Type of grain fed post-calving affects milk yield in later lactation

First 100 days - Factsheet 5

Key points

Supplementary feeding strategies used in the fresh and early lactation periods can improve profitability by programming dairy cows to produce more milk later in lactation.

Feeding maize grain instead of wheat grain for the first three weeks post-calving, followed by a grain mix of wheat grain, barley grain and canola meal in early lactation, was estimated to be worth $70/cow more than feeding wheat grain alone at the same rate of feeding.

Strategies such as feeding more of the grain mix to cows in the first 70 days in milk and less from 71 days onwards, or adjusting the diet weekly based on estimated profit were also tested, but did not show additional benefit above feeding the same grain mix at a flat daily rate, which is also an easier strategy for farmers to implement.

Introduction

A significant opportunity exists to adjust the amount and type of supplementary concentrates fed to grazing dairy cows in Australia to increase milk income over feed costs – and ultimately grow overall herd level profitability.

The broader challenge is that most feeding strategies employed on farms are targeted at the 'average cow' in the herd. This means that lower producing cows receive nutrients in excess of requirements and may begin depositing these additional nutrients as fat, while higher producing cows might not receive sufficient nutrients from feed to meet their production potential.

The Dairy Feedbase – First 100 Days project team has already shown several positive outcomes from various grain supplementation strategies in fresh cows (first three weeks post-calving) and early lactation cows (first 100 days of lactation). The fresh cow experiments described in Factsheet 1 and Factsheet 2 of this series showed how, in certain circumstances, feeding maize grain instead of wheat grain in the fresh cow period resulted in greater dry matter intake and milk yield.

In addition, the longer-term experiments described in Factsheet 3 and Factsheet 4 of this series showed how feeding canola meal as part of the grain mix is more profitable in early lactation compared to a grain mix of just wheat and barley. Adjusting the allocation of grain mix across the early lactation period to provide more grain over the first 70 days in milk when cows are predominantly in negative energy balance and less after 70 days, instead of a flat rate throughout, could also be marginally more profitable in some circumstances.

The logical next step in the First 100 Days research program was to combine fresh cow feeding strategies, targeted at the first 21 days in milk, with early lactation feeding strategies from 22 days in milk onwards.

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Experiment outline

Eight treatments were evaluated in this experiment (Figure 1). Over the first 21 days in milk, half of the cows were offered 5 kg DM of maize grain (slow starch fermentation in the rumen) and the other half were offered 5 kg DM wheat grain (rapid starch fermentation in the rumen). All cows were also fed 1 kg DM of canola meal.

From 22–130 days in milk, four grain mix treatments were offered to these cows:

1 7 kg DM/cow of wheat grain from 22–130 days in milk **(Flat wheat)**
2 7 kg DM of a grain mix containing wheat grain, barley grain and canola meal from 22–130 days in milk **(Flat grain mix)**
3 9 kg DM of the wheat grain, barley grain and canola meal mix from 22–70 days in milk, dropping to 5 kg DM from 71–130 days in milk **(70 DIM)**
4 7 kg DM of the wheat grain, barley grain and canola meal mix initially, adjusted up or down by 1 kg DM each week for every individual cow based on profit (milk income minus the cost of the grain mix) for each individual cow **(Profit)**

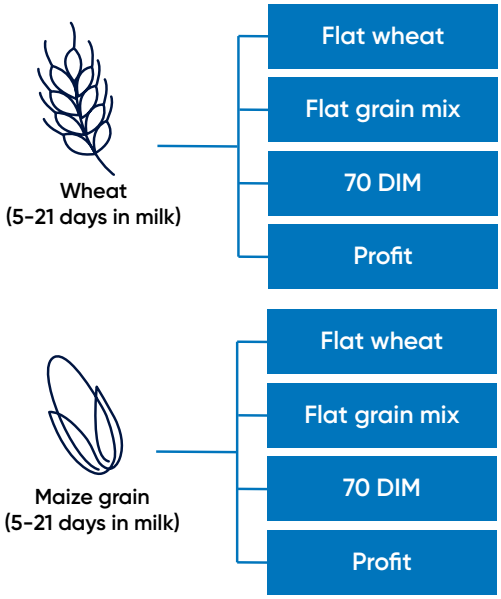

Figure 1 Diagram of the eight treatment diets tested from five to 130 days in milk.

Milk production was also measured for all cows in a subsequent carryover period from 131–200 days in milk, during which all cows were fed a common grain mix and continued to graze perennial ryegrass pasture.

