

# **Profitable and resilient pasture-based dairy farm businesses: The New Zealand experience**

Mark Neal, John R. Roche and Laurence Shalloo

## **Summary**

Dairy farmers in pastoral systems face a number of risks, including price volatility. Farm data was used to understand how to be profitable and able to withstand these risks. We concluded that maximising pasture harvested, and minimising reliance on supplementary feed, and effective cost control (minimising expenditure) are the key factors that lead to profitable businesses which are also resilient to the low milk prices that occur in a volatile market.

## **Introduction**

In export-oriented pastoral dairy farming, it is robustness to milk price volatility that is most important, especially if currency fluctuations, milk prices and input prices are more uncertain in the future than they have been historically (Roche and Horan 2013). The financial success of a business is often measured by annual operating profit or return on assets, but business robustness is likely to be closely related to ability to cover costs, and service debt, when the prevailing milk prices are unfavourable or if there are other shocks to the farming business (e.g., unexpected expenses). Farming businesses in NZ are also facing growing pressure from environmental regulations regarding, amongst others, N leaching and GHG emissions, and, so, resilient farm businesses will need to consider these aspects as well.

There have been a number of previous analyses of dairy-farm businesses using DairyBase, the New Zealand dairy industry database of farm physical and financial information, or its predecessor, ProfitWatch. For example, Silva-Villacorta et al. (2005) reported that over the period 1998 to 2002, although farms with more imported feed had higher production per-cow and per hectare, they also had higher costs; therefore, economic farm surplus per hectare was similar to lower input farms. More recently, Ma et al. (2018) reported that despite higher levels of production per-cow and per hectare, with increased use of imported feed, there was no difference in profit per hectare, and return on assets declined from low to medium use of imported feed.

The objective of this study is to use a rich dataset, comprising 12 years of DairyBase data, to examine factors associated with higher levels of profitability, and consider which factors are likely to be the most important when businesses are faced with difficult circumstances such as low milk prices. By using the longest and largest available dataset available, we are able to consider the

effect of both the full range of milk price volatility and regional differences on actual farm outcomes simultaneously.

