Measuring how NZ dairy farmers react to volatile prices by analysing farmer responses over a period of time using panel data

Professor Nicola M Shadbolt, Assoc. Professor Peter Tozer & Imran M Siddique
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INTRODUCTION

• Background
• The DEA approach
• Panel results
• Conclusion

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MILK PRICE & PRODUCTION

• 70% \(\uparrow\) price
• 150% \(\uparrow\) price volatility
• 4.7% pa \(\uparrow\) milk production
Higher milk price can lead to higher profits if farmers respond to these price changes accordingly and adjust their input costs.
INCREASES IN AVERAGES:

• Cost of production $/KgMS
• Production KgMS/cow
• Production KgMS/hectare
• Operating Profit $/ha
  • $2198/ha last 7 years versus
  • $1164/ha previous 7 years

BUT NO CHANGE IN RETURN ON ASSETS (5%) OVER TIME
Dairy Farm Land Prices

Weighted average land sale price $/ha

Milk Production KgMS/ha

Milk Production KgMS/ha

Dairy Land Sale Value $/ha

RESEARCH QUESTION

How have farmers been reacting to the now prolonged period of volatility and what groups of farmers can be identified based on the success or otherwise of their actions.
PASTORAL SYSTEMS

DairyBase data
21 variables
8 seasons
Droughts in 4 seasons
3 high milk price years
Previous research

PCA identified highly correlated sets of variables in every year. They were either:

• Production/ha dominated – technical efficiency
• Operating Profit Margin dominated – financial efficiency
• Both were identified as key resilience metrics
Farmers who managed upside and downside risk

None of the farmers who best captured up-side risk in the good years were in the group of those who best mitigated down-side risk in the bad years. Only metric that was high for both groups was Operating Profit Margin.
Farmer response over time using panel data

- 54 farms using balanced panel data over 8 years
- Estimate technical (TE) and scale (SE) efficiencies
- Data envelopment analysis (DEA) – measure the efficiency of each farmer wrt estimated best practice
- Inputs: effective area, peak cows milked, total labour (paid & family)
Few farms were efficient in all years

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<td>6</td>
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<td>SE Farms</td>
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## TE & SE Farms

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<td>3, 9, 11, 22, 34, 40</td>
<td>7, 10, 11, 22, 34, 40</td>
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<td>6, 8, 10, 17, 22, 31, 40</td>
<td>6, 7, 10, 31, 45, 46</td>
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<td><strong>SE Farms</strong></td>
<td>19, 34, 40, 45</td>
<td>22, 34, 40</td>
<td>7, 22, 34, 38, 40</td>
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Characteristics of farms that were both TE & SE

• No dramatic change in the three inputs (land, labour, and number of cows)
• They slightly adjusted their inputs to find an optimal point of production.
• They did not significantly respond to price fluctuations and operated at a near constant level of production.
Characteristics of farms that were both TE & SE

• Operating profit margins rose up to 59% in a high milk price year and dropped as low as 11% in a low milk price year.

• Most attained high efficiencies by replacing paid labour with less unpaid family labour in low milk price years, some achieved high efficiency when they replaced family labour with paid labour in high milk price years.
FARM 22

Technical and Scale Efficient Farm - Farm ID 22

Peak cows milked/Area

Labor/TE/OPM/SE

Area

Total Labour

Operating Profit Margin %

TE

SE=CRS/VRS

FARM 10

Technical and Scale Efficient Farm - Farm ID 10

- Peak cows milked/Area
- Labor/TE/%OPM/SE
- Area
- Operating Profit Margin %
- TE
- SE=CRS/VRS

Data from 2006-07 to 2013-14
CONCLUSION

- Farms that achieved TE and SE only slightly flexed within their production system over time, mainly adjusting labour during high and low milk price years.
- Farms that altered inputs (land, labour, cows) disturbed the optimal level of production and became technical and/or scale inefficient.
- Contrary to theory and as per previous studies: best profit is not achieved by chasing milk price.
THANK YOU