A new tool to minimise protein losses in dairy farming

For several years, dairy farmers have frequently faced feed price variations and milk price fluctuations that affect their profit margin. Feed costs generally represent more than 50% of the variable costs in animal husbandry, making them a crucial parameter when it comes to profitability.

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On the one hand, dairy farmers are constantly striving to improve the genetic potential of animals and enhance management measures. Still, on the other hand, they also try to optimise the feed costs to prevent a long-term profit margin decrease.

In this context, maximising feed efficiency while keeping production costs low represents one, if not the, key to success. To help farmers achieve this balancing act, the feed industry always creates innovative solutions, one of them being phytogenic feed additives (PFA).

Prices on the rise

The continuing price increases have not spared the feed industry. Prices for protein sources in feed have been high for a year now, especially for soybean meal (Fig. 1). But cereals, such as corn and wheat remain expensive as well (above €300/T).

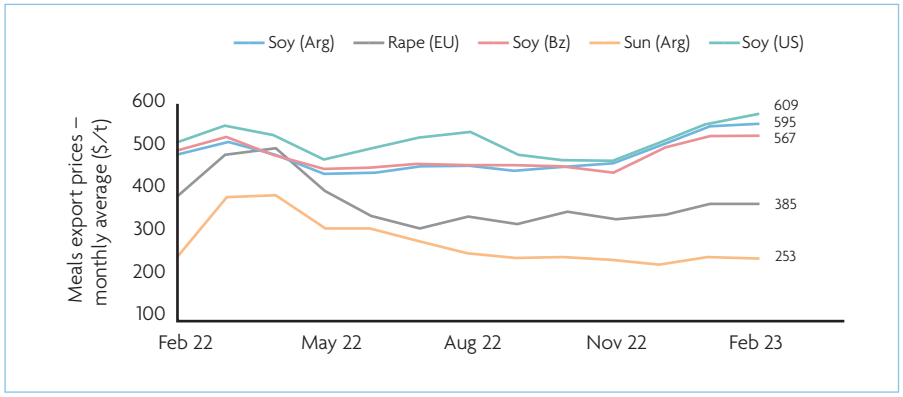
Correspondingly, this feed cost increase entails an increase in milk and meat prices.

However, for the past couple of months, there have been some signs of milk prices decreasing. Milk prices have dropped in New Zealand and the USA, and the milk spot price in Europe has also started to decline, this is due to a lack of demand in export markets (China).

Thus, the dairy industry faces a scissors effect (high feed costs and low milk prices).

The good news: there are new approaches to help farmers and feed mill companies save feed costs, allowing feed formulation and diet optimisation flexibility and with PFAs serving as key tools.

Fig. 1. Evolution of raw material costs. (source: DG Agri, Oilseeds dashboard, February 2023).



Unique protein efficiency

Ruminant animals' physiology is unique regarding protein metabolism. The rumen microflora can synthesise microbial proteins from nitrogen sources (rumen degradable protein (RDP), amino acids, non-protein nitrogen, and fermentable energy.

The amino acid profile of these microbial proteins is relatively stable and well-balanced, especially the levels of lysine and methionine.

Some rumen bacteria can degrade proteins into ammonia (NH3) (protein hydrolysation), and some may synthesise amino acids from ammonia and the carbon chain. This yield of protein synthesis is relatively low (about 50%) and depends on the nutrient level (fermentable organic matter, minerals, and vitamins), synchronicity between degradable proteins, and fermentable organic matter in the rumen.

The main locations where digestion of the microbial proteins occur are the abomasum and the small intestine. Based on the rumen yield, the percentage of true protein, and the rate of digestibility, only between 50% and 60% of the metabolised yield is achieved.

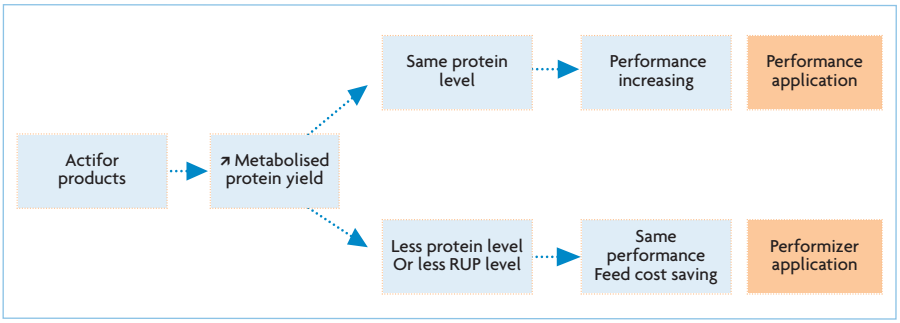


Fig. 2. Ways of the utilisation of well-formulated phytogenic solutions in dairy diets.

