COMPETITIVE STRATEGY ANALYSIS OF NZ PASTORAL FARMING SYSTEMS

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Abstract

The purpose of this paper is to examine the financial performance of five pastoral dairy farming systems through the use of financial ratio analysis in the form of the Du Pont model and to determine any differences in the drivers of financial success between systems. The differing level and allocation of resources, or organisational structure, that each farm system adopts was the basis for a test to determine superior competitive advantage. This test was on the premise that if a farm system has a competitive advantage it would exhibit above average performance. While the on-farm competitive strategy is the same for all systems, cost leadership, the organisational design, and the resource configuration differ between farms. There are low-input farms which achieve low cost production through cost control (the numerator effect) and high-input farms which achieve it through improved outputs (the denominator effect). There has been significant debate in New Zealand as to which system is better with discussion focusing often on misleading metrics. The focus on competitive advantage and the rigour provided by the Du Pont model analysis enables a more balanced assessment of the benefits or not of intensification on New Zealand farms. The results highlight how misleading commonly used metrics can be. Despite differences in production and operating profit per hectare there is very little difference between return on assets or return on equity between the systems. Of particular interest is the consistency in operating profit margin between systems indicating no loss in operating efficiency as systems intensify. The only exception to this was the more intensive systems in 08/09 when input and output market price relativity was extremely unfavourable. Further research is required to determine if farms switch between systems as input and output market prices change and to explore those farms that are more resilient to such changes.

Keywords: pastoral dairy farm systems, competitive advantage, Du Pont analysis, cost of production

Introduction

Strategy-structure-performance relationships

Business literature is awash with debate around the vexed question of whether structure follows strategy, or vice versa, with respect to establishing competitive advantage. Contingency theory researchers (Chandler, 1962, Porter, 1985) have concluded that optimal organizational design is contingent on strategy. Porter (1985), when distinguishing between two key types of competitive advantage – low cost and differentiation - surmised that the significance of any strength or weakness is ultimately a function of its impact on relative cost or differentiation. Essentially the premise is that it is the external environment and strategic decisions that influence structure.

An alternate view is that the internal resources or organizational structure of a firm are in fact a key source of competitive advantage rather than just being part of the implementation of strategy (Barney, 1991, Barney & Clark, 2007). It is proposed that this resource-based view (RBV) may explain the sources of competitive advantage better than an externally focused orientation (Pertusa-Ortega et al, 2010).

The connection to performance is also the subject of debate. To suggest a firm has a competitive advantage would suggest that it, over time, would out perform its competitors and exhibit above average performance. Pertusa-Ortega et al (2010) identify that while organizational structure can influence competitive strategy it will not directly influence performance. They reference a number of studies that all confirm that strategy influences performance most as it directly influences costs and revenues. In an attempt to define a causal relationship between sustainable competitive advantage and sustainable performance Tang & Liou (2009) suggest that that the presence or absence of competitive advantage may be reflected in the causal relationship between resource configuration, dynamic capability and observable financial performance. The relationship between performance and managerial ability or some other resource advantage is also noted by Langemeier (2010) who notes the importance of identifying unique resource advantages. Hansen et al (2005) similarly identifies from the literature the frequency at which farm management is found to be the crucial factor in determining farm production and financial performance.

Measuring Performance

The Du Pont model has been used consistently by business analysts to provide a better understanding of a firm's superior performance (Little et al, 2009, Langemeier, 2010). It is used to evaluate the drivers of both Return on Assets (RoA) and Return on Equity (RoE). It commonly provides the metrics in the analysis of strategy-structure-performance relationships. For example Palepu & Healy (2008) evaluated execution of competitive strategy and Little et al (2009) evaluated alternative strategies - cost leadership/differentiation - with modified versions of the Du Pont model. Little et al (2009) concluded that the Du Pont model enabled them to determine that for a firm to be successful with cost leadership it was through generating asset turnover while success with differentiation was through generating profit margins.

