



Reallocating concentrate amounts by herd milking order can increase milk yield

Smart Feeding - Factsheet 3

Key points

Feeding less concentrate to early-milking order cows and more to later-milking order cows slightly increased milk solids yield per cow compared to control cows fed equal amounts, but only in early lactation cows.

A combination treatment that simultaneously allocated more concentrates and reserved fresh pasture for later-milked cows in early lactation resulted in lower milk solids yield and profit compared to control cows.

Reallocating concentrate generated a daily advantage of 9c/cow in milk income minus feed costs over control cows and was less labour-intensive and easier to implement than reserving fresh pasture for later-milked cows.

Introduction

Recent research at Agriculture Victoria's Ellinbank SmartFarm as part of the Smart Feeding project in Dairy Feedbase has shown that cows milked first in the milking order produce significantly more milk than cows milked later in the milking order. As described in detail in Factsheet 1 of Smart Feeding, the milk yield of cows in early lactation declined by approximately two litres/hour for each hour the cows spent away from pasture during milking. Given that on many farms cows can spend up to three hours or more away from pasture at each milking event, this causes substantial variation in daily individual cow milk production within the herd.

Furthermore, the voluntary milking order of cows within the herd has been proven to be consistent, with broadly the same cows milked first and last each day.

Mitigation strategies

Practical farm management strategies that optimise the allocation of farm resources in a more even manner to the herd were considered to address the disparity in milk production between cows that are milked early, compared with cows milked later in the milking order. The aim was to increase the overall amount of milk produced by the herd from the same feed resource, thus improving the feed conversion efficiency (FCE) of the total herd.

Reserving fresh pasture for cows milked later in the milking order was tested as a management option to counteract this milking order challenge and the results of this strategy are outlined in detail in Factsheet 2 of Smart Feeding.

Another option tested was to reallocate the total amount of concentrate that the herd receives, so that instead of each cow receiving a flat (uniform) rate of concentrate supplement per day, the cows milked first are fed less and the remaining concentrate is allocated to the cows milked last, therefore offering them a greater amount of concentrate (Table 1 highlights the different amounts of grain fed during the experiments based on herd milking order).

A third option also investigated in this experiment was a combination of both mitigation strategies, where fresh pasture was reserved for cows milked later in the milking order and they were also allocated extra concentrate (simultaneously).

Outline of experiments

Two separate experiments were conducted, one using late lactation cows and one using early lactation cows. Reallocation of concentrate amounts was tested in both late and early lactation cows while the combination option (reallocation of concentrate and reserving fresh pasture simultaneously) was only tested in the early lactation experiment.

The main aim was to reallocate the total amount of concentrate fed to the herd based on milking order, which would theoretically provide a more even nutrient intake for all cows in the herd and increase average herd milk production.

In the late lactation experiment, there were three time-intervals used (Table 1), while in the early lactation experiment there were only two time-intervals in which the cows were returned to the paddock.

Table 1 Concentrate fed per cow in the late lactation experiment.

	Return to paddock immediately post milking (T0:00)	Return to paddock 1h 30 mins later (T1:30)	Return to paddock 3 hrs later (T3:00)
Control treatment (kg DM/day)	6	6	6
Reallocated concentrate (REALLOCATION) treatment (kg DM/day)	4	6	8

Figure 1 (below) shows the layout of the early lactation experiment where the combination treatment was also investigated. The control treatment in both early and late lactation experiments reflects what happens on most pasture-based farms in Australia.

