Feeding Cows with Increasing Feed Prices: Efficiencies, Feed Options, and Quality Control

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Feed efficiency should be monitored. One way to define feed efficiency is to express milk produced per unit of dry matter consumed. This requires that dry matter intake be determined by knowing what was offered and how much was refused. On farm dry matter determination is helpful when doing this; however, estimates can be made from lab TMR dry matter results. Also milk should be corrected to be expressed as 3.5% fat. Therefore, one pound of 3.5% fat milk is equal to (0.432 times milk lbs.) plus (16.23 times milk fat lbs.). A herd producing 70 lbs. of 3.8% fat milk would actually be producing 73.4 lbs. of 3.5% fat corrected milk (FCM = (.432 * 70) + (16.23 * 2.66)). If this herd consumes 50 lbs. of dry matter per day the feed efficiency is 1.47 (73.4/50). Typically for herds averaging 150 to 200 days in milk, as are most of our herds in Virginia, we would expect a feed efficiency of 1.5 to 1.6. A large number of late lactation cows with average days in milk of the herd at greater than 250 might drop to 1.4. Early lactation cows or groups might have a feed efficiency of 1.8 or greater due to use of body stores to produce milk in early lactation. Now with feed costs greater than $5 per cow per day, it is an excellent time to determine your feed efficiency. An economic analysis by Dr. Pat French (personal communication) indicates that currently the breakeven feed efficiency is 1.3 and breakeven milk yield is 55 lbs./cow/day. His analysis indicates the current cost of a lb. of dry matter is $.13. Make changes as needed to produce more milk per unit of feed consumed. This makes sense both economically and environmentally. Another meaningful measure of efficiency is to determine income over feed costs. Currently we are seeing an income over feed cost of about $9/cwt.

Grouping lactating dairy cows into two or more feeding groups can reduce output of nitrogen and phosphorus and reduce ration cost. In Virginia the trend over the last 10 to 15 years is for feeding one group of lactating dairy cows. The reasons are many but center around keeping feeding simple, cheap feeds, and herd size. Interestingly the recent trend has been for grouping of dry cows into two groups, far-off and close-up. When feeding one group of lactating dairy cows we tend to balance the ration for the higher producers in the group. This is with limitations because it is difficult to balance energy in rations for more than 100 lbs. of milk per cow per day. The high producing dairy cow will use body fat deposits to make up any shortage. This is not the case with protein, so we sometimes feed high amounts for high producers resulting in overfeeding of lower producers. This directly results in more nitrogen being excreted in the urine and feces. The same is true for phosphorus except most is excreted in the feces. Phosphorus is many times over supplemented according to a Virginia survey and the 2001 NRC publication. Both nitrogen and phosphorus can be problems in the environment. Feeding two or more rations to lactating dairy cows will result in a better match of ration nutrient concentration and the cows' requirement resulting in less nitrogen and phosphorus being excreted.

A cow will many times drop in production when switched from a high group ration to a low group ration. One suggestion is to not change nutrient density by more than 15%. This translates to 15.7% protein when a high group ration of 18.5% protein is fed. Early lactation cows should be kept on the high group ration for at least one to two months to achieve milk production potential. After this time they should be grouped by production considering reproductive status in some cases. Another way to consider ration formulation is to balance rations for 30% above average for one-group herds, 20% for each group of a two-group herd, and 10% for each group of a three-group herd. These numbers are based on lead factors we developed in the 1980's for computerized ration formulation. The more groups we have the more similar the production within each group and the more similar the nutrient requirements. If multiple feeding groups are possible it might also be advisable to have a first lactation group where heifers stay together for their first lactation.

Feed management practices that limit overfeeding of protein can be evaluated by monitoring MUN levels. Milk urea nitrogen (MUN) is a direct indicator of protein status of animals and can be used to predict over or under feeding. Factors that can influence MUN concentrations are: protein intake both rumen degradable and undegradable, energy intake especially rumen available energy needed to capture rumen available N, heat damage resulting in reduced protein and energy digestibility, consumption of water because dehydration increases MUN, and feed sorting. Best management practices to prevent overfeeding of protein are:

1. Balance ration for total protein, rumen degradable and undegradable protein, and rumen available energy as measured by nonfiber carbohydrates or starch as well as total energy.

2. Monitor dry matter intakes weekly on all groups and calculate N intakes relative to requirements.

3. Analyze feeds monthly for total protein, plus heat damaged protein (more than 10% of protein in the fibrous fraction (ADIN or ADFCP)) in feeds if excessive heating is suspected.

4. Group cows by production and feed accordingly.

5. Prevent feed sorting by feeding a ration properly mixed with uniformity of feed delivered; particle size separation at different feed bunk locations can be monitored by use of a particle size separator.

