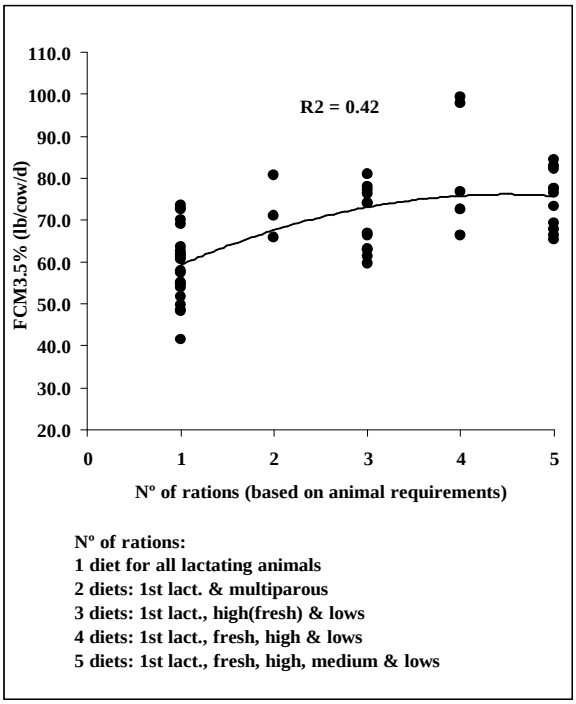
Impact of feeding multiple rations in dairy herds based on animal performance

By Alejandro R Castillo, Ph.D.
UC Cooperative Extension.
Merced and Stanislaus Counties, CA

In a previous article (May 2003) we discussed the theory of grouping animals according to animal's requirement as a strategy to: (1) save money on feed cost, (2) increase production efficiency (milk yield, reproduction, and animal health), and (3) decrease nutrient excretion and/or manure production. According to a recent survey in Merced County (CA) more than 40% of the dairy farms are feeding only one diet for all lactating animals, and the rest are using two or more different diets (see Figure 1). Probably the main concerns of dairy producers feeding multiple rations to lactating cows are: (a) increase total daily feeding time, (b) increase the risk of feeding errors (e.g. the ration was delivered to the wrong pen of animals), (c) not very clear economical benefits, and (d) the loss in milk due to cow movement and diet changes. These situations may be resolved by training the right workers, planning cow movements and evaluating the economical impact of these management practices. Because each farm may use different feeding management, the aim of this article is provide information that can help the dairy producer decide if it is economically feasible to feed multiple rations (two or more) for lactating animals.

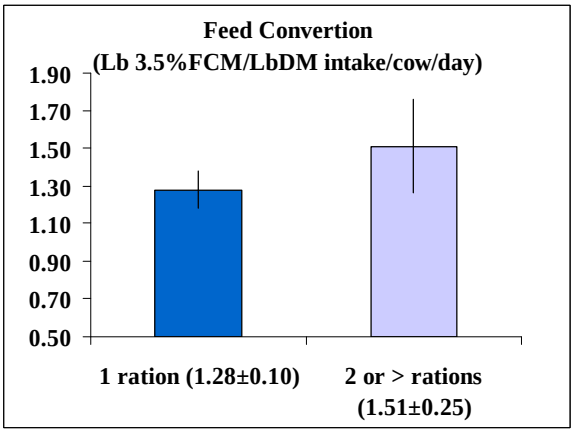
The analysis is carried out on three variables: milk yield, feed conversion, and gross efficiency of nitrogen utilization. This information is part of the mentioned survey in Merced County (CA) on 51 dairy farms. Figure 1 describes the relationship between the number of diets and the 3.5% fat corrected milk (3.5%FCM). The 3.5%FCM is used for a more accurate assessment and for comparison among cows at different stages of lactation. Each dot in Figure 1 represents one dairy farm. The milk yield increased with the number of diets. The R2 means that 42% of the variations on 3.5%FCM are explained by the number of diets. The figure indicates that we might not expect milk yield improvements with more than 4 or 5 diets. Furthermore, if we make the response linear, the relationship is about 4 lb milk/ration. The average milk yield in the survey was 68 lb, from 60 to 75 lb 3.5%FCM/cow/day for one to five rations, respectively.

Figure 1 Number of rations and milk yield in dairy farms (n=51)



The second variable to analyze is feed conversion, also named feed efficiency; and it can be defined as the yield of milk per unit of dry matter intake/cow/day. Figure 2 compares the feed conversion of one ration versus 2 or more rations in 51 dairy farms. The difference is 0.23 less lb milk produced /lb dry matter intake for one versus two or more rations. For an average dairy this might represent between 10 to 15% more milk/day with the same amount of feed. Improving feed conversion through managing the number of rations is an important strategy to decrease the price of the feed per unit milk by increasing milk yield per cow.