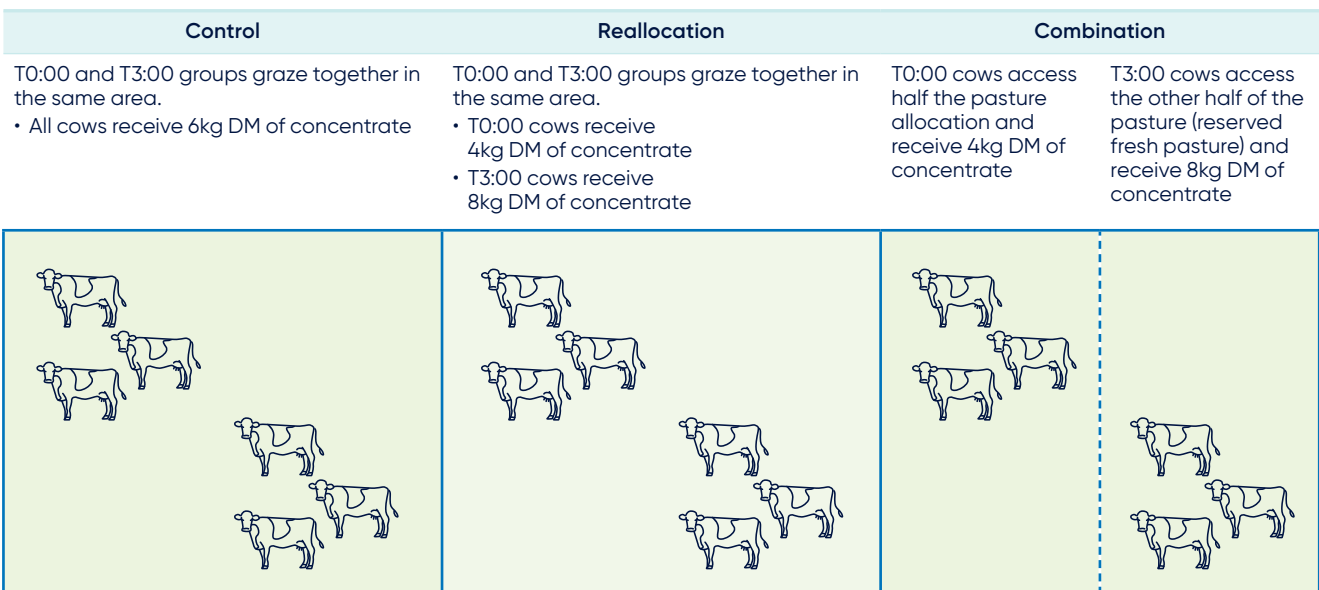


Figure 1 Outline of treatments in the early lactation cow experiment.

Results and implications

The average daily milk yield (kg/cow) in the early lactation experiment for each treatment, as well as at each time interval, is shown in Figure 2.

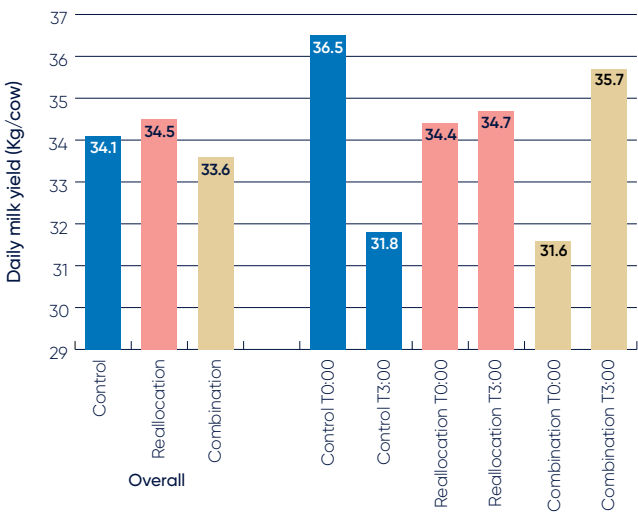
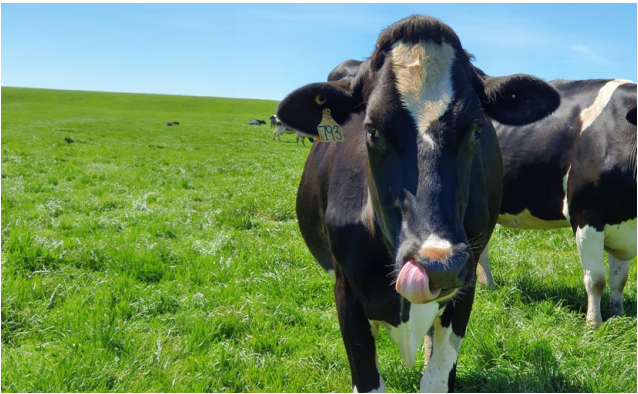


Figure 2 Average daily milk yield per cow in each treatment in the early lactation experiment.



The reallocating concentrate strategy succeeded in marginally increasing overall milk yield compared to the control group. Notably, milk production was very even between the T0:00 cows and T3:00 cows in the Reallocation treatment, while cows in the Combination treatment at the T0:00 interval (where the paddock was split in half so that fresh pasture was reserved for the T3:00 cows, AND the T0:00 cows were only fed 4kg DM of concentrate) were the lowest yielding group of all in the experiment.