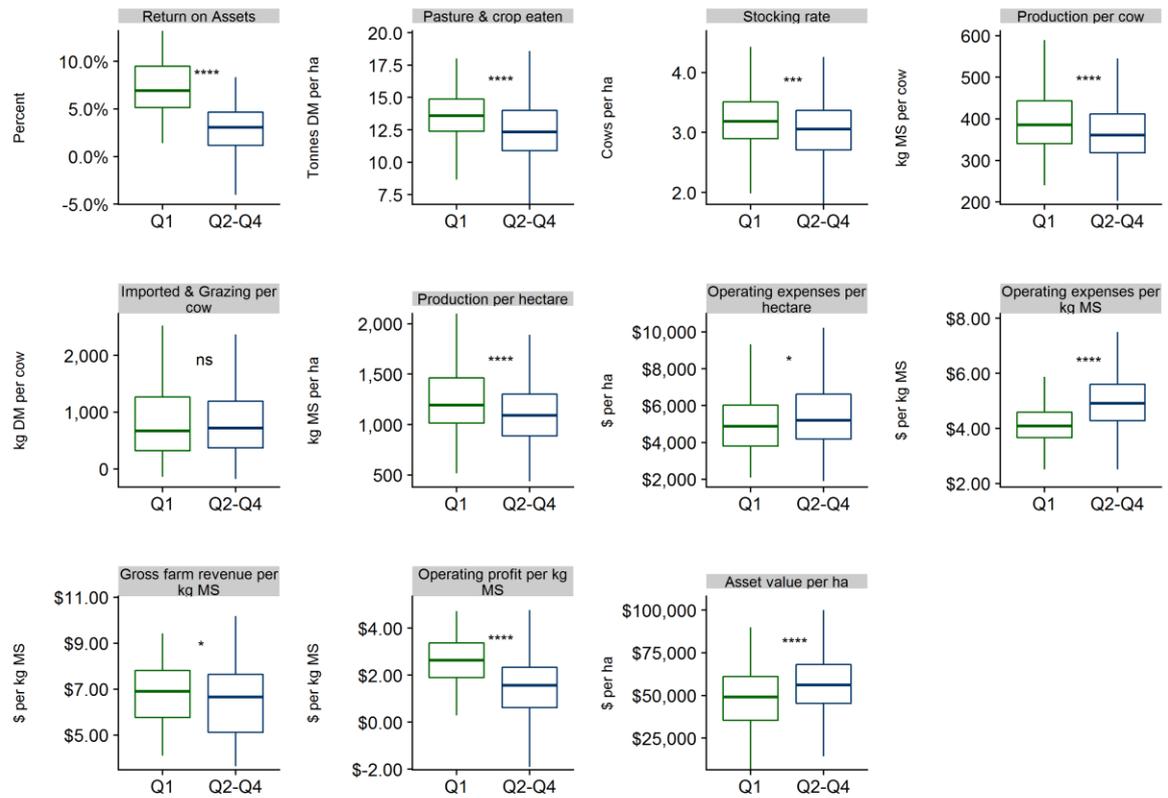
## Methods

DairyBase is an industry-supported descriptive database of farm-level physical and financial data over annual timeframes. An extract including only owner-operator accounts (i.e., this excludes sharefarmers and diverse ownership structures) was created for financial years from 2005/06 to 2016/17. Characteristics associated with profitability were determined by splitting each region's data into one of two groups: Q1 representing the top quartile of farms ranked by operating return on assets within each year, and the remainder (Q2-Q4).

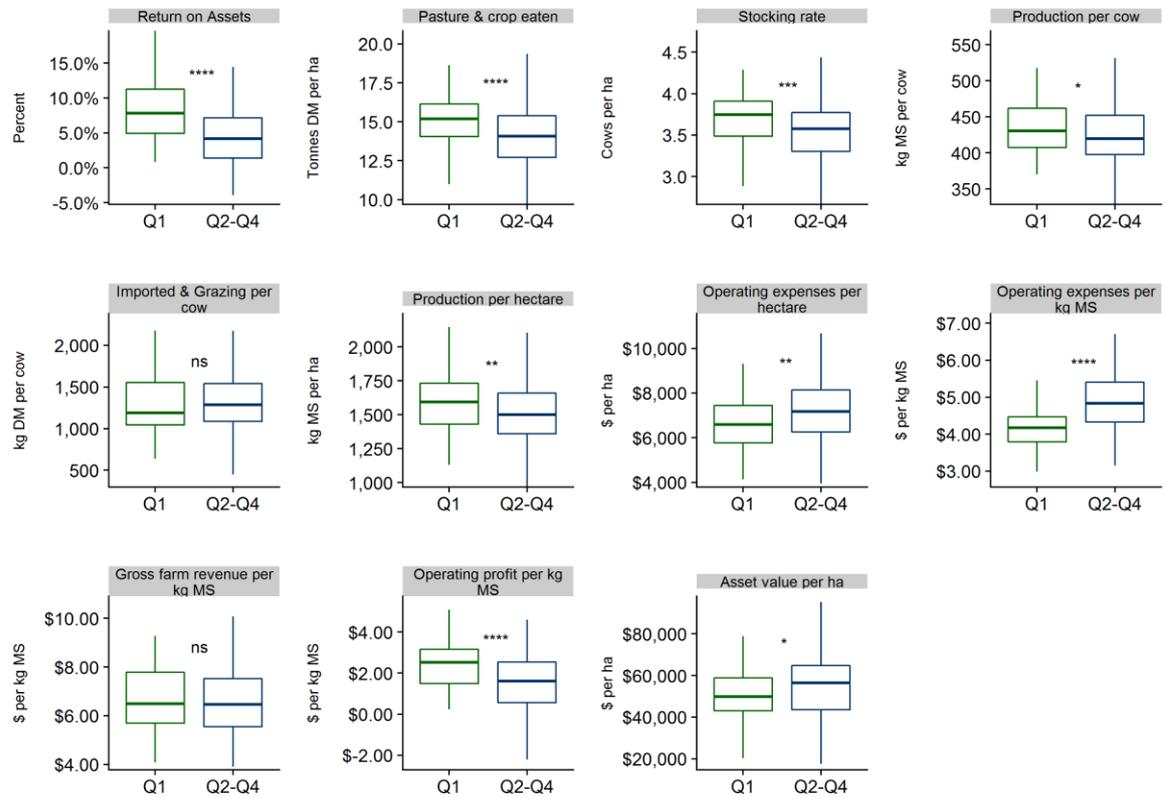
## Results and Discussion

There was some variation in the significance of the relationship between biophysical farm performance and intensification parameters and farm profitability, as measured by return on assets, but, in general, there were high levels of agreement (Figure 1 & 2). There was a 4 percentage point difference in return on assets between farmers with high operating return on assets (Q1) and Q2-Q4 farmers, equivalent to dropping from 7-8% return to about 3-4% return (Figure 1 and Figure 2). High return farmers harvested more pasture and crop (+1.3 and +1.1 tDM/ha, Waikato and Canterbury/Marlborough respectively), had greater stocking rates (+0.12 and +0.18 cows/ha), greater production per-cow (+25 and +10 kg MS/cow), but imported no more feed (including winter grazing).

