TechNote 19

Use supplements profitably

IN THIS TECHNOTE

In early lactation, energy is generally the primary limiting factor in a pasture-based system. Therefore, supplementary feeds should be used to fill an energy deficit, and not to try and balance, or improve, the nutritive value of the cows' diet.

For more details see TechNotes 10: Response to supplements, and 18: Allocate required nutrients.

In early lactation, supplements can be used:

- If herd demand is greater than feed supply,
- To achieve pasture management targets (e.g. spring rotation planner, pre-grazing leaf stage/yield, round length and/or pasture residuals),
- If poor weather (e.g. late snow storms, prolonged periods of rain) prevents good pasture utilisation and intake.

19.1 Determine the milksolids response

When supplements are incorporated into a pasture-based system, there is the potential for increased total intake and production; however, the actual milksolids response is variable and often less than expected. This is because there are several key factors that affect the response to supplements and these are highlighted in Figure 1. Approximate responses for an early lactation cow are provided in Figure 1 and these factors are described in detail in TechNote 10.

For more details see TechNote 10: Response to supplements.

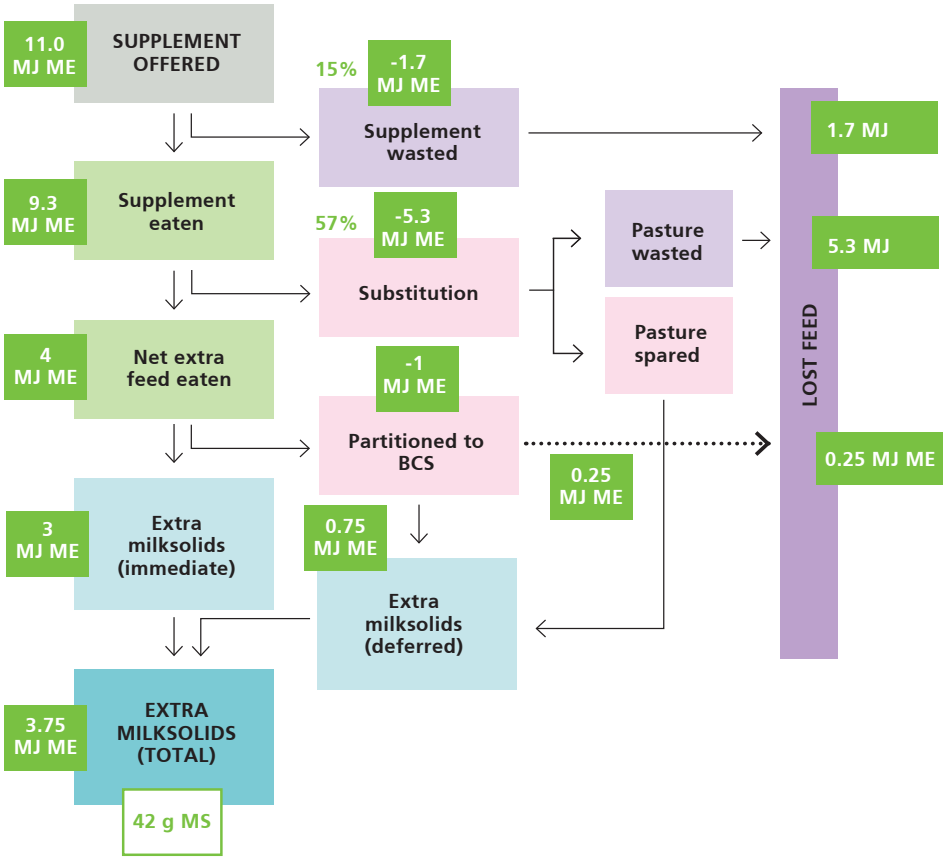
From a physiological perspective, the dairy cow requires 70 - 80 MJ ME to synthesise 1 kg milksolids (3.5 % protein and 4.5% fat). Energetics would then predict that 1 kg DM could produce 140 – 150 g milksolids; however, this is the maximum possible physiological response and assumes that all the energy from the supplementary feed is converted into milksolids, which due to factors such as wastage, substitution, and energy partitioning, is not the case.

Q: What do I need to consider when determining the milksolids response to supplements?

A: The most important factors to consider are how hungry the cow is, and how the supplements and the pastures are managed. Average milksolids responses are between 55 to 80 g milksolids/kg DM.

In the scenario presented in Figure 1, the total milksolids response to the supplement offered is 42 g/kg DM. This is the sum of the immediate milksolids response (38 g/kg DM; produced while cows are receiving the supplement), plus the deferred milksolids response (6 g/kg DM; extra milksolids produced due to energy from BCS and spared pasture). In this scenario, where cows are offered 2 kg DM PKE per day, the predicted total milksolids response would be 84 g/cow/day or an increase from 1.9 kg to approximately 2 kg milksolids.

Figure 1: Estimated total milksolids response during early lactation, if 2 kg DM of PKE is fed out in a trailer to a 450 kg cow eating 16 kg ryegrass, and producing 1.9 kg milksolids.



