Early lactation grain feeding strategies to maximise profit

First 100 days - Factsheet 4

Key points

Feeding cows a concentrate mix of 9kg DM/day up to 70 days in milk and 5kg DM from 71 days in milk onwards, generated a marginally greater net benefit per cow (milk income minus feed cost) than feeding the same amount of concentrate overall at a flat rate of 7kg DM/day.

Using liveweight gain as a trigger point to reduce grain supplementation was the least profitable of the four strategies tested.

Substitution of grazed pasture was evident when 9kg DM/day of grain was fed for all of early lactation; however, this treatment produced more milk in the carryover period than the other feeding strategies when all cows were offered a common diet from 119 days in milk onwards.

Introduction

Feeding the same amount of concentrate to each cow in the herd on a pasture-based dairy farm is a common supplementary feeding approach in Australia. While the amount of concentrate offered to the herd may vary during the year – due to factors such as stage of lactation, the availability of grazed pasture and whether other supplementary forages are being fed – the overall diet is, in effect, formulated for the 'average' cow in the herd. However, there is always some variation in daily milk yield between the highest and lowest producing cows in the herd.

Some farms have the infrastructure capability to feed individualised amounts of concentrates to certain cows within the herd based on factors such as milk production or stage of lactation. However, previous research experiments have shown that the perceived benefits of this approach are rarely observed in grazing-based systems when milk production is measured at a herd level.

An alternative supplementary feeding strategy is to match nutrient supply from concentrates with the period within the lactation when cows are diverting nutrients towards milk production, at the cost of body condition.

In early lactation, nutrients from feed are generally prioritised towards milk production and the cow enters a state of negative energy balance. In pasture-based systems in particular, cows often cannot consume enough nutrients to meet demand for milk production and body reserves are used during this period. From approximately 70–80 days in milk, feed energy is increasingly diverted towards replenishing lost tissue reserves and reproduction, as cows emerge from the negative energy balance phase.

However, there is substantial variation within individual cows in the timing of this process. Potential improvements in milk yield could come from providing more energy to cows in negative energy balance and reducing energy supply from supplements when they shift to a state of positive energy balance at around 70–80 days in milk.

The availability of liveweight walk-over scales and other automated weighing options in some modern dairies provides an opportunity to use the point where cows start gaining weight in early lactation as a trigger to manipulate supplementary feeding and improve overall milk production.

Experiment outline

Four treatments were tested in grazing dairy cows from 14 to 118 days in milk, followed by a carryover period from 119 to 200 days in milk where a common diet was offered to all cows. A grain mix of wheat grain, barley grain and canola meal comprising 25 per cent, 50 per cent and 25 per cent of total dry matter (DM) respectively, was previously identified as the most profitable option in First 100 Days – Factsheet 3 and was offered to all cows in this experiment in one of four treatments.

Treatment	Concentrate	Average amount offered/day
1 – High (HI)	9kg DM/cow	9kg DM/cow
2 – Medium (MED)	7kg DM/cow	7kg DM/cow
3 – 70 DIM (days in milk)	9kg DM/cow up until 70 days in milk, then 5kg DM thereafter	7.1kg DM/cow
4 – Liveweight gain (LWG)	9kg DM initially then 5kg DM/cow from the point each individual cow began gaining liveweight	7kg DM/cow

From 119 to 200 days in milk, all cows were fed a diet of 7kg DM of the same grain mix plus grazed pasture, however only milk yield (see Figure 1 below) and milk composition were measured from this point.

Dry matter intake of grazed pasture and concentrate

Daily average total dry matter intake of the grain mix from the start of the experiment to 118 days in milk was 9kg DM in the HI treatment and 7kg DM in the MED, 70 DIM and LWG treatments.

Individual cow pasture intake was estimated over five consecutive days at two timepoints – 41 days in milk and 97 days in milk.

Feeding 9kg DM of grain from 14–118 days in milk resulted in the greatest intake overall, as expected. However, as shown in Figures 2 and 3 (on the following page), the contribution of pasture to total DM intake varied depending on the strategy used. Even though similar amounts of concentrate were consumed overall from 14–118 days in milk for the MED, 70 DIM and LWG treatments, the 70 DIM and the MED treatments consumed more pasture than the LWG treatment in the two measured periods.

Milk yield

Milk yield across the entire experiment, including the carryover period from 119 to 200 days in milk when all cows were offered the same diet, is shown in Figure 1. Cows on the LWG treatment produced less milk than the other three treatments throughout, despite receiving the same amount of grain mix as the MED and 70 DIM groups overall.