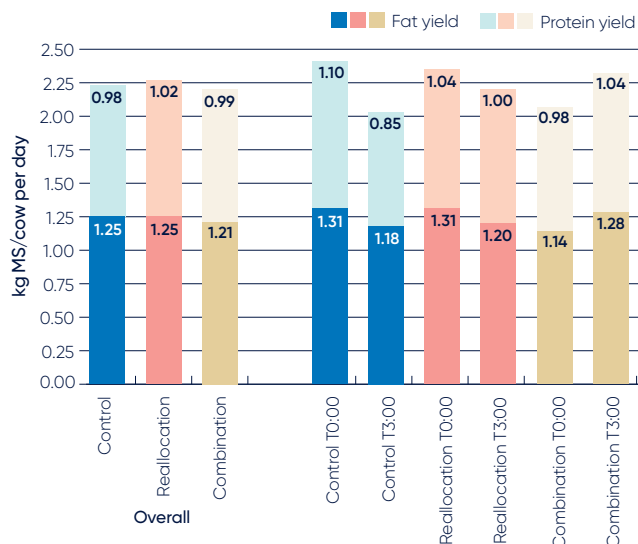


Figure 3 Daily milk fat and protein production (kg milk solids/cow) for each of the groups in the early lactation experiment. Darker shades = milk fat yield; lighter shades = milk protein yield.

Overall, the Reallocation treatment produced an average of **2.27kg** of milk solids per cow each day, compared to **2.23kg** for the Control treatment and **2.20kg** for the Combination treatment.

The marginally greater milk solids yield per cow when concentrate was reallocated offers some promise for this mitigation strategy, though the dairy milk solids yield advantage was relatively small.

Interestingly in the late lactation experiment, no milk solids yield advantage was observed in the Reallocation treatment when compared to the Control treatment, even when three time-intervals were investigated instead of two. Average milk solids yield in the Control cows overall, who were fed 6kg DM of concentrate, was **1.62kg of milk solids/cow** (0.87kg of fat and 0.75kg of protein) and overall yield in the Reallocation treatment where concentrate was fed at 4kg, 6kg or 8kg DM, depending on milking order, was also **1.62kg of milk solids/cow** (0.88kg of fat and 0.74kg of protein).

Dry matter intake differences

Late lactation experiment

In the late lactation experiment, there was no significant difference in overall average pasture DMI between the Control cows and Reallocation cows, when the different timepoints were all combined.

However, in the control group, pasture intake in the T0:00 cows that entered the paddock first and had access to high quality pasture immediately post milking, was 45% greater than the cows that entered the paddock three hours later at T3:00. The pasture intake difference between T0:00 cow and T3:00 cows in the Reallocation treatment was even greater – with a 61 per cent greater pasture DM intake observed in the T0:00 cows compared to T3:00 cows. However, the daily concentrate intake was higher in the T3:00 cows (7.8kg DM versus 4.0kg DM in T0:00) in the Reallocation treatment, whereas it was the same for all timepoints in the control group (5.9kg DM).

These results show that as expected, when grain was reallocated according to milking order, cows in the Reallocation treatment that returned to the paddock first (T0:00) compensated for the reduction in the amount of concentrate offered by consuming more pasture than the Control T0:00 cows.

Early lactation experiment

In contrast, in the early lactation experiment, the average total pasture intake of cows in the Reallocation treatment was 10% higher than the Control treatment. The pattern of pasture intake across time within each treatment was the same as the late lactation experiment however, with T0:00 cows eating significantly more pasture than T3:00 cows in both Control and Reallocation treatments.

The Combination treatment, where fresh pasture was reserved AND grain was reallocated away from T0:00 cows to T3:00 cows, showed the lowest overall differential in pasture intake between T:00 and T3:00 cows, but the T0:00 cows in the Combination treatment still ate marginally more pasture than T3:00 cows.

Pasture nutritive characteristics

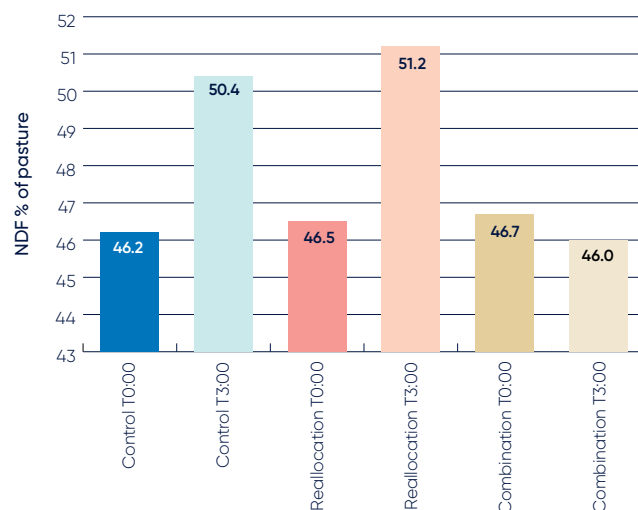


Figure 4 Pre-grazing pasture Neutral Detergent Fibre (NDF) levels in the early lactation experiment at each timepoint.