6. Although there seems to be some genetic variation between herds it generally is suggested that when bulk tank MUN is above 14 mg/dl, consider modifying the ration; rations below 12 are considered best from an environmental standpoint.

7. If bulk tank MUN is below 10 mg/dl, protein consumption may be low or feeds may be heat damaged.

Consider options for more expensive feeds. This is always a problem when prices of corn and soybeans are elevated as they are now. The other available feeds have also been elevated due to market demand. There might be some local options that could be used to reduce ration cost. A recent analysis of Mid-Atlantic feed costs in March of 2011 by Dr. Pat French (personal communication) indicated some possible alternatives. He used linear programming to put economic weights on the cost of rumen degradable protein, rumen undegradable protein, neutral detergent fiber, nonfiber carbohydrate, and fat. He found, in order of greatest difference from predicted value relative to market price, that feather meal ($399/ton), whole cottonseeds ($231), distillers dried grains ($264), wheat middlings ($167), pressed brewers grains ($66), cottonseed meal ($305), hominy ($264), and barley ($221) were possible economical alternative feeds. A nutritionist should be involved when making feed substitutions to ensure proper balance of ration components. As prices change some relationships will also change.

More frequent feed analysis may reduce feeding costs. Weiss and St.-Pierre from Ohio State suggest that sampling feeds only once per month is insufficient for larger herds. Their data indicate monthly sampling for a herd of 50 cows is sufficient but for herds size of 200 sampling every 7 to 10 days would result in a $50/day savings due to reduced over feeding. For 1000 cows sampling every 3 to 4 days could result in a $250/day savings.

TMR analysis can be a check to proper ration supplementation. Typically a nutritionist wants to sample individual ration ingredients for lab analysis. They then will put together a ration with these results. Many times they will not actually sample the TMR or final product. One reason for this is difficulty in getting a proper mixture of the ingredients. However, if careful sampling protocol is followed a meaningful lab analysis can be obtained. We have been sampling TMR's of some cooperator heads for the last three years. Some are feeding only one ration and a few are grouping by production. These TMR's averaged 47.2% dry matter. Protein averaged 16.9% of the dry matter and TDN 73%. Starch averaged 24.3% with a range of 20.3 to 27.2% and non fiber carbohydrates 38.7% with a range of 32.1 to 43.9%. Acid detergent fiber averaged 21.6% and neutral detergent fiber 34.8%. The macromineral results averaged .87% calcium, .39% phosphorus, .34% magnesium, 1.47% potassium, and .41% sodium. The magnesium, potassium, and sodium amounts are similar to what is recommended for hot weather feeding and are greater than required during cooler times of the year. The level of phosphorus indicates effort by these herds to reduce the amount being fed although still above the requirement. The micro minerals averaged 85 PPM manganese, 103 PPM zinc, and 26 PPM copper. All are well over the required amounts for lactating cows indicating some over supplementation. This is probably an attempt to boost the immune system which is a problem with early lactation cows. These numbers are being provided to give a benchmark for comparison. Check your calculated ration nutrients against these numbers. If you are interested it is possible to sample your TMR and compare. Sampling protocols can be found at the following link: http://www.vtdairy.dasc.vt.edu/pdf/sampling.pdf

Particle size measurement can be used to check forages and TMR's. The Penn State-Nasco Particle Size Separator is an established method of determining particle size in forages and

TMR's. It is sometimes called a shaker box because the method requires shaking to get settling of the feed particles. There are three screens that cause particle separation. The largest screen is 1.9 cm followed by .79, and .32. What appears in the top screen is the coarsest material and smaller particles disperse on the two other screens or settle to the bottom. The suggested relationships for corn silage, haylage, and TMR's are below.

Screen size	Corn silage	Haylage	TMR
1.90 cm (top)	3-8%	10-20%	3-8% (10%?)
0.79	45-65	45-75	30-40
0.32	30-40	20-30	30-40
Bottom	less than 5	less than 5	less than 20

The top screen catches only the coarsest particles that are associated with stimulating rumination. Signs of inadequate coarse particles in a ration are reduced or erratic intakes, reduced milk production, depressed milk fat concentration, and reduced cud chewing.

A study by Kononoff and Heinrichs (2003) looked at particle size of corn silage based TMR's and found the following results before and after feeding.

Screen size	Short TMR	Refusal	Long TMR	Refusal
1.90 cm (top)	7%	25%	16%	60%
0.79	56	40	50	24
0.32	34	31	30	15
Bottom	4	5	4	1

These results demonstrate that longer particle size results in cows sorting feed and leaving the coarser, higher fiber components of the TMR. Very little of the material in the original bottom two screens were left after cows had access to the feed.

One method to check on ration delivery is to do a particle size measurement at different places on the feed bunk shortly after feed is supplied so that cow eating will not affect the results. Results should be the same from one location to the other. If there is variation it means that the TMR is not adequately mixed and delivered.

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