Results

Fresh period (first 21 days)

In the fresh period from five to 21 days in milk, there was no difference in milk yield between cows fed maize grain and cows fed wheat grain. Both groups had an average daily milk yield of 35 kg/cow during this three-week fresh period with identical fat and protein concentrations also observed.

Early to mid-lactation (22–130 days in milk)

Milk yield results are presented for the entire experimental period in Figure 2, with the early lactation treatment period shaded. The milk yield of cows fed wheat grain for the first 21 days in milk and then one of the four early lactation treatments are presented in Figure 2a. Figure 2b shows the milk yield of cows that received maize grain during the first 21 days.

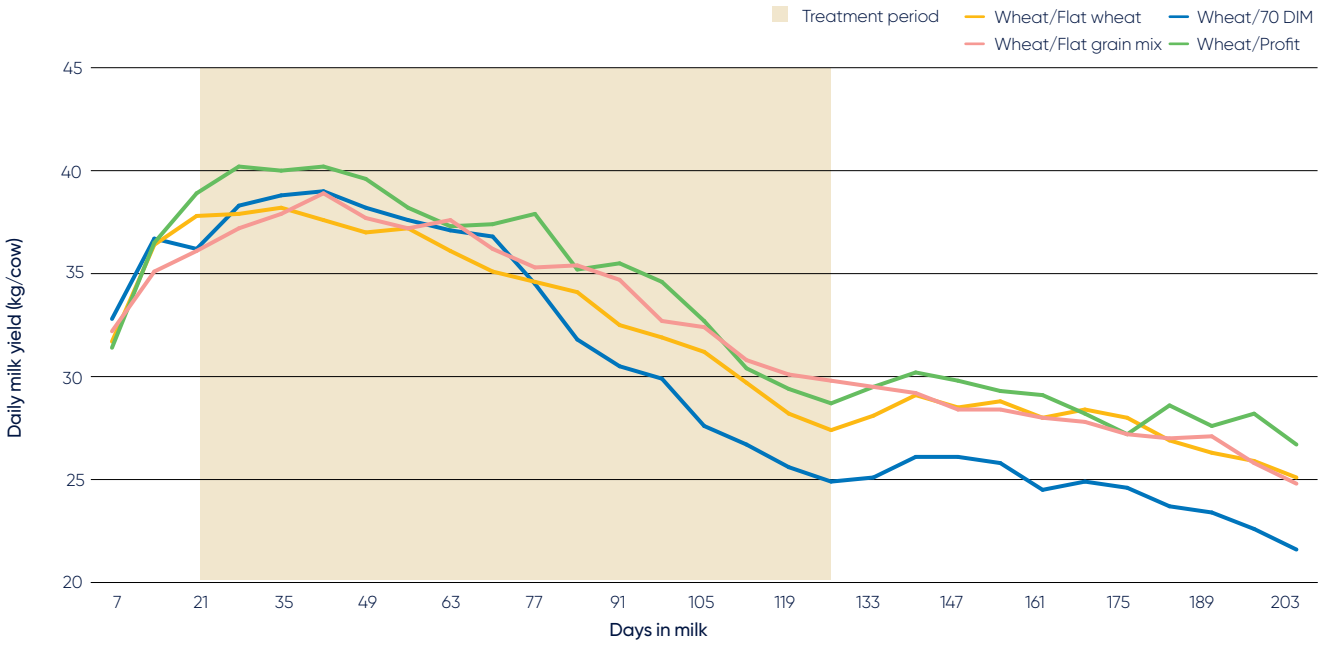

Figure 2a Milk yield per cow for each early lactation treatment that had received **wheat grain** in the first 21 days in milk.

