

## **Animal Nutrition and Dairy Industry Sustainability**

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Animal nutrition will have a strategic responsibility on the coming regulatory process related to environmental stewardship. At farm level the two areas to work with dairy cow nutrition will be: feeding management to minimize nutrient excretion maintaining economical efficiency and estimation of nutrient excretion and/or manure chemical composition.

A recent published paper in the Journal of Dairy Science discussed the advances in animal nutrition and sustainability (VanderHaar and St-Pierre, 2006). The authors point out that over the past 100 years, numerous studies have demonstrated that a dairy cow's nutrition have a major impact on productivity. Unfortunately, the dietary intake or density of a nutrient at which efficiency is maximized is different than that which maximizes profits. For example, one of the mentioned researchers extensively studied the efficiency of dietary protein content for milk yield. One of the main conclusions was that for a herd with an average potential of 35 kg milk/day, the maximum physical efficiency is achieved at crude protein content in the diet of 14.9%, whereas maximum economical efficiency is achieved at a crude protein of 18%. More protein in the diet generates more net income, but also, leads to more nitrogen being excreted. According to the authors one possible solution is to assign an economic cost to nitrogen excretion and the maximum economic efficiency likely will occur closer to the point of maximum physical efficiency. For the previous example, the U.S.A. official system (National Research Council, 2001) predicts a requirement of 15.2% of crude protein content in the diet, which is the result of the rumen (9.7%) and the intestine (5.5%) requirements. But, these two are equivalent to crude protein requirement only if the rumen and the intestine requirements are perfectly balanced, which is difficult managing different feedstuffs, by-products, prices, and crude protein contents in feeds. Other researchers working under controlled conditions suggest that no increase of milk yield or milk protein can be expected for dairy cows with more than 16.5% of crude protein in the diet. The complexities of protein nutrition and limitations in measuring feed nitrogen fractions make accurate specifications for feed protein fractions difficult. Today, commercial dairy farms are trying to maintain a positive cost benefit relationship, a safety margin of crude protein content in the diet should be considered. In terms of animal performance, VanderHaar and St-Pierre indicate that the economic risk of underfeeding protein in dairy cows is greater than the risk of overfeeding protein, so protein efficiency has not been maximized in the past, nor is it likely maximized in the near future.

In respect to the second point (manure composition), important data has recently published by the American Society of Agricultural Engineers. Nevertheless, more local information is needed. The question is why animal nutrition is a very important tool to estimate manure nutrient composition. Some of the answers may be: 1) because is difficult to control all the input in a typical California dairy farm, they are high intensive manage and labor with many interactions with other systems, a mass balance might represent a high cost for a normal dairy; 2) due to more than 80% of the total inputs in a typical dairy farm are feeds, and because fertilizers (5 -15% of the inputs) can be reduce with a good manure management, it should be possible to estimate feeds inputs through nutrients intake, and manure production and composition with the software used to balance diets.