Estimated milksolids responses during spring from different scenarios are outlined in Figure 2. The actual milksolids response during early lactation/spring is often less than expected. These graphs provide examples of the impact that feeding method, feed type, and grazing residuals have on the predicted total milksolids responses to 2 kg DM supplement.

The higher responses (e.g. greater than 80 g milksolids/kg DM) occur when supplement quality (MJ ME) is high, and supplement wastage, and grazing residuals are low.

19.1.1 Supplement type

Supplement composition can affect substitution rate and the milksolids response. Substitution is approximately 10% greater with a forage (e.g. silage) compared with a concentrate (e.g. cereal grain), and within the concentrates, substitution is greater with starch-based concentrates (e.g. maize grain) compared with fibre-based concentrates (e.g. PKE).

Supplement composition also affects the amount of milk protein and fat that is produced. Supplements high in starch will increase the production of milk protein more than milk fat, while feeds high in fibre increase the production of milk fat more than milk protein. This effect is not shown in Figure 2 but is taken into consideration in the DairyNZ Supplement Price Calculator and should be taken into consideration when calculating revenue generated from the milksolids response.

For more details see TechNote 10: Response to supplements.

19.1.2 Pasture management

Grazing residuals are reflective of cow hunger, which in turn impacts on the rate of substitution and the total milksolids response. The hungrier the cow, the lower the post-grazing residual, the lower the substitution rate and the greater the milksolids response.

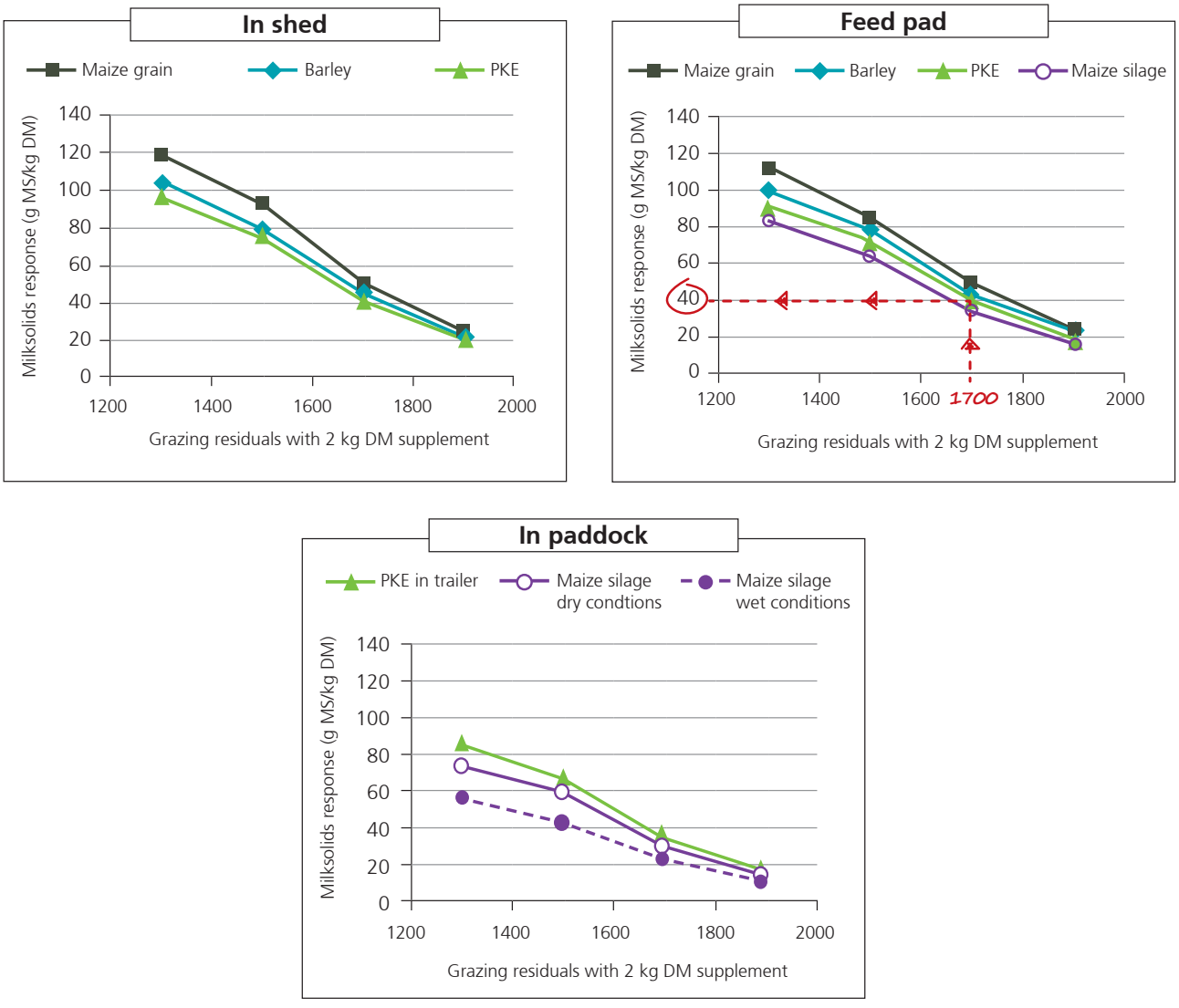
In addition, using supplements during a feed deficit (as reflected by a low post-grazing residual) will result in an increased deferred milksolids response, as this may prevent over-grazing and allow more grass to be grown.