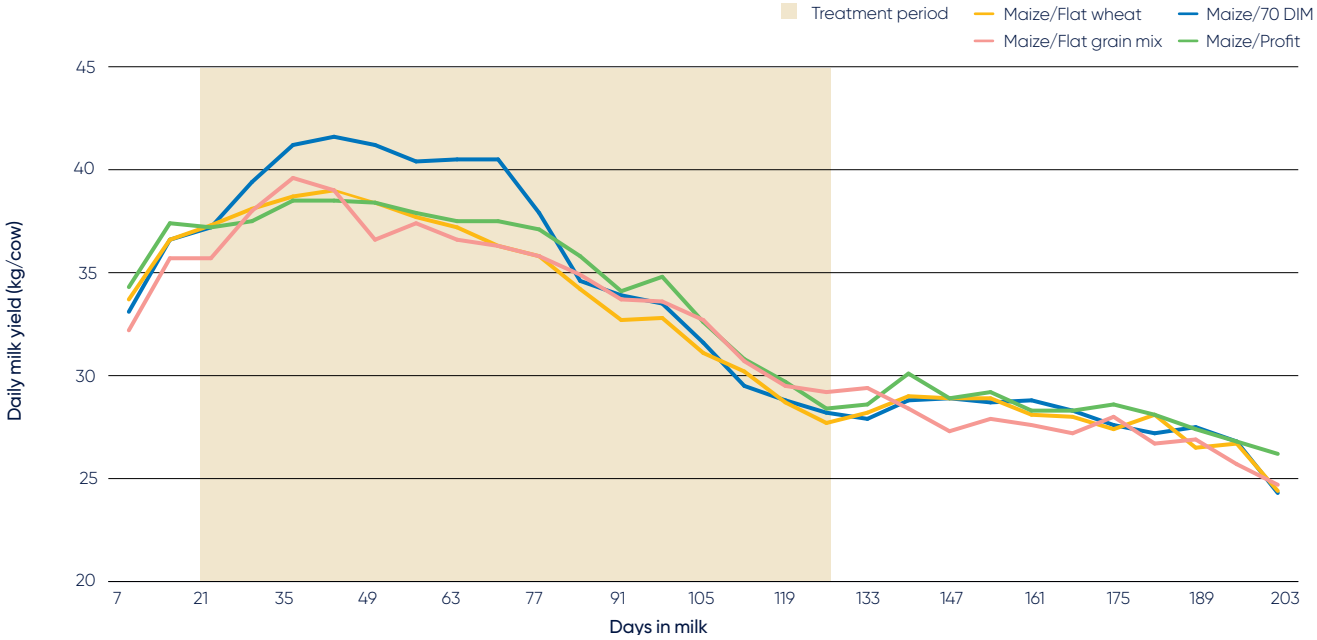

Figure 2b Milk yield per cow for each early lactation treatment that had received **maize grain** in the first 21 days in milk.

The graphs show some notable differences between some of the grain supplementation strategies depending on whether wheat or maize grain was offered in the fresh period.

Milk fat and protein concentrations and energy corrected milk yield

Figure 2a and b shows average daily milk yield in kg/cow per day and does not account for milk composition differences. Milk fat concentration ranged from 3.3–3.7 per cent across the eight treatments while milk protein concentration ranged from 2.9–3.1 per cent. While these differences were relatively small and were not statistically significant, they did impact the average energy corrected milk* yield for each treatment and are an important consideration. The average energy corrected milk yield per day of each treatment from 22–130 days in milk is shown in Figure 3.

**Energy corrected milk is milk yield standardised for a uniform level of fat and protein.*

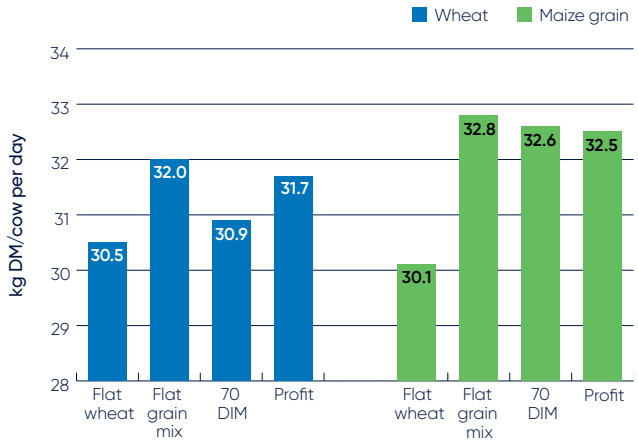

Figure 3 Average daily energy corrected milk yield for each treatment from 22–130 days in milk, where either wheat or maize grain was fed from 5–21 days in milk.

Dry matter intake

Average intake of grain mix was almost the same for all groups apart from the profit treatment, where cows ate 0.4 kg DM less grain mix per day than the other three treatments. This was because their grain allocation was adjusted up or down each week by 1 kg DM for each individual cow based on their weekly profit (milk income minus cost of grain mix).

Pasture intake was measured at 37 days in milk for five consecutive days and is shown in Figure 4.

