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EXTRA MILK LEADS TO MORE WORK –

PKE and DDG are fed on the feed pad to minimise wastage

BUT NOT NECESSARILY MORE PROFIT

Many farmers have increased milk production in recent years by importing more feed. The hidden costs of this on labour and machinery have now been measured in a farm systems trial. This article looks at how farmers are working harder, but not necessarily making more money.

Supplement profitability trials

The Northland Dairy Development Trust (NDDT) has just completed six years of supplement trials at the Northland Agricultural Research Farm (NARF) near Dargaville. NARF is an 84 ha farm at Dargaville, which can run three independent 28 ha farmlets providing valuable information to evaluate these system differences. All costs and time are recorded so that full profit comparisons can be made.

The most recent project was a three-year trial investigating the economics of feeding palm kernel extract (PKE) and other

supplements on dairy farms. The trial came about as a result of farmers asking if it was profitable to purchase other feeds such as distiller's dried grains (DDG) to boost production when Fonterra's fat evaluation index (FEI) is limiting PKE use.

The project followed on from the previous three-year trial looking at whether farmers could grow crops to reduce the amount of purchased supplement. Northland farmers had clearly identified that they would like to reduce their reliance on imported feed, particularly PKE, and wanted to know the financial implications of this.

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This trial ran from 2015 to 2018 and addressed the following issues:

- Could the farm maintain production and profit with reduced imported feed through a range of seasons?
- Could we replace imported feed with extra forage grown on-farm?

One of the farms grew a range of crops including maize silage, turnips and fodder beet in an attempt to remove the need for imported feed. This Cropping farm was compared with a Pasture Only farm (with no imported feed) and a PKE farm, with PKE imported to fill feed deficits.

The results were:

- The PKE farm was the most profitable farm over the three seasons, which included a range of climatic conditions
- The Pasture Only farm was slightly less profitable, but did allow us to measure the marginal costs and return to importing PKE or growing forage crops
- The Cropping farm was the least profitable of the three systems, and unfortunately variable crop yields and the opportunity cost of removing the cropped land from the pasture rotation made the cropping strategy uneconomic.

Table 1 shows the performance of each farm averaged over the three seasons. We were now confident that PKE was a useful tool to maintain profit through a range of climatic conditions. However, high levels of PKE feeding were affecting milk processing characteristics and Fonterra introduced the FEI index with associated financial penalties if too much PKE was fed.

Farmers then started looking to alternative supplements to add when FEI was limiting PKE use. These other

supplements were generally more expensive than PKE and there were multiple claims that response rates were better than those to PKE feeding. Farmers began to ask if the extra supplement was profitable, or whether they should choose other strategies such as drying cows off or destocking when FEI was limiting.

In response, NDDT set up a further three-year trial on three farmlets that looked at the economics of buying these extra supplements when FEI was limiting feeding levels. The three farmlets were:

1. **Pasture Only farm:** No imported supplement, home-grown grass silage (2.7cows/ha).
2. **PKE Only farm:** PKE used to fill pasture deficits, but constrained by acceptable milk FEI (3.1 cows/ha).
3. **PKE Plus farm:** PKE fed up to acceptable milk FEI and then other imported supplements added (3.1cows/ha).

PKE was fed on the PKE Only and PKE Plus farms only when grazing residuals indicated that pasture supply is limiting. Other supplements (DDG, soya bean hulls (SBH) and baled silage) were purchased by the PKE Plus farm on the basis of cost, and only fed when milk FEI levels indicated no further PKE could be fed without incurring penalties.

Climatic variation was considerable, with a difficult spring and a prolonged drought during the trial period, which gave us useful information about the resilience of each system over time.

Pasture growth

Pasture growth for the three seasons is shown in **Figure 1**. The 2019/20 season was marked by a prolonged drought and 2020/21 also had a relatively dry summer/autumn along with a wet spring. Total pasture production during the latter two seasons was lower than the historic (10-year) average.

Table 1: Farm performance averaged over three seasons 2015-2018

		Pasture Only farm	Cropping farm	PKE farm
kgMS/cow		358	368	392
kgMS/ha		915	997	1,092
Operating profit \$/ha				
Milk price:	\$6/kgMS	\$1,998	\$1,588	\$2,252
	\$8/kgMS	\$3,818	\$3,581	\$4,437

