

The Northland Dairy Development Trust  
&  
The Northland Agricultural Research Farm  
**Dairying in a Variable Climate**  
**Project Update – Feb 2021**

**Project funders**

Ministry for Primary Industries  
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## Summary (to 8<sup>th</sup> February 2021)

This is a 3 year farm systems trial investigating the use of palm kernel extract (PKE) and other supplements on farm production and profitability. There are three independent 28ha farmlets:

1. **Pasture Only farm**, (2.7 cows/ha) no imported feed
2. **PKE Only farm**, (3.1 cows/ha) imports PKE to fill pasture deficits
3. **PKE Plus Farm**, (3.1 cows/ha) imports PKE and other supplements to fill pasture deficits.

PKE is fed on the PKE Only and PKE Plus farms only when grazing residuals indicate pasture supply is limiting. Other supplements (DDG and baled silage) are fed on the PKE Plus farm when milk FEI levels indicate no further PKE can be fed without incurring penalties.

### Key features of 2020/21 season to date (8<sup>th</sup> Feb 2021)

- A relatively dry winter, spring and summer has resulted in lower pasture growth rates than normal. This has been somewhat compensated by good pasture utilisation
- Feeding of imported supplement occurred on the PKE Only and PKE Plus farms from early August through to mid-October and again from early December through the present time. Milk FEI level has constrained the amount of PKE fed through much of this time
- Pasture Only cows were put on once-a-day milking in late December and PKE Only cows late January
- Despite pasture growth being lower than the historic average, milk production to date this season is significantly higher than last season on all farms and higher than the 2018/19 season on the two PKE supplemented farms
- PKE supplementation to date has been higher than the 2018/19 season but lower than the 2019/20 season

**Table 1.** Milk Production for the last two seasons and the current season to 8<sup>th</sup> February 2021

	Kg MS/ha		
	2018/19	2019/20	2020/21 (to 8 <sup>th</sup> Feb 2021)
<b>Pasture Only Farm</b>	996	816	789
<b>PKE Only Farm</b>	1,225	1,129	990
<b>PKE Plus Farm</b>	1,300	1,279	1,066

**Table 2.** Imported supplement fed for the previous two seasons and the current season to 8<sup>th</sup> February 2021

	Imported Supplement kg DM/cow		
	2018/19	2019/20	2020/21 (to 8 <sup>th</sup> Feb 2021)
<b>Pasture Only Farm</b>	0	0	0
<b>PKE Only Farm</b>	748	978	476
<b>PKE Plus Farm</b>	1,046	1,410	699

Financial analysis of the individual farms considers labour and other variable costs. With a milk price of \$6.35/kg MS during the 2018/19 season, farm operating profit (EBIT) was highest on the PKE Only Farm. Despite a higher predicted milk price during 2019/20 (\$7.20/kg MS), profit on all farms was significantly lower than the previous season. This was due to the drought reducing milk production and increasing the supplement usage (on the supplemented farms). The PKE Plus farm was the most profitable due to hitting the sweet spot of a high milk price with unfavourable weather, showing the high cost of having to dry cows off early on the other farms. Financial analysis of the 2020/21 season has not yet commenced.

**Table 3.** Operating profit for the 2018/19 and 2019/20 seasons

Operating Profit \$/ha	Milk Price \$6.35/kg MS	Milk Price \$7.20/kg MS
	2018/19	2019/20
Pasture Only Farm	\$3,064	\$1,926
PKE Only Farm	\$3,365	\$2,187
PKE Plus Farm	\$3,055	\$2,413

***Marginal Milk Cost***

This trial provides the opportunity to calculate the marginal cost of the extra milk produced on the supplemented farms compared with the Pasture Only farm. Over the two seasons milk responses to imported supplements have averaged around 100 g MS/kg DM supplement fed. Analysing the costs of this additional production shows an average of \$5.96/kg MS for the PKE Only farm and \$6.41 for the PKE Plus farm. Further analysis shows for each dollar spent on purchasing PKE on the PKE Only farm, \$0.85 was added to other farm expenses.

**Table 4.** Cost of additional milk produced (marginal milk, ¢/kg MS) compared to the Pasture Only farm

	Marginal milk cost - ¢/kg MS	
	2018/19	2019/20
PKE Only Farm	\$5.39	\$6.54
PKE Plus Farm	\$6.67	\$6.27

To date, this project has illustrated that although imported supplements can have a role in improving farm production and profit, care needs to be taken that costs are closely monitored and milk responses are maximised. If milk responses drop were below what has been experienced in this trial or milk price is less than \$6.00/kg MS then the addition of imported supplement may have been uneconomic.