High return farmers also had lower gross operating expenses (-\$340 and -\$580/ha), that when combined with greater milk production (+100 and +90 kg MS/ha), resulted in lower operating expenses per kg MS (-\$0.80 and -\$0.70/kg MS). The association between gross farm revenue per kg MS (milk plus meat) and return on assets was marginal (Waikato +\$0.24/kg MS) or non-significant (Canterbury). The difference in operating return on assets was a result of the large difference in operating profit per kg MS combined with lower levels of assets per ha (-\$7,000 and -\$6,600).

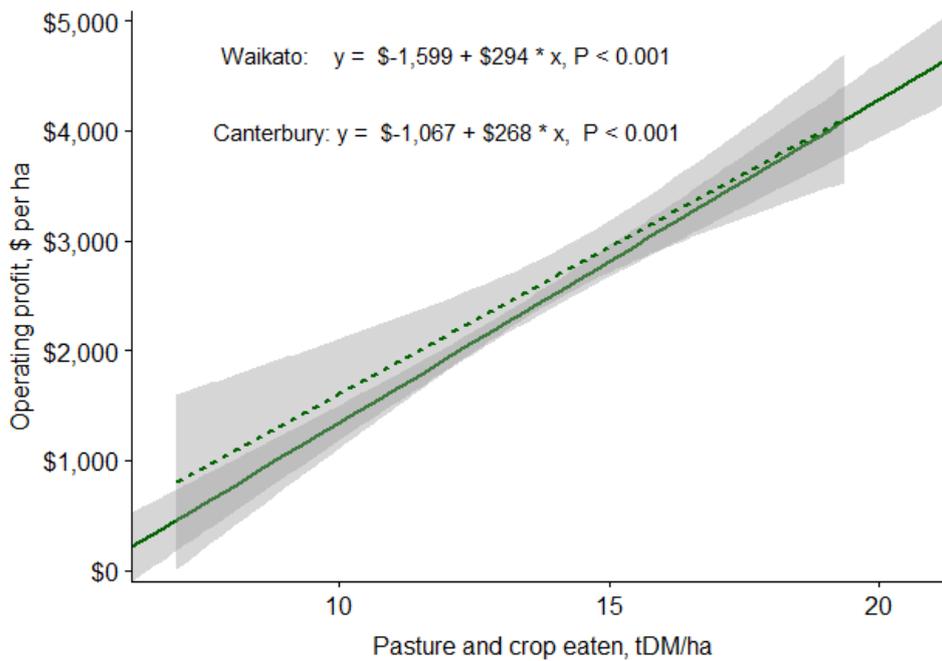


**Figure 1:** Characteristics of farms in the Waikato region that are in the top quartile (Q1) ranked by operating return on assets within years compared with remaining quartiles (Q2-Q4). Significance levels shown are as determined by the Kruskal-Wallis non-parametric test.



**Figure 2:** Characteristics of farms in the Canterbury/Marlborough region that are in the top quartile (Q1) ranked by operating return on assets within years compared with remaining quartiles (Q2-Q4). Significance levels shown are as determined by the Kruskal-Wallis non-parametric test.