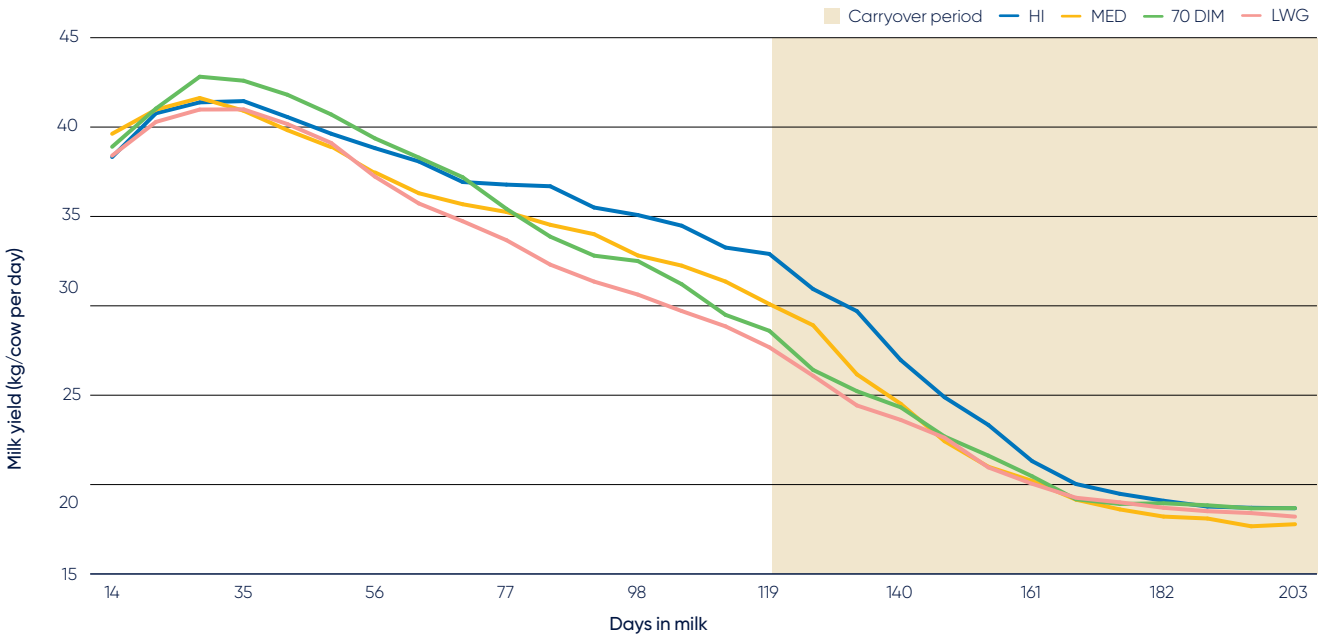

Figure 1 Daily milk yield across the entire experimental period for each treatment.

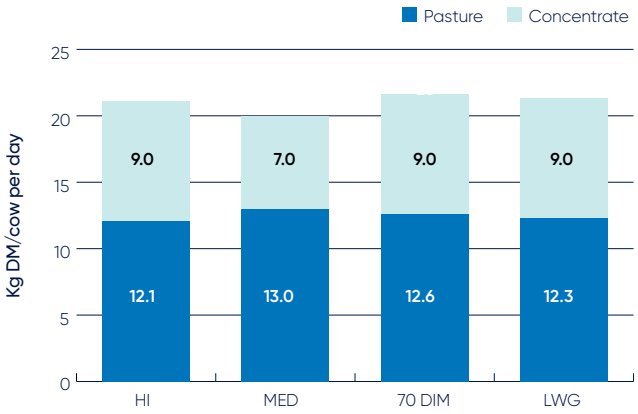

Figure 2 Total daily dry matter intake per cow from 41–45 days in milk.

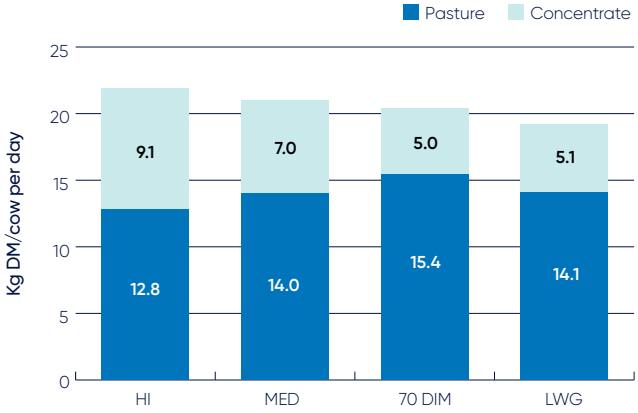

Figure 3 Total daily dry matter intake per cow from 97–101 days in milk.