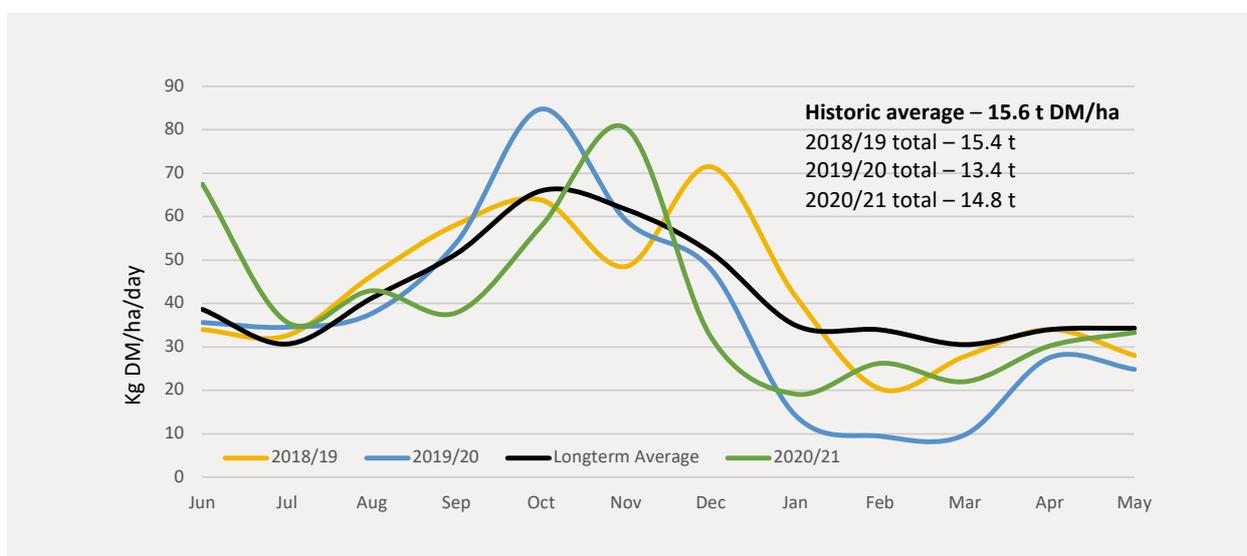


Figure 1: Calculated pasture growth rates at NARF – average of three farms

Supplement use

Silage was made on all farms and fed back into that farm. PKE was fed on both PKE farms when residuals were below targets and FEI allowed. Extra supplement was then purchased on the PKE Plus farm when FEI limits were reached and residuals were still below target. The choice of supplement was made on the basis of cost per unit of feed when allowing for nutritional requirements. Soya hulls were used when protein was not limiting in spring. DDG was used in both spring and summer, and good quality grass silage was purchased in autumn when the cost (per unit of energy and protein) was considerably lower than that of DDG.

Table 2 summarises the supplement used over the three years of the trial. Supplement use was highest during the drought season of 2019/20. In each season most of the supplement was fed during the summer/autumn period.

Milk production

Milk production was lowest during 2019/20 on all three farms due to the summer/autumn drought. However, production on the PKE Plus farm was less affected by the drought than the other farms, as the other two farms used once-a-day (OAD) milking to manage body condition score (BCS) and then early culling and/or drying-off of cows to manage feed demand (see **Table 3**).

Table 2: Imported supplements fed during the three seasons

	Imported supplement kgDM/cow		
	2018/19	2019/20	2020/21
Pasture Only farm	0	0	0
PKE Only farm	748	978	784
PKE Plus farm	1,046	1,410	1,303

Table 3: Total milk solids production per ha and per cow

	kgMS/ha			kgMS/cow		
	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21
Pasture Only farm	996	816	936	372	313	340
PKE Only farm	1,225	1,129	1,272	403	359	405
PKE Plus farm	1,300	1,279	1,405	423	407	447

