# LIVING BELOW THE FEI THRESHOLD

## 2017/18 SEASON

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**Is it possible to reduce the impact of the fat evaluation index grading system, while increasing profit? A two-year farm systems comparison in Taranaki set out to answer that by investigating (1) using alternative supplementary feeds to replace palm kernel expeller, and (2) focusing on a pasture-only farm system and removing palm kernel expeller entirely. This article covers the outcomes from Year 1, while the second year's research will be covered in our next issue of *Inside Dairy*.**

### Key points

- Replacing PKE with maize grain and barley reduced FEI grading penalties but decreased profit because of the high cost of the supplementary feed.
- Removing PKE, reducing stocking rate and relying on PASTURE only also reduced FEI grading penalties, but also decreased profit because of a reduction in milksolids (MS) production.
- Even with large responses to supplementary feed (greater than 100g MS/kg DM), the marginal cost must be considered to ensure it is adding to profit instead of reducing profit.

For farmers that supply Fonterra, the amount of palm kernel expeller (PKE) that can be fed to lactating cows is restricted by the fat evaluation index (FEI) grading scheme. As a result, there is increased farmer interest in both the use of alternative supplementary feeds, which have a smaller effect on FEI, as well as less intense farm systems, which do not require any imported supplementary feed. The research detailed below aims to answer some of the questions around these issues.

### Research overview

In Hawera, South Taranaki, Dairy Trust Taranaki (DTT) compared a farmlet feeding PKE with a farmlet that replaced PKE with alternative supplementary feeds; and also a farmlet that removed PKE, reduced stocking rate and relied on PASTURE only.

The research was completed over two seasons (2017/18 and 2018/19):

- Year 1 (2017/18) – where maize grain and barley replaced PKE (*this article*).
- Year 2 (2018/19) – where a meal blend replaced PKE (*follow-up article*).

Maize grain and barley were chosen as the alternative supplementary feeds for the first season. However, due to

cost, these were swapped for a meal blend for the second season.

The farmlet comparisons were part of a larger DTT, Ministry for Primary Industries (MPI) Sustainable Farming Fund, and DairyNZ farm systems research programme titled Future Proofing Dairying in Taranaki.

## Farmlet comparisons – Year 1

At the DTT Gibson Farm in Hawera, two 24ha farmlets were stocked at 3.3 cows/ha (79 Friesian cows). Another 24ha farmlet was stocked at 3.0 cows/ha (73 Friesian cows).

- **Farmlet 1 (PKE)** offered PKE via troughs (780kg DM/cow/year) in the paddock when pasture supply was less than herd feed demand.
- **Farmlet 2 (GRAIN)** offered maize grain and barley via an in-shed feeding system (720kg DM/cow/year) when pasture supply was less than herd feed demand.
- **Farmlet 3 (PASTURE)** relied on home-grown pasture.

All farmlets (including PASTURE) also imported 100kg DM/cow of hay.

Home-grown pasture silage was harvested from each farmlet when pasture supply was greater than pasture demand, and fed back to that same farmlet to fill feed deficits.

Feed management decision rules were set for all farmlets based on feed budget and grazing management targets. No cropping occurred on any farmlet, and planned start of calving was the same between them.