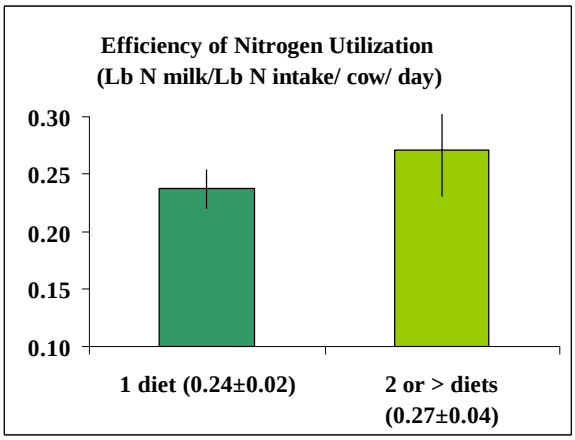
Figure 2 Effect of the number of rations in dairy herds on feed conversion



With respect to the efficiency of nitrogen utilization, the survey in Merced County indicates that dairy producers are feeding the right amount of protein with a mean of 17% crude protein. This is consistent with the recommendations of the National Research Council (2001) for dairy cattle producing 68 lb milk/cow/day. Although protein feeding is not in excess, the data also indicate that it would be possible to decrease the amount of nitrogen excretion in 3% (feces + urine) by managing the number of rations (Figure 3). This Figure represents the effect of the number of rations on the efficiency of nitrogen utilization, which was estimated as lb of nitrogen in milk per lb of nitrogen intake, and can be defined as the amount of nitrogen intake harvested as nitrogen (or protein) in milk. By feeding diets according to requirements, we should decrease nitrogen excretion and increase the total protein in milk. Moreover, according to unpublished data from the same survey, it would be also possible to decrease mineral excretion in about 7%. Decreasing nutrient excretion in feces and urine by ~10% (3% nitrogen and 7% minerals) might be a significant reduction of manure production and feed cost by minimizing the overfeeding of nutrients.

It is important to mention that there are some dairies doing an excellent job in terms of milk yield feeding only one ration or diet for all lactating animals (Figure 1). However, it is suggested to these dairies to reconsider this strategy and include the possible improvements in feed conversion, and the reduction of manure production discussed in this article, more milk yield and solids in milk might be expected.

Figure 3 Effect of the number of rations in dairy herds on the gross efficiency of nitrogen utilization



Feeding *tailor made rations* for the different groups of dairy animals based on milk yield and/or their physiological status, should improve milk yield per cow, decrease the feed cost per unit of milk yield, and reduce manure production.

Summarizing: (1) to improve milk yield per cows at least four rations should be considered, in this survey only 30% of the farms were feeding 4-5 different rations. (2) The average feed conversion with two or more rations in this study was 1.51±0.25 lb milk/lb feed (see Figure 2). Some dairies were close to 2.0 lb milk/ lb feed. This value is indicating future trends and the importance to keep records of feed conversion and to watch closely this variable. Finally, (3) animal nutrition plays an important role in managing and reducing manure production on dairy farms. Make a plan with your adviser and keep all records (inputs and outputs) in your dairy farm for the coming regulatory process.

Acknowledgment This information was possible thanks to the help and support of the Dairy Farmers in Merced County, CA.

Combining dairy manure and no-till - can it be done?

Scott Stoddard
Farm Advisor
Vegetable Crops and Soils, Merced and Madera Counties

At first thought, it may not seem practical to combine dairy manure in a no-tillage system. Many guidelines suggest that surface applied manure (not lagoon waster water) be incorporated into the soil for a variety of reasons, including odor control, limiting nutrient loss, and reducing the chance for off-site movement with irrigation or rainwater. Of course, running a disc across the ground to incorporate manure is antithesis to the no-till paradigm.

No-tillage and other forms of conservation tillage are very popular on farms east of the Rocky Mountains. In fact, in that area of the country conservation tillage is the standard way because it effectively controls soil erosion from rainfall. But here in California, conservation tillage use is in its infancy: less than 2% of the annual cropland is under reduced tillage management. California producers have been slow to adopt this practice for a number of reasons; however, as the economic benefits continue to be shown, interest is increasing, especially in the dairy industry.

In fact, to date the dairy industry has been one of the main adopters of no-tillage practices. Planting equipment for corn and small grains is readily available, and no-till corn can be planted earlier, effectively extending the growing season. Producers should be pleased that no-till also provides many environmental benefits like reduced dust and soil erosion. Of course, that warm fuzzy feeling may quickly disappear if switching to no-till reduces the amount of land available for manure application by an equal amount.

As a graduate student in Kentucky, I worked on a research project that looked at the impacts of manure and conservation tillage. In the spring and/or fall, we applied fresh dairy manure (about 80% moisture) at a rate to provide about 200 lbs N/acre, then did or did not incorporate. In a nutshell, the effects of manure application were the same for either a chisel-disc or a no-till system: the corn grew just as well in both, and the impact on water quality was the same. Any problems with water quality were not the result of tillage; rather they were reflected in the *amount* of manure and fertilizer that was used (Stoddard *et al*, 2005). The nutrient benefits of manure were not reduced in the no-till system, and therefore adding more manure or fertilizer exceeded the nutrient demands of the crop. When more N was added than needed, we saw increased nitrate in the groundwater.

But lets not get bogged down in the adverse results—it is not difficult to understand that over-application of N, whether it be from manure or fertilizer, can impact water quality. The important point is that a surface application of manure that was not incorporated worked just as well as the plots where it was disced into the soil.

Would the results of this study apply here in dry, irrigated California? Carol Frate, Farm Advisor in Tulare County, has done some work looking into this. Sweeping the manure out of the furrows in the no-till systems facilitated irrigation, but otherwise there was no significant difference in corn silage yield compared to the conventional system. As no-tillage use increases in California further research may be necessary, but I believe manure can be used effectively in conservation tillage systems on the soils and environment in and around Merced County.

Stoddard, C.S., J.H. Grove, M.S. Coyne, and W.O. Thom. 2005. Fertilizer, tillage, and dairy manure contributions to nitrate and herbicide leaching. J. Environ. Qual. 34:1354-1362