The slope of the lines in the graphs from (Figure 2) highlight the range of milksolids responses possible, and the importance of pasture management. Although a high milksolids response can be achieved in specific scenarios, meta-analyses of research data, indicated an average response to supplements in grazing systems of 80 g milksolids/kg DM. Furthermore, an analyses of on-farm data from Ireland, indicated the average on-farm response to supplements may actually be lower than this at 55 g milksolids/kg DM.

It is important to take these factors into consideration, when making decisions regarding supplement feeding in early lactation.

For more details see TechNote 10: Response to supplements.

Figure 2. *Estimated milksolids response to 2 kg DM supplement fed at different residuals and using different feeding methods. (These are the grazing residuals with the 2 kg DM supplement included in the system).*



19.1.3 Energy partitioning

The milksolids response to supplements varies depending on where the extra energy is partitioned. Early lactation cows are genetically predisposed to produce milk. Thus, the majority of the extra energy eaten when supplements are fed is partitioned to milk production. However, after the first few weeks of lactation, some energy is partitioned towards BCS, and extra feed (e.g. supplement) can alter BCS 'nadir' (when BCS loss ceases), the total amount of BCS loss and the rate of BCS gain.

For more details see TechNotes 7: Lipid metabolism, 10: Response to supplements and 16: Determine energy requirements.

19.2 Choose good quality supplements and feed appropriately

It is important to ensure that if supplements are used in a grazing system, then they are of good quality, (e.g. greater than 11 MJ ME) and free from spoilage (e.g. must and mould). Supplementary feeds must also be stored and fed appropriately.

For more details see TechNotes 3: What's is a feed, and 4: Feed composition and characteristics.

Recommendations for incorporating supplements into a grazing system vary depending on the type and composition of the supplement. The speed at which supplements can be introduced into the diet depends on the rate at which the starch or sugar is degraded (broken down) or made available to the rumen bugs.

Feeds that are high in sugar (e.g. molasses and fodderbeet) need to be introduced slowly into the diet and total feeding levels restricted. For example: recommendations are that in early lactation molasses intake should not exceed 2 L/cow/day and fodder beet should not exceed 3 - 4 kg DM/cow/day. More information on fodder beet feeding is provided in TechNotes 24, 28 and 31.

The rate at which starch is broken down depends on the protein structure of the specific grain. For example, the protein structure of maize grain holds the starch in place for a longer period than wheat and therefore the starch in maize grain is broken down at a slower rate.

As a rule of thumb:

- starch breaks down in maize grain at about 20% per hour,
- starch breaks down in barley at about 25 - 30% per hour,
- starch breaks down in wheat at about 40 - 50% per hour.

However, these figures depend on the processing of the grain. Therefore, maize grain is a 'safer' feed and can be introduced into the diet faster than wheat. However, it still requires a transition period. A safe rule of thumb is 2 kg DM for the first day and then increase by 1 kg DM every two to three days, until you reach maximum recommended intake is reached.

In contrast, as PKE is low in starch it can be introduced into, and removed from, the diet without a transition period. Note the amount of PKE that can be fed may be limited by milk supply companies and their specific requirements.

Feeding a high starch supplement in combination with a high fibre feed, such as pasture, PKE or soyahulls, can reduce fibre digestion. Fibre provides the bulk of energy from pasture; therefore, starch or sugar based supplements can reduce the metabolisable energy available from pasture. This is most probably due to two primary reasons:

Q: Does feeding a high starch feed with PKE increase digestibility?

A: No, combining a high starch feed with a high fibre feed such as PKE, can actually reduce fibre digestion and the energy available from PKE.

- When cows are offered supplementary feeds, total intake generally increases and so does the speed at which feed travels through the intestine. The increased passage rate reduces the time available for feed to be digested, which means that feeds which are broken down more slowly by rumen micro-organisms (e.g. fibre) are not fully digested.
- Different microbial populations digest different types of carbohydrates. Starch based feeds, favour the population of microorganisms that digest starch and not those that digest fibre.

For more details see TechNotes 5: Carbohydrate metabolism, and 10: Response to supplements.

19.3 Determine the economics of feeding supplements

Decisions on purchasing and feeding supplements in early lactation should consider the predicted milksolids response and the total cost of feeding the supplement. Rarely will supplementation increase profitability unless there is an energy deficit.

For more details see TechNotes 9: Pasture management, 10: Response to supplements, and 18: Allocate required nutrients.

Resources are available to help calculate the cost/benefit of adding supplements to the system.

- The DNZ Supplement Price Calculator http://www.dairynz.co.nz/feed/feed-management-tools/supplement-price-calculator/
- The DNZ Spring Feeding Check http://www.dairynz.co.nz/publications/feed/

19.4 Further reading

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