## Living within the FEI

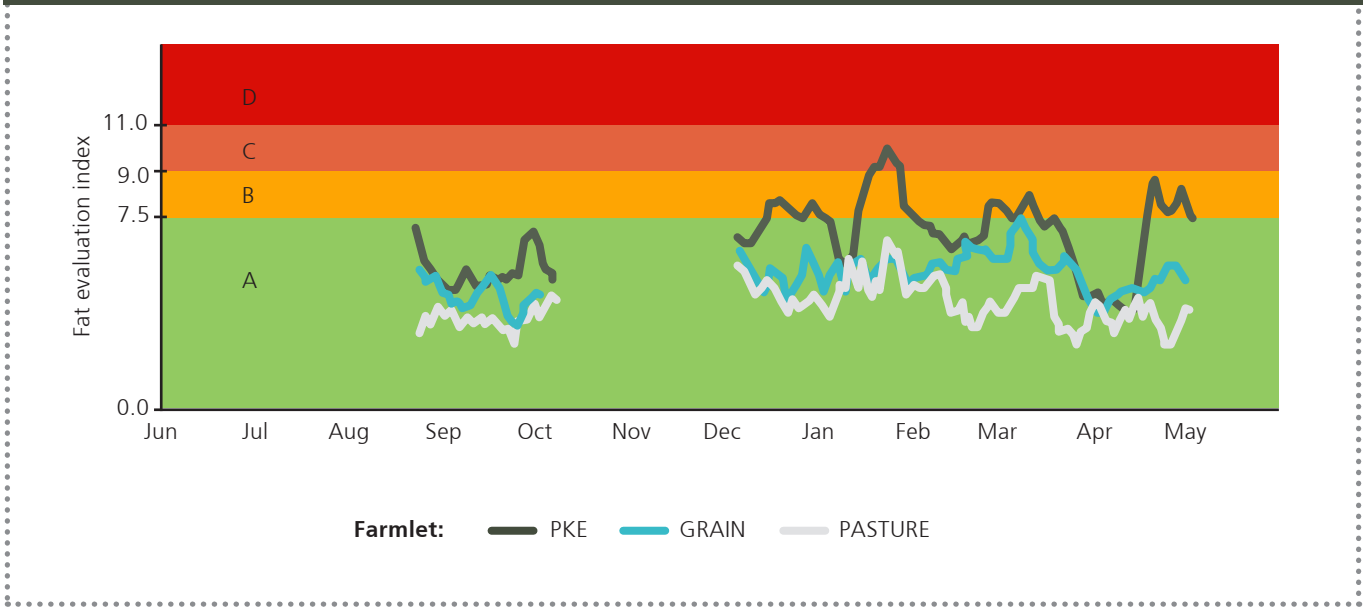
Both replacing PKE with a similar quantity of maize grain and barley, and PASTURE only, lowered the six-day rolling average FEI (*Figure 1*). The PKE farmlet had seven days where the six-day rolling average FEI was within the 'C' band. Based on the Fonterra FEI grading system, this resulted in demerits being applied to two days of milk production ($0.04/kg MS overall milk price reduction). For both the GRAIN and PASTURE farmlets, the six-day rolling average FEI remained in the 'A' and 'B' bands for the whole lactation.

*On each farmlet, when pasture supply was greater than demand, silage was harvested and fed back to fill feed deficits.*

MS production was greatest in the PKE farmlet and least in the PASTURE farmlet. Compared with the PKE farmlet, cows in the GRAIN farmlet produced 15kg MS/cow and 47kg MS/ha less. This difference was due to several factors, including GRAIN farmlet cows milking for three fewer days and being offered 60kg DM/cow less supplementary feed. Cows in the PASTURE farmlet milked for six additional days compared with the PKE farmlet cows – yet produced 66kg MS/cow and 301kg MS/ha less.

A large marginal MS response to supplementary feeding

**Figure 1.** Six-day rolling average fat evaluation index for the PKE, GRAIN, and PASTURE farmlets



was recorded in this comparison. Compared with the PASTURE farmlet, the response was 115g and 105g MS/kg DM in the PKE and GRAIN farmlets, respectively. This is greater than the New Zealand DairyBase (**dairynz.co.nz/DairyBase**) average from the last 12 years: 80g MS/kg DM.

The comparative stocking rate (CSR) was greater than 90kg liveweight/t DM on all three farmlets, above optimal (80 to 85kg liveweight/t DM). This created a larger feed deficit, which, combined with strict grazing decision rules, contributed to the large response.

In theory, the response to supplementary feed is determined by the amount of additional metabolisable energy (ME) supplied. This suggests maize grain and barley should produce a greater response per kg DM compared with PKE because of the greater ME content (maize grain and barley approximately equal to 13MJ ME/kg DM; PKE approximately equal to 11MJ ME/kg DM).

However, in this comparison, the response was greater in the PKE farmlet. This likely occurred because pasture substitution is less when offering fibre-based (PKE) compared with starch-based (maize grain and barley) supplementary feeds[1], and current laboratory values may underestimate the ME content of PKE[2].