As shown by the shaded lines in Figure 4, at the T3:00 timepoint, pasture nutritive value declined (indicated by an increase in NDF concentration) in both the Control and Reallocation treatments at the T3:00 timepoint where no fresh pasture was reserved, but in the Combination treatment, the NDF concentration was similar at both timepoints because fresh pasture was reserved for the T3:00 cows in this treatment. This demonstrates how pasture NDF increases as cows graze lower into the sward profile, and relatively less leaf and more stem is present.

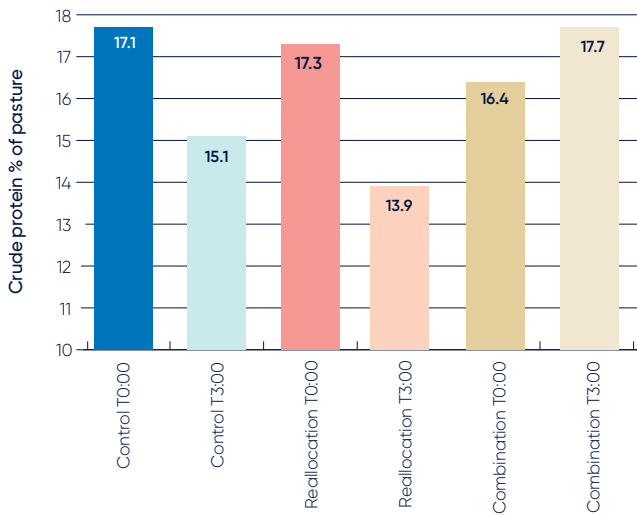


Figure 5 Pre-grazing pasture crude protein levels in the early lactation experiment at each timepoint.

A similar trend was observed in crude protein concentration at each time point, which was lower at T3:00 compared to T0:00 in the Control and Reallocation treatments but not in the Combination treatment (Figure 5).

Economic analysis

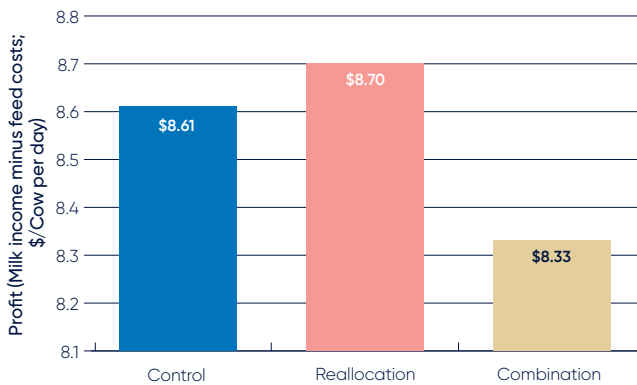


Figure 6 Milk income minus feed costs (\$/cow per day) for each treatment.

Milk income minus feed costs for each treatment was calculated using six-year average feed and milk prices. The Combination treatment was substantially less profitable than the other two treatments as shown in Figure 6. Even though the average milk yield and milk solids yield of the Reallocation treatment was marginally greater than the Control treatment, this didn’t translate into much extra profit/cow as the Reallocation treatment cows ate more pasture, meaning their daily calculated feed costs/cow were higher than the control cows. However, the projected 9c/cow per day advantage of the Reallocation strategy would still be worth \$45 per day on a 500-cow herd.

Overall implications for farmers

- Reallocation of concentrate to cows based on herd milking order, where cows milked first got less and cows milked later got more concentrate, resulted in marginally more milk solids per cow in early lactation cows but had no impact on milk solids yield in late lactation cows.
- The cows in the Reallocation treatment had a higher estimated dry matter intake of grazed pasture overall, than control cows, but again this difference was only observed in early lactation.
- A Combination treatment of two mitigation strategies applied simultaneously (reserving fresh pasture and providing more concentrate to cows milked later in the milking order) was tested in the early lactation experiment and had the poorest milk solids yield response and lowest estimated profit/cow.
- The cows milked first in this Combination treatment were overly penalised in terms of restricting concentrate intake and not having full access to the total herd pasture allocation, compared to cows in the other two treatments, thus negatively impacting milk solids production.
- The experiment demonstrated how the nutritive characteristics of the pasture that cows are grazing within the herd is affected by herd milking order, as the nutritive value of pasture was significantly lower by the time the T3:00 cows arrived at the paddock in both the Control and Reallocation treatments.
- One advantage of the reallocating grain strategy compared to reserving fresh pasture in the paddock is that it is less labour intensive and easier to implement, particularly in modern dairies. Therefore, this strategy may be appealing for farmers depending on their system.