## Background

This project is conducting a farm systems experiment that compares three different management strategies within a variable climate and the constraints of milk fat evaluation index (FEI). The project is being conducted at the Northland Agricultural Research Farm (NARF), commenced in June 2018 and runs for three years.

Data collected allows examination of the effects of these systems on milk production, farm operating profit, environmental sustainability, cow welfare, labour, and capital requirements. This project will assist farmers in developing more resilient, profitable, and potentially lower impact farming systems.

## Farmlet structure

All farms are self-contained farm systems. Each farm is 28 ha with paddocks allocated so pasture growth potential is similar across farms. Silage can be made when there is a pasture surplus and fed when pasture supply below feed demand.

The three farm systems are:

**1. Pasture Only – 2.7 cows/ha**

A simple pasture only system. Silage is made when pasture surpluses occur and fed back as required.

**2. PKE Only – 3.1 cows/ha**

PKE is fed when pasture grazing residuals fall below target levels while maintaining ideal grazing rotation length. PKE is not used to create a pasture surplus for conservation. PKE use is constrained by the need to keep the milk fat evaluation index (FEI) within the acceptable limits set by Fonterra.

**3. PKE Plus – 3.1 cows/ha**

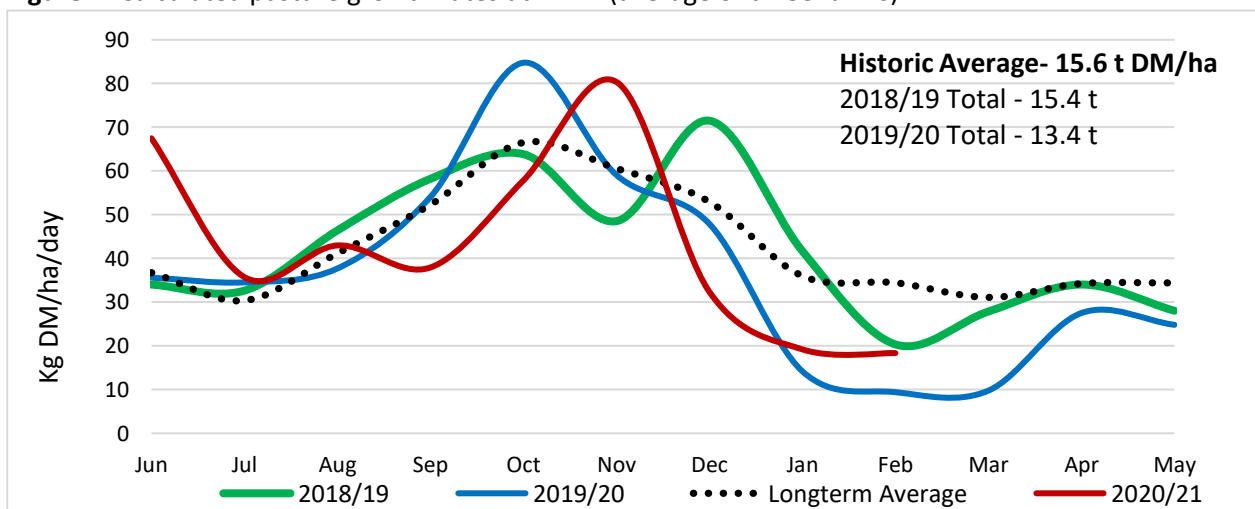
Supplements are fed when pasture grazing residuals fall below target levels. PKE is used first until milk FEI limits are reached and then alternative spot market feed sources are used.

## Trial Results

### Pasture Growth

Pasture growth for the last three seasons is shown on the graph below and compared to the long-term average. The 2019/20 season has been marked by a prolonged drought and 2020/21 has to date been dry but not quite as extreme as 2019/20. Total pasture production during 2019/20 season was 2t DM/ha lower than the historic average.