The HI group received more grain mix overall than the other three treatments. However, the milk yield of these cows did not differ statistically from the MED or 70 DIM groups; therefore, more of the milk in those two treatments came from grazed pasture.

Milk protein and fat concentrations were not significantly different between treatments at any stage and ranged from 2.9–3.2 per cent for milk protein and 3.7–3.8 per cent for milk fat.

Pasture intake measurement periods

The experiment allowed an interesting sub-comparison between feeding 9kg DM vs 7kg DM of grain mix in early lactation (HI v MED treatments).

From 41–45 days in milk, feeding an extra 2kg DM of grain mix resulted in an increase of 1.2kg DM in total dry matter intake (21.2 vs 20.0kg DM for the HI vs MED treatments). This resulted in an extra 0.7kg of milk for cows in the HI group over the MED group (40.7 vs 40.0kg/cow), but there was also some substitution of pasture evident.

In the second period where pasture intake was measured, starting at 97 days in milk, grain mix intake was 2.1kg DM higher for cows in the HI group and they produced 2.3kg more milk than cows on the MED treatment. As shown in Figure 3, the extra 2kg DM of concentrate resulted in more milk from around 60 days in milk onwards.

In addition, there was a carryover milk yield benefit for cows that had received the HI treatment for the first ~40 days of the carryover period, despite the fact all cows received the same diet from 119 days in milk onwards.

Economic analysis of each treatment

Milk income minus the cost of the grain mix was used for each treatment as an indicator of profitability, across the treatment and carryover periods.

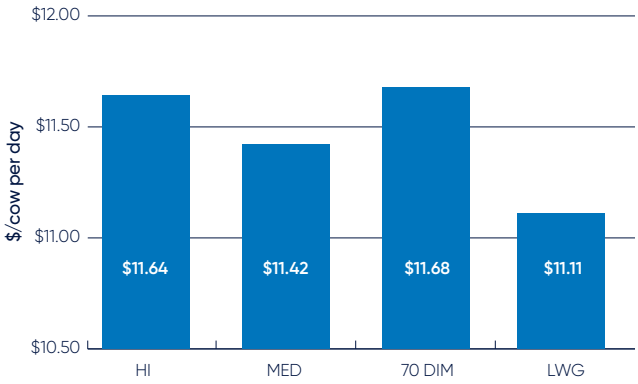

Figure 4 Milk income minus cost of grain mix for each group in the treatment period (14–118 days in milk).

On average, the net benefit was not greatly different between the first three treatments during the treatment period when the feeding strategies were applied (Figure 4). When the cost of pasture was also accounted for, the profitability of the HI, MED and 70 DIM diets was still similar – $9.59, $9.17 and $9.47 per cow per day, respectively.

For the MED, 70 DIM and LWG treatments, all cows received the same total amount of grain during the treatment period. The economic analysis showed that during the carryover period, the 70 DIM strategy was worth $6.87/cow per day, compared to $6.46/cow for the MED strategy and $6.37/cow for the LWG strategy.

Across a full lactation, the 70 DIM strategy would be worth an extra $108/cow compared to the MED treatment. However, this does not account for the cost of pasture or any factors such as the varying amounts of energy used from body tissue mobilisation and the cost of replenishing body condition, as well as potential labour costs associated with switching every cow from 9kg DM to 5kg DM from 70 days in milk onwards.

Implications and summary

The experiment compared four supplementary grain feeding strategies across the period of early lactation, a time where significant metabolic changes are occurring in cows as they reach peak milk yield and dry matter intake before declining and moving into the tissue replenishment phase in mid-lactation.

Using the point at which cows start gaining liveweight as a trigger to reduce concentrate feeding was least profitable, resulting in lower overall milk yield and pasture intake.

Despite the cows on the 70 DIM treatment consuming more pasture, they were only marginally more profitable over the whole lactation than cows fed via the MED strategy. For some farmers, this increase in profit may not be enough to justify the extra work required to individually change grain amounts for each cow when they reach 70 days in milk.

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