*Dairy Trust Taranaki operations manager Debbie McCallum with the author, DairyNZ Master's student Jake Jarman.*

## Profitability

Differences in profitability were estimated for each farmlet. Where applicable, we used input prices for the research farm during the season. Average costs of System 3 and 4 South Taranaki farms, extracted from DairyBase, were used where research farm expense data, relevant to each farmlet, couldn't be determined. We then completed economic modelling, accounting for changes in milk and key input prices, to evaluate the likely long-term profitability of the three farmlets.

In the analysis, we used an average milk price of $6.44±1.65/kg MS, PKE price of $289±42/t, and maize grain and barley price of $424±29/t. Results are summarised in *Table 1*.

Due to the differences in MS production, total revenue was 3% lower in the GRAIN farmlet ($8800/ha) and 22% lower in the PASTURE farmlet ($7100/ha) compared with the PKE farmlet ($9090/ha). Conversely, due to the relatively greater cost of maize grain and barley, the GRAIN farmlet ($6400/ha) farm operating expenses were 9% greater compared with the PKE farmlet ($5880/ha), and 45% greater compared with the PASTURE farmlet ($4420/ha). This analysis does not include capital costs (e.g., it assumed an in-shed feeding system is already in place).

Overall, this meant profitability in the PKE farmlet ($3215/ha) was 33% greater than the GRAIN farmlet ($2412/ha), and 16% greater than the PASTURE farmlet ($2687/ha). Sensitivity analysis concluded the PASTURE farmlet was more profitable compared with both the PKE and GRAIN farmlets when milk and supplementary feed prices were unfavourable (e.g., less than

**Table 1.** Production and profitability of the PKE (3.3 cows/ha offering PKE), GRAIN (3.3 cows/ha offering maize grain and barley), and PASTURE (3.0 cows/ha pasture-only) farmlets.

| 2017/18 season at $6.44/kg MS | | | | |
|---|---|---|---|---|
| Treatment | FEI | Production | | Profit |
| | FEI average | kg MS/cow | kg MS/ha | $/ha |
| PKE | 6.6 | 404 | 1328 | $3215 |
| GRAIN | 5.1 | 389 | 1281 | $2412 |
| PASTURE | 4.0 | 338 | 1027 | $2687 |

**"...even with a large MS production response to supplementary feeding, profit may not increase."**

*Dairy Trust Taranaki's 110ha (effective) Gibson research farm near Hawera, South Taranaki. With 72 x 1ha paddocks, and infrastructure to support multiple herds, the property is perfect for farmlet comparisons.*

$5.00/kg MS and more than $450/t).

This highlighted the resilience of low-input systems to market variability, but the PASTURE farmlet was less profitable than either of the other two farmlets when those prices were favourable. This sensitivity to milk price and cost of feed inputs is also observed in analyses of New Zealand and Irish commercial dairy farm datasets[3, 4].

Although there was a large response to supplementary feeding, the marginal cost of supplementary feeding was $7.78/kg additional MS in the GRAIN farmlets due to the high cost of the supplementary feed. Therefore, the cost of additional MS produced ($7.78/kg MS) was greater than the milk price ($6.44/kg MS) and was not returning a profit in the GRAIN farmlet.

The PASTURE farmlet was 11% more profitable than the GRAIN farmlet, even when producing 23% less MS/ha, highlighting the need for farmers to accurately assess supplementary feeding effects on profit. Conversely, the marginal cost of supplementary feed in the PKE farmlet was $4.83/kg MS, so PKE feeding was adding to profit.

### Research conclusions (Year 1)

In summary, in the 2017/18 season, removing PKE and reducing the stocking rate was more profitable than replacing PKE with maize grain and barley. Both these alternatives were less profitable than offering PKE.

This comparison highlights that, even with a large MS production response to supplementary feeding, profit may not increase. The type and cost of supplement fed and the marginal cost per kg MS must be carefully considered when making feed-purchasing decisions.

Look out for part two of this article in our next edition of *Inside Dairy* (June/July).

For more on the research being conducted by DTT, visit **dairytrusttaranaki.co.nz**

## References: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