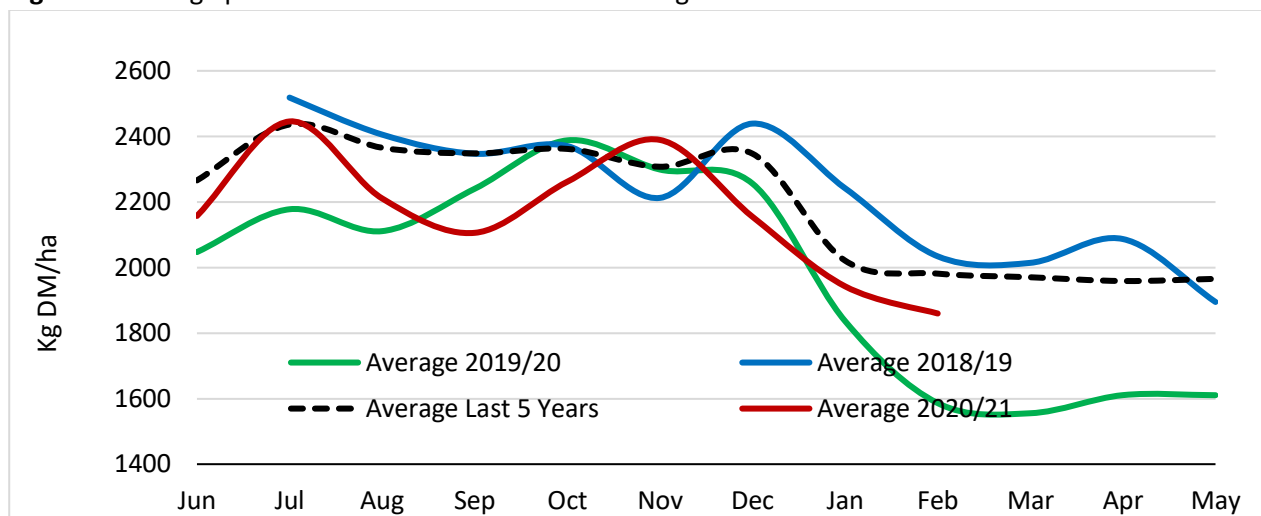
**Figure 1.** Calculated pasture growth rates at NARF (average of three farms)



## Pasture Covers

Very good pasture growth during June 2020 resulted in good average pasture cover on all three farms at calving (see Figure 2). Recent months have shown a drop in pasture cover, however still significantly higher than summer 2019/20. Differences between farms are small.

**Figure 2.** Average pasture cover on all three farms during the last three seasons.



## Supplement Use

Table 5 shows the imported supplement fed during the 2018/19, 2019/20 and 2020/21 season to date. The PKE feeding level has been constrained on the supplemented farms much of the time due to milk FEI limits.

**Table 5.** Imported supplements fed on the last three seasons (to date).

	Imported Supplement kg DM/cow		
	2018/19	2019/20	2020/21 (to 8 <sup>th</sup> Feb 2021)
Pasture Only Farm	0	0	0
PKE Only Farm	748	978	476
PKE Plus Farm	1,046	1,410	699

## Milk Production and Mating

Milk production during 2019/20 was significantly lower than the 2018/19 season for the Pasture Only and PKE Only farms, mainly due to drought and earlier culling and drying-off of cows.

Despite pasture supply being lower than an average season during 2020/21, thus far milk production has been significantly higher on all farms than the 2019/20 season and also higher on both supplemented farms than the 2018/19 season.

**Table 6.** Total milk solids production per ha and per cow and empty rate (cows in calf/cows at mating).

	Kg MS/ha			Kg MS/Cow		
	2018/19	2019/20	2020/21 (to 8 <sup>th</sup> Feb)	2018/19	2019/20	2020/21 (to 8 <sup>th</sup> Feb)
Pasture Only Farm	996	816	789	372	313	291
PKE Only Farm	1,225	1,129	990	403	359	319
PKE Plus Farm	1,300	1,279	1,066	423	407	343

## Mating Results

Table 7 shows the mating results from the last three seasons. Overall, there are no significant differences between farms. Though feed levels around mating time have been challenging on the Pasture Only farm, cow condition has been managed with using once-a-day milking which appears to have minimized the impact of the lower feeding levels.

**Table 7.** Six week in-calf rate and empty rate (cows in calf/cows at mating).

	Six Week in Calf Rate (%)			Empty Rate (%)		
	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21
<b>Pasture Only Farm</b>	79%	71%	76%	9%	6%	9%
<b>PKE Only Farm</b>	67%	76%	69%	11%	6%	13%
<b>PKE Plus Farm</b>	74%	76%	70%	6%	7%	7%

## Responses to PKE

Comparing milk production on the two PKE supplemented farms with the Pasture Only farm provides a calculation of milk solids (MS) response to supplement on a whole farm system basis. These supplement response rates are lower than the three previous seasons which averaged 122 g MS/kg DM PKE fed. Overall, response rates on the PKE Plus farm were similar to the PKE Only farm, despite the use of DDG which has higher energy and protein levels than PKE.

**Table 8.** Supplement response calculations relative to the Pasture Only farm (g milk solids/kg DM supplement fed).

	PKE Only farm		PKE Plus farm	
	2018/19	2019/20	2018/19	2019/20
<b>Milk Solids Response g/kg DM supplement fed</b>	100	102	94	104

## Acknowledgements

Thanks to NARF staff for making this project happen. Special thanks to NDDT trustees and NARF committee members for their support and commitment in proposing and overseeing this project.