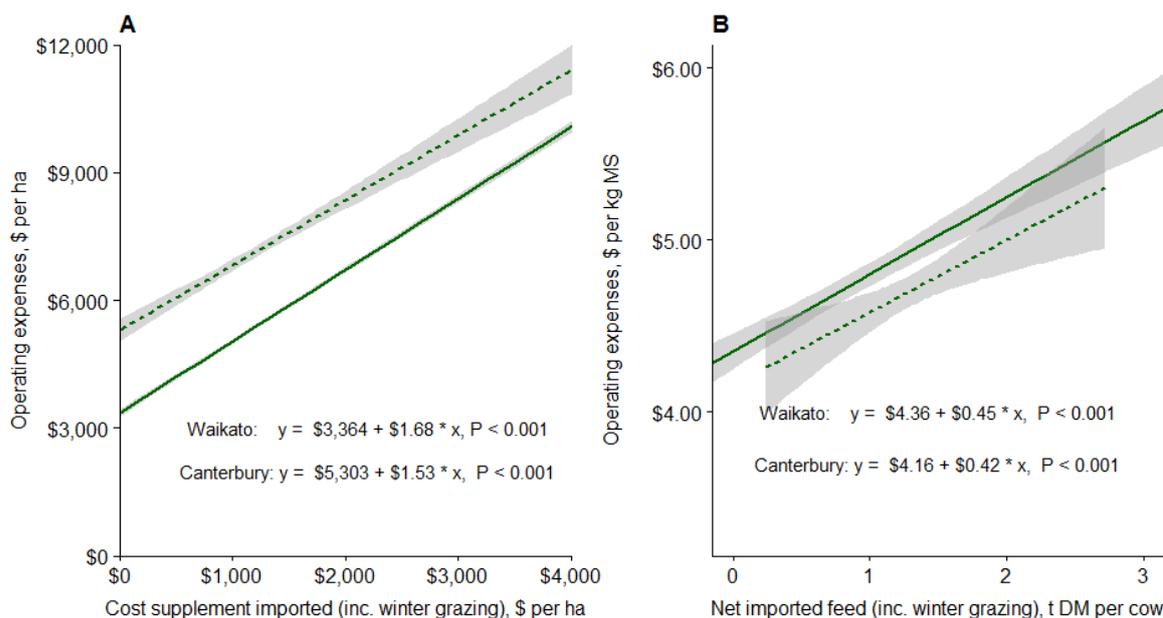
Higher pasture and crop eaten per hectare was associated with higher profit per hectare, of approximately \$300 per t DM (figure 3). This is consistent with Irish data (L. Shalloo, pers. Comm.).



**Figure 3:** Association between pasture and crop eaten per hectare and profitability per hectare, Waikato and Canterbury.

Notably, when supplement use increased (measured by cost), non-supplementary feed expenses also increased. This is presented for the Waikato and Canterbury/Marlborough region in Figure 4 (Panel A), where for each dollar spent on supplement made, purchased and cropped and winter grazing, operating expenses per hectare increase by \$1.66 and \$1.53, respectively. This is similar in magnitude to the multiplication factor reported by Ramsbottom *et al.* (2015), where for every €1/ha in purchased feed costs, there was an increase in total costs of €1.53/ha. AHDB (2013) also reported a similar factor, with a £1.62 increase in total costs for every £1 spent on non-forage feed costs.

Increasing the amount of imported feed was also associated with higher expenses per kg milk solids. For every tonne of feed or crop fed, per-cow expenses increased by an additional 42 and 45 cents per kg MS for the Waikato region and Canterbury/Marlborough region, respectively (Figure 4, Panel B). In other words, a farm importing 0.5 t DM per-cow would have approximately 40 to 45 cents per kg MS lower operating expenses than the average farm importing 1.5 t DM per-cow.



**Figure 4:** Association between the use of imported feed and operating expenses. Panel A: Increasing net imported feed (including winter grazing) associated with higher operating expenses per kg MS. Panel B: Increasing cost of imported supplement (including winter grazing) associated with proportionately higher operating expenses per hectare. Waikato region (solid line) and Canterbury/Marlborough region (dashed line). The shaded area represents the 95% confidence interval for prediction of the mean. P value refers to significance level of the slope coefficient.

Greater milk production from imported feed will only offset the greater expenses associated with this feed if milk revenue is more than the cost of producing the marginal milk. Lower milk prices led to gross farm revenue being less than \$5.50 for 3 years in the last 12 years of the sample, and Figure 3 Panel B shows that farms at the 2 t DM/ha import level would have, on average, little to no operating profit available to pay interest expenses. Furthermore, there was an additional 3 years in the last 12 years where gross farm revenue was not enough to pay for the average expenses of a farm with 2 t DM imported per-cow plus the interest expenses, which now average \$1.23 per kg MS (Economic Survey, 2018). Therefore, when milk price is low (6 out of 12 years), farms are most likely to be in challenging cash flow positions, and there will be an advantage to farms that are less reliant on imported feed.

## Conclusions

High pasture harvest, with low reliance on supplementary feed and effective cost control, are key attributes of financially-robust dairy businesses. These businesses may not be the most profitable during years of high milk price (3 out of the last 12 years); however, they are more capable of maintaining a positive cashflow through low milk price years (6/12), ensuring they are profitable and resilient to the increasing volatility in the sector.

## References

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