In parallel, the rumen undegraded protein (RUP), also called bypass protein, is digested in the abomasum and the small intestine in the acidic environment. Here, the digestibility and the amino acid profile depend on the raw material characteristics too.

The yield of metabolised protein out of RUP is generally higher than microbial protein (between 75% and 85% in the diet) and is directly linked to the protein digestibility of the raw materials (60-90%).

Both types of protein are metabolised in the small intestine will be utilised for milk protein synthesis and maintenance needs.

There are different ways to support the metabolised yield (efficiency):

- Improved bypass protein leads to higher metabolised yield by improving protein digestibility in the small intestine.
- Stimulating microbial protein efficiency involves influencing the microbial microflora. For example, reducing Entodiniae (a type of protozoa) can enhance rumen synthesis.
- Maintaining an optimal ratio of amino acids and ensuring their sufficient availability in the diet (feed protein) is crucial for milk synthesis in the udder. When using synthetic amino acids, it is essential to evaluate their availability and digestibility in the small intestine.

Plant extracts support improvements in nitrogen efficacy

Be it in the rumen, in the small intestine, or the udder – opportunities to improve the protein metabolism of cows need to be considered. Selected precious plant extracts (aldehydic EO, spices, tannins, and saponins) added to a well-formulated, tailored solution has shown to support the effectiveness of metabolised protein in dairy cows.

These natural, holistic solutions can potentially unfold their impact on three levels based on various sections of the digestive tract:

- Reduced protein degradation in the rumen will increase the level of bypass protein, thus, lowering protein losses in the urine.
- Improved rumen function leads to a higher amount of fermentable organic matter, hence raising the efficiency of microbial protein production. This will help lower ammonia losses from the rumen, via the liver (where it is transformed to urea) into the urine.
- Better protein digestibility in the small intestine will reduce protein losses in faeces.

In an in vivo trial, a unique phytogenic solution (Actifor) has demonstrated improved protein efficiency by 2.7% (data not shown).

Different types of application

When supplemented via the so-called 'performance' application, selected phytogenic feed additives optimise intake and may increase milk production, milk protein content, and help reduce protein losses.

In addition to potentially increasing metabolised protein yield, performance, and protein efficiency, there is also another way of utilising phytogenic solutions.

When talking about obtaining the same performance in dairy cattle while reducing the nutrient level (crude protein), we talk of the Performizer concept (Fig. 2).

With this approach, the dietary protein level can be reduced by approximately 0.5%, leading to reduced feed costs while maintaining the performance of animals.

Another possibility is to use this concept with a diet adjustment around the protein balance: in this case, the bypass protein level can be reduced (less RUP) by 0.5-1%, and the degradable protein level can be increased (more RDP).

This means a possible replacement of bypass protein sources (for example, protected soybean meal) with regular protein sources (regular soybean meal) or regular dietary protein meal with non-protein nitrogen sources (urea, vinasses).

Possible protein reduction, and corresponding inclusion of phytogenic feed additives, not only leads to a reduction in feed costs, but also has a positive impact on the environment as increased protein efficiency means reduced protein wastage (Fig. 3). Moreover, the Performizer application opens new flexibility and independence in terms of use of raw materials. This means using secondary raw materials, by-products, non-protected or non-protein raw materials, and having the possibility of drawing on regional resources.

PFAs – for your cow's sake and your profitability

The continuing high raw material prices in the feed industry are challenging dairy farmers all over the world. There is evidence that optimising dairy rations with phytogenic feed additives represents a reliable, cost-effective strategy, ensuring feed efficiency and thereby protein efficiency.

The application of phytogenic solutions is an excellent way to help reduce feed costs, as it offers possibly more flexibility in designing diet formulations for dairy cows while considering regional resources of feed components, especially proteins. ■

References are available from the author on request

Fig. 3. Improved performance in dairy cows using the Performizer concept.