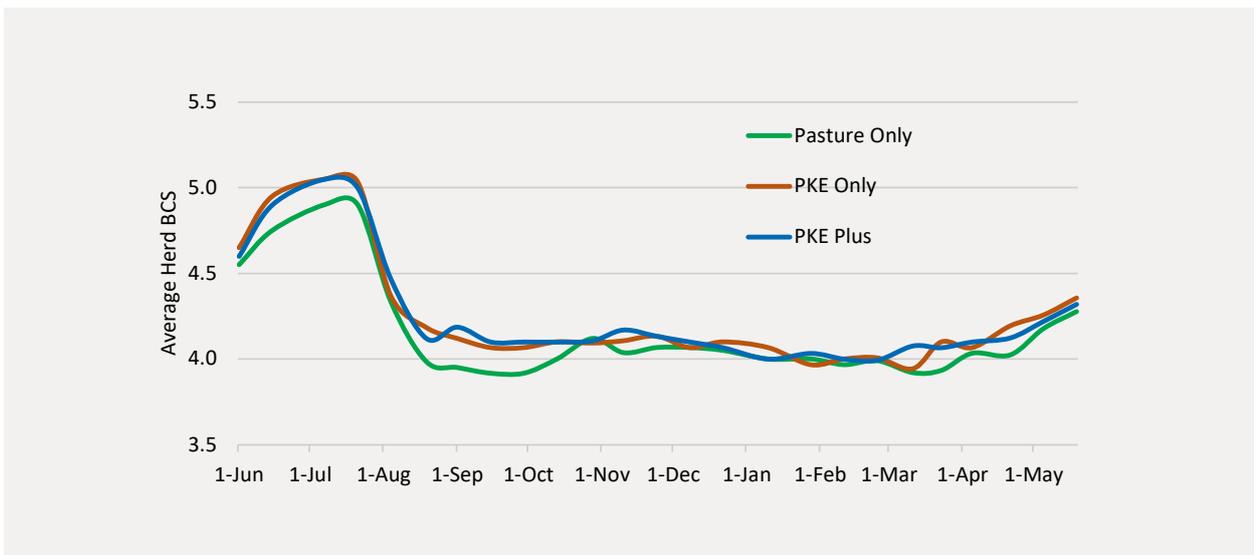


Figure 2: Herd body condition score – average of three years

A worry score was assessed fortnightly, which relates to the concern the manager has about cows and feed supply.

Mating results

There were no significant differences between farms for six-week in-calf rate (average 73%) or empty rates (average 8%). Feed levels prior to mating were challenging on the Pasture Only farm each year, resulting in lower cow condition than the other farms during early spring. The impact of this was managed through using OAD milking every year for low condition cows and heifers and at times all cows. This appears to have been an effective tool in minimising the impact of lower feeding levels pre-mating.

Body condition score

BCS was assessed fortnightly. The Pasture Only farm had lower BCS during spring and late autumn than the other farms in each of the three seasons (see Figure 2). Earlier drying-off allowed the Pasture Only farm cows to regain condition during May to be near the condition of cows on the other farms. Strategic OAD milking was used to manage condition on cows below BCS 3.5.

Worry score

A worry score was assessed fortnightly, which relates to the concern the manager has about cows and feed supply. The Pasture Only farm tended to have a higher worry score during late winter, spring and early summer, largely due to the inability to bring in additional feed during these periods (see Figure 3). The worry score for the PKE Only farm tended to be elevated during late summer/early autumn when milk FEI was challenging. The Pasture Plus farm had the lowest worry score through all seasons.

Key results from trial

Milk production on the PKE Plus farm was least affected by the weather

As would be expected, milk production was highest on the PKE Plus farm and lowest on the Pasture Only farm in all three seasons (see Table 3). The 2019/20 drought reduced milk production on the Pasture Only and PKE Only farms, but only had a minor effect on the PKE Plus farm, due to the ability to purchase extra supplement to counter the lower pasture growth.

Milksolids response to supplement feeding was higher on the PKE Only farm than the PKE Plus farm

Milk response to PKE fed on the PKE Only farm was higher than the combined response of feeding PKE, DDG and silage on the PKE Plus farm (see Table 4). This is probably due to lower substitution in the PKE Only farm herd as they were often under more feed pressure. The responses are higher than the 12-year Dairybase average (80gMS/kgDM) and those reported in other studies, probably due to strict adherence to decision rules on feeding supplement only when pasture residuals are too short. Supplement feeding was not used to prop up production and is determined by the careful monitoring of grazing residuals.

Profit was highest on the PKE Only farm except during the drought year

Financial analysis of the individual farms considers all variable costs. The farms were run independently of each

