Eliminating waste protein from diet to help cut herd feed bills

Paying closer attention to how cows utilise protein could be a way to reduce feed costs this winter, according to new research presented at the recent British Society of Animal Science Conference.

Limiting the impact of higher feed commodity prices on the cost of production will be a major objective when formulating diets for the coming winter. The prices of the principal proteins like soya and rape have increased markedly and there are doubts that they will fall back to a great extent in the next few months.

More precise formulation

This makes the results of a new trial at AFBI in Northern Ireland, which were reported at the recent British Society of Animal Science (BSAS) conference, even more timely. They suggest that, by being more precise when formulating the protein fed, it is possible to increase the efficiency of Nitrogen use and reduce dietary crude protein level without compromising performance.

Researcher Aimee Craig explained that dairy cows are poor utilisers of Nitrogen. Nitrogen Use Efficiency (NUE), which is calculated as the milk Nitrogen output as a percentage of the Nitrogen fed, is typically around 30%.

"This means a high proportion of Nitrogen is wasted. If we can improve NUE it will be possible to reduce feed costs and also cut ammonia, nitrous oxide and nitrate emissions—helping meet reduction targets.

"The trial was set up to examine if it was possible to reduce the crude protein in diets to improve NUE without affecting performance, particularly in early lactation."

Effect of total diet crude protein content on performance of early lactation cows

	15% CP diet	16% CP diet	17% CP diet
Dry Matter Intake (kg/day)	23.2	23.3	23.8
Average milk yield (kg/day)	35.7	37.1	36.3
Fat (%)	4.49	4.46	4.47
Protein (%)	3.44	3.48	3.49
Combined fat and protein (kg)	2.82	2.92	2.89
Milk urea (mg/kg)	97	115	114
Nitrogen Use Efficiency (%)	34	34	31

Cows were split into three groups and were fed a diet made up on 50:50 grass silage and concentrates, plus a small amount of chopped straw. The same silage was fed to all cows throughout the trial.

Cost of concentrates

Diets were formulated to be a total of 15%, 16% or 17% total crude protein by varying the protein content in the concentrates. At the time of the trial, the concentrate for the 15% CP diet cost £296/t, for the 16% diet was £303/t, while the concentrate for the 17% total CP diet was £312/t. The diets were formulated to have the same total energy content and were balanced to meet the cows' requirements for metabolisable protein.

Cows remained on the diets for 180 days and, in addition to production information, blood ureas were regularly measured. The results showed that there could be opportunities to look to reduce crude protein content (table 1).

"There was no difference in dry matter intakes, milk yield, compositional quality or yield of fat and protein between the different crude protein levels," Ms Craig explained. "The yield of cows fed 15% crude protein tailed off towards the end of the trial.

"There were big differences in milk urea Nitrogen with levels increasing with crude protein content. Blood urea protein also increased. When NUE was calculated, we saw reduced levels as dietary crude protein increased. In simple terms, cows used Nitrogen more efficiently at lower crude protein levels.

"Overall, reducing crude protein in the diet had no effect on intakes and yields but improved NUE and reduced feed costs. At the time of the trial, each1% reduced in crude protein saved around £8/tonne.

"Provided diets are balanced for metabolisable protein—which is the protein that the cow actually uses—it could be possible to reduce total dietary crude protein without affecting cow performance and help reduce emissions," Ms Craig concluded.

Legal requirements

David Wilde, national ruminant technical manager at Massey Harpers Feeds, says that while it is a legal requirement to state the crude protein content of feeds on the label this should not be taken as an indication of how well that feed will meet the requirements of the cow. He stresses that cows have no requirement for 'crude' protein.

"When assessing and meeting a cow's protein requirements, what nutritionists need to look at is the metabolisable protein, and

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specifically the balance between two key fractions.

"MPE is bypass protein plus the microbial protein made in the rumen from rumen energy. This is the protein cows use for production. MPN is the bypass protein plus microbial protein from the rumen degradable protein in the diet and shows the excess of degradable protein in the diet.

"Cows have specific requirements based on both of these. It is the balance between them and the ME content of the diet that allows rations to be effective. And this is what was achieved in the AFBI trial.

Cows at grass need supplementing carefully to meet protein requirements, improve Nitrogen use efficiency, and cut nitrate and ammonia emissions

"Feedstuffs and ingredients will vary in how they supply these fractions, and this explains why two 18% compounds can perform differently. The two concentrates could have similar MPN content but substantially different MPE levels, which will affect how well they support milk production.

"The higher the crude protein of the feed, the higher the MPN content, while MPE is affected by the digestibility of fibre and starch in the rumen. This explains why some diets with a lower crude protein can still meet the metabolisable protein requirements of the cows."

Mr Wilde says that dairy rationing systems based on the Feed into Milk project describe feeds in more detail. This means that in particular they can provide a more accurate assessment of protein supply and quality. It also allows compounders to produce compounds and blends that deliver protein more effectively.

"The Massey Harpers FiMLAC range, for example, is formulated to metabolisable protein, allowing more accurate balancing of forages. Typically, concentrates have higher levels of MPN than MPE which can result in poor NUE. But this ratio can be modified to supply the MPE the cow needs."

Balancing protein at grazing

"Grazing is a good example of this. Grazed grass will contain large, excessive levels of MPN, leaving the cow short of MPE. To balance grazing precisely requires a concentrate that is high in MPE and low in MPN, which is what we deliver with our 'reverse ratio' grazing compounds.

"With the focus firmly on steps that can be taken to reduce the impact of higher protein prices this winter, it will pay to make sure that diets are calculated based on MPE and MPN. This will help improve NUE and keep cows milking well with lower crude protein contents. This may, in turn, help to reduce Nitrogen-related emissions," Mr Wilde concludes.