrink when choosing from different feed ingredients, particularly protein, energy, and mineral sources given the larger cost per pound relative to

forages. Dry ingredients with small particle size and light bulk density are more susceptible to wind losses. Soy hulls and malt sprouts might be an example of such ingredients. Conversely, wet ingredients that are heavier in bulk density may have higher losses due to feed deterioration and run-off.

Storage Design

Ingredients are commonly stored on flat-storage (either open or covered) or in upright bins. Placing ingredients in piles outdoors offers the greatest potential for shrink losses, especially if left uncovered. Losses for some ingredients in excess of 20% would not be surprising under these conditions. When evaluating different storage facilities and options, the value of ingredients to be stored must be considered relative to the expected improvements that might be gained with one type of storage over another storage type.

How much might a dairy expect to gain annually by using an upright bin for storing a protein blend with an average annual cost of $270 versus storing the same protein blend in uncovered flat storage. There are two costs associated with this decision, namely 1) the value of any feed savings through reduced feed shrink in an upright bin, and 2) the opportunity cost of a having cows consume a more consistent and accurate ration each day created by having less variation in mixing errors with auger versus bucket loaded ingredients. The latter, or opportunity cost, is more difficult to specifically measure and evaluate, but must be considered.

If a 500 cow dairy fed an average of 4 pounds of protein blend per cow daily, at an average cost of $270 per ton, then the annual cost of the protein would be $98,550. If the shrink of the protein blend could be reduced by 3% by moving from uncovered flat storage to an upright bin, the recouped protein blend value, otherwise lost to shrink, would be $2,956 per year. In this case, moving to an upright bin would be highly advisable.

Open-sided commodity sheds can be managed to keep shrink below 5 percent, but do require proper over-hang and ample concrete apron in front of storage bays to minimize weather exposure and to facilitate loading and handling. Cost and design are key considerations with commodity shed type flat storage. Flat storage can quickly become the most expensive form of storage if over-built or if proper planning does not occur before building. This type of storage tends to be the preferred method of storage for higher inclusion rate ingredients such as whole cottonseed, baled hay, or other ingredients fed at 2-3 pounds or more per head daily. Blends containing higher levels of liquid fat are also often stored on flat storage for ease of handling and flow.

Upright bins will do the best job of limiting ingredient shrink, but may also be the most expensive form of ingredient storage. Feed shrink in upright bins can typically be limited to 1-2%. Weighing and mixing tends to be more accurate from bins versus flat storage, which may account for even greater savings over and

above actual feed shrink caused by wind loss, tire tracking, birds, etc… Bins are often available through "lease-to-buy" and bin placement programs offered by feed companies and others as incentive and convenience for purchasing preblended ingredients and other feed products.

Disadvantages of upright bins can include: slower feedout rates, feed bridging and down time, ingredient limitations such as high fat levels, and possible equipment failures or damage due to lightning strikes or hitting the bin with other equipment.

So are bins or flat storage superior? Having a combination of both often is the best overall strategy to accommodate both higher inclusion rate ingredients (flat storage) while storing higher cost ingredients with lower feeding rates in upright bins. Shrink will typically be lower in upright bins versus covered or uncovered flat storage. Creating a feed center, with multiple types of ingredient storage and where ingredients are all stored within short distances and easy access of the forages can improve feeding efficiency and mixing accuracy significantly.

Other considerations for reducing and managing feed shrink, include:

- ✓ avoid feeding in an elevated "H-bunk" that encourages feed throwing
- ✓ periodically check scale load cells for accuracy
- ✓ utilize batch mixing charts with conversions made for moisture variations
- ✓ establish mixing protocol and sequencing based on specific ingredients
- ✓ control rodents and wild animals in and around plastic storage bags
- ✓ weigh all deliveries of purchased feeds
- ✓ closely manage forage feedout to maximize aerobic stability of the TMR in the bunk, in turn minimizing the feed refusals created by out-of-condition feed due to heating or secondary fermentation
- ✓ record receiving dates and tonnage on all in-coming ingredients

Implementation

Feed costs represent the single largest variable expense of producing milk. Many dairies have the ability to monitor and track feed inventories and feed use, but lack a well thought out system and plan. The economic incentives for creating such a plan are large. Often, when data is available it's under-utilized. Collecting feed disappearance and feed inventory information allows dairy managers to more quickly uncover areas of needs to avoid issues that otherwise would arise with cow health, lost production, or higher than expected feed costs.

Begin by making a commitment to reducing feed shrink and managing the feeding process on a daily basis; speak to this commitment with employees and other professionals supporting the dairy. Understand the control points, and where the greatest economic returns typically occur with improvements. Make feed inventory and shrink management part of the feeder responsibilities, including

writing it into the job role and description. Provide on-going training for these same employees. Develop an organized, yet simple, monitoring program that will be embraced by the feeder, nutritionist, veterinarian, ag lender or accountant, and management team alike. Recognize the significant costs associated with variation and feed shrink that occurs in a feeding program, deploying the proper amount of resources in labor and capital to allow improvements to be made. Investment and changes in storage facilities and bins along with computer software often are solid investments with relatively quick returns. Set clear expectations with the entire dairy management team as to what the goals and commitments are for improving feed shrink and ration variation.

Now get busy, and celebrate the success and improvements along the way!