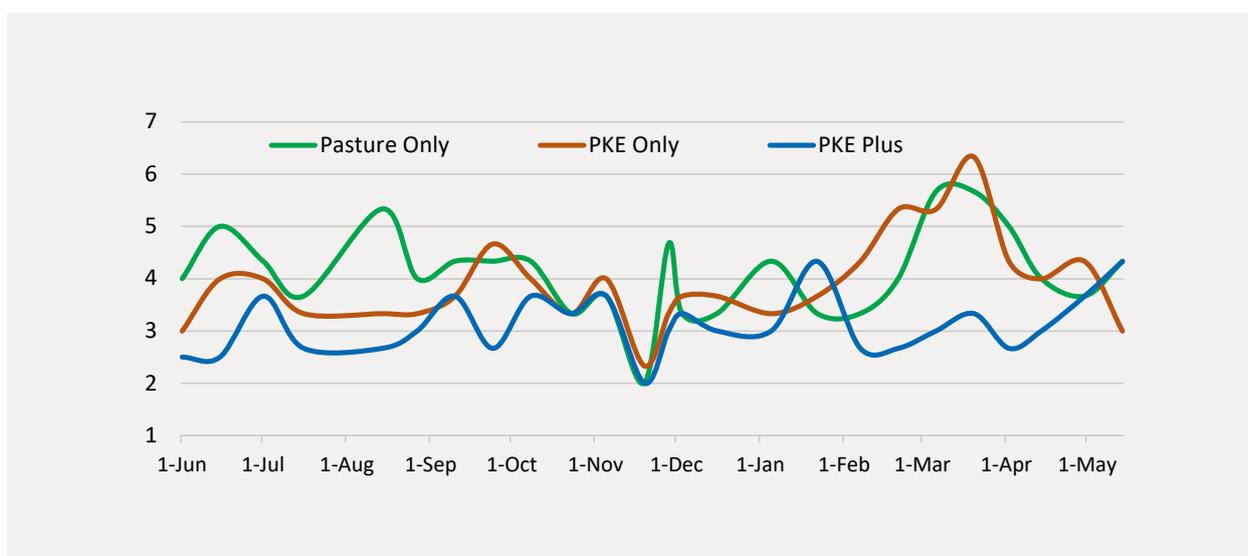


Figure 3: Managers' worry score for the three farms (1 = low, 10 = high) – average of three years

other, so all costs were captured, including differences in labour and machinery hours. Farm operating profit (EBIT) was highest on the PKE Only farm in two of the three seasons, while the PKE Plus farm was the most profitable in the 2019/20 season when a drought occurred and cows on the other farms were dried off early (see Table 5).

Marginal cost of extra milk is high on the PKE Plus farm

This study provided the opportunity to calculate the marginal cost of the extra milk produced by feeding the extra supplement, which is the minimum milk price needed to

make the extra feed profitable. The marginal cost of feeding PKE is generally lower than the DDG and silage fed on the PKE Plus farm (see Table 6). This is primarily due to the lower milk response to the additional supplement and the higher cost of the DDG and silage compared to the PKE.

Further analysis showed consistently that for each dollar spent on purchasing supplement \$0.66–\$0.86 was added to other farm expenses. These extra costs are mostly labour and machinery costs associated with feeding out, which effectively increases the cost of PKE from 33c to 60c/kgDM. Consultants do not always take these hidden extra costs into

Table 4: Three-year average purchased feed and milksolids response compared with Pasture Only farm

	Supplement kgDM/c	Milk response gMS/kgDM
Pasture Only farm	–	
PKE Only farm	836	113g
PKE Plus farm	1,253	104g

Table 5: Operating profit for the three seasons (\$/ha)

	Milk price \$6.35/kgMS	Milk price \$7.14/kgMS	Milk price \$7.55/kgMS
	2018/19	2019/20	2020/21
Pasture Only farm	\$3,002	\$1,877	\$3,031
PKE Only farm	\$3,301	\$2,119	\$3,743
PKE Plus farm	\$2,991	\$2,336	\$3,488

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Table 6: Cost of additional milk produced (marginal milk, \$/kgMS)

	Marginal milk cost – \$/kgMS		
	2018/19	2019/20	2020/21
PKE Only farm over Pasture Only farm (PKE fed)	\$5.39	\$6.54	\$5.65
PKE Plus farm over PKE Only farm (DDG, SBH, silage fed)	\$10.57	\$5.70	\$9.47
Marginal profit PKE only (\$/kg MS)	\$0.96	\$0.61	\$1.89
Marginal profit PKE Plus (\$/kg MS)	-\$4.22	\$1.45	-\$1.93

account when evaluating feed inputs. Farmers intuitively know these costs are occurring and make comments such as, 'My milk production has gone up and I am working harder, but I don't seem to be making any more money.'

Methane reduction did not always lead to less profit

Overseer modelling of greenhouse gases (GHGs) on each farm allowed us to estimate differences in methane emissions between farm systems.

On average over the three seasons, the Pasture Only farm produced 23% less methane than the PKE Plus farm, but only earned 10% less profit. The PKE Only farm emitted 9% less methane than the PKE Plus farm and increased profit by 4%. The extra feed eaten on the higher input farm led to higher emissions, but not necessarily higher profit, which is due to the high cost of the marginal milk on that farm.

Conclusion

With looming environmental challenges, farmers are looking at more than production per hectare when evaluating their systems. Dropping out high cost production can reduce GHG emissions significantly without necessarily affecting profit as much as individuals expect. The changing environmental regulations are definitely putting the spotlight on high input systems. Farmers are beginning to question whether these systems are sustainable in the long term for people and the environment. Succession planning becomes more difficult due to the higher level of management skill required in high input systems. It is therefore important for farm consultants to look at all aspects of the farm system when helping farmers assess change.

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