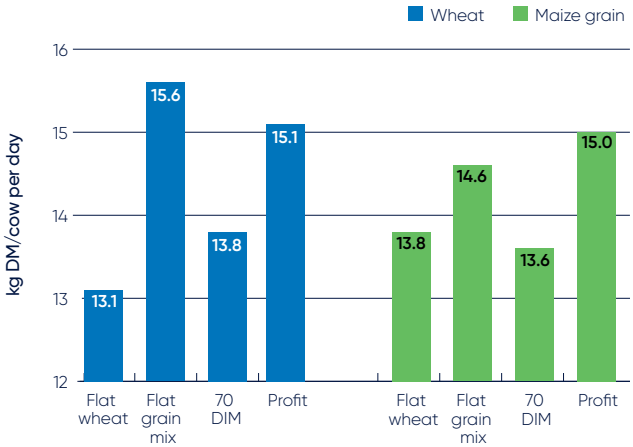

Figure 4 Average daily pasture intake per cow from 37–41 days in milk, where either wheat or maize grain was fed from 5–21 days in milk.

Notably, the cows receiving the Flat wheat treatment ate less pasture than the cows on the Flat grain mix treatment despite both receiving 7 kg DM/day of supplementary grain. During the pasture intake measurement period, cows on the 70 DIM treatment were being offered 9 kg DM of the grain mix each day, and this resulted in a lower pasture intake compared to the cows on the Flat grain mix who were receiving 7 kg DM/cow each day throughout the full experimental period.

Carryover period and economic analysis

An interesting aspect of the carryover period (131–200 days in milk) was the large decline in milk yield from the cows that had been fed wheat for the first 21 days in milk followed by the 70 DIM treatment in early lactation (see Figure 2, blue line). This significant decline was not evident in the 70 DIM cows that had been fed maize grain for the first 21 days in milk instead of wheat.

Below is an analysis of the most profitable combination using the following assumptions:

- A milk price of $6.04/kg protein + fat ($9.00/kg protein and $3.60/kg fat; reflecting the 6-year average price from 2013-18).
- The wheat and maize grain fresh period diets cost $364/t DM and $462/t DM, respectively.
- The cost of the grain mix comprising wheat grain, barley grain and canola meal that was fed in the early lactation Flat grain mix, 70 DIM and Profit treatments was $360/t DM.

The most profitable treatment overall was the treatment where maize grain was fed in the fresh period followed by the Flat grain mix of 7 kg DM/cow per day from 22–130 days in milk (see Table 1).

This was worth $10.98 per cow each day and was $0.61 per cow per day more profitable than feeding wheat in the fresh period followed by the Flat grain mix strategy in early lactation. Feeding this diet would be worth $70/cow more over a 200-day period than if wheat was fed in both the fresh and early lactation periods.

Summary of key findings and implications

- The most profitable combination in the experiment was to feed maize grain during the first three weeks post-calving and then feeding a wheat grain, barley grain and canola meal mix at a flat rate of 7 kg DM/cow per day from 22–130 days in milk.
- Overall, using maize in the fresh cow period resulted in higher profit (measured as milk income minus cost of grain mix) for three of the four subsequent early lactation treatments. When a flat rate of 7 kg DM of wheat grain only was fed from 22–130 days in milk, it was marginally less profitable to have fed maize in the preceding fresh period (1–21 days in milk) compared to feeding wheat.
- It appears that the maize grain has a programming effect on the cows when offered in the fresh cow period that causes these cows to produce more milk and be more profitable than if wheat was fed in the fresh cow period, but only if they receive the wheat grain, barley grain and canola meal mix for the remainder of the lactation.
- Changing the grain allocation each week based on weekly estimated profit was not a strategy that provided any additional benefit compared to feeding the wheat grain, barley grain and canola meal mix at a flat rate.
- Feeding 9 kg DM of the grain mix from 22–70 days in milk before decreasing to 5 kg DM for the next 60 days was not a strategy that offered a clear benefit over feeding a flat rate of 7 kg DM of the same grain mix for the same timeframe.
- As shown repeatedly in other experiments, the presence of canola meal in the grain mix stimulated higher intake of grazed pasture (and subsequent milk production) compared to the same amount of supplement fed as wheat alone.

Table 1 Milk income minus the cost of grain mix for the treatment and carryover periods ($/cow per day).

	Wheat in the fresh cow period				Maize grain in the fresh cow period			
Early lactation diet	Flat wheat	Flat grain mix	70 DIM	Profit	Flat wheat	Flat grain mix	70 DIM	Profit
Treatment period	10.50	10.37	10.40	10.79	10.08	10.98	10.87	10.97
Carryover period	8.49	8.06	7.56	8.34	8.44	8.63	8.49	8.81

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