Tang and Liou (2009) applied the Du Pont approach to three structures or "resource bundles" and found that return on invested capital discriminated the groups more effectively than any other indicator. However, when comparing the sustainable competitive advantage of companies with different resource configurations they concluded it is made up of not one measure but an amalgamation of measures. Through quite complex analysis they concluded that superior financial performance arises from a firm's unique resource configuration and management capability.

NZ Dairy Farm Strategies

Apart from a few exceptions, such as organic milk production, the on-farm strategy followed by the majority of NZ dairy farmers is low cost. With over 95% of their milk exported the price they receive for their milk is strongly influenced by the world price of milk ingredients/commodities. While member ship of cooperatives provides vertical integration for most of these farmers, and therefore an opportunity to benefit from differentiation along the supply chain, this is reflected in the return they receive for their cooperative investment and is now (within the Fonterra cooperative) clearly distinguished from the price received for the milk alone.

So the external environment is the same for all producers and the on-farm competitive strategy is the same. Yet organisational design, the resource configuration, differs between farms. There are low-input farms who achieve low cost production through cost control (the numerator effect) and high-input farms who achieve it through improved outputs (the denominator effect). There is significant debate in the industry over which system is right and which is wrong, with much of the debate fuelled by conflicting opinion and misleading metrics (Roche and Reid, 2002, Shadbolt et al, 2005). A frequently reported concern is that New Zealand's low cost advantage is being eroded by more intensive production systems, requiring greater use of purchased supplements and significant investment in depreciating assets.

Little et al (2009) state that conventional wisdom is that companies devise successful competitive strategies around either profit margin or asset turnover. All farm systems are operating under the same competitive strategy of cost leadership. Under this strategy firms typically generate a low profit margin but balance that against a high asset turnover. Is this the case for our low and high-input farming systems or are the differing resource configurations creating different relationships between the key drivers of the Du Pont model and RoE? Does performance differ between systems and which drivers have the most influence?

Volatility of market prices – both inputs and outputs – has increased in recent years and this has led to further debate around which system is the more able to cope in such conditions. When a farm moves from a low-input system to a high-input system it mitigates one source of risk and creates another. In pastoral farming, climate uncertainty has a big impact on production. In particular, rainfall dictates whether pasture grows or not through the critical summer months. In a low-input system, if pasture stops growing cows are dried off and production reduces or stops altogether. In a high-input system, feed supplement reserves are utilised, and more are purchased if it is cost effective to do so. Climate uncertainty is therefore replaced by market uncertainty. Lactation lengths are improved with high-input systems making better use of available resources, but at a cost. Farmers use a variety of methods to manage the variability of those feed costs but the costs tend to be inversely correlated to rainfall reflecting a greater demand for them when pasture growth is limiting. The high-input system therefore does not totally mitigate climate uncertainty.

Hedley and Kolver (2006) suggested that while the higher input systems can provide more consistent production they may be more complex to manage. They state risk in these systems may be higher if variability in feed prices is not controlled, as profitability is very sensitive to milk and feed price fluctuations. Overseas observations, including that US confinement farms with higher levels of milk production had inferior financial performance to pasture based farms (Benson, 2008), and that it is the difference between milk price and feed costs, not the price or costs per se, that is crucial to profitability (Hansen et al, 2005), add fuel to the debate on system choice.

Which system is the more resilient? This paper reports on an initial exploration into the evaluation of the various systems. It is part of a larger research project funded by DairyNZ in which resilience *per se* is explored in greater depth and risk management strategies better understood and developed.

Methodology

This research measured performance of individual dairy farmers from DairyBase (www.dairybase.co.nz), a database used by farmers and professional advisors in New Zealand to analyse their results and benchmark them with their peers. The data set included physical and financial data for three consecutive seasons, 2006/7, 2007/8 and 2008/9. The total number of farmers analysed varied by season and by system (Table 1) and included farms from both the North Island and South Island. Each season was analysed separately so no attempt was made to track trends between years or exclude farms that did not have data in all three years. Owner-operator data was extracted from the DairyBase database and grouped by farm system. Farms with missing data or extreme values were eliminated.

There are five production systems defined by DairyNZ based on the time of year that imported feed is used. All systems assume that young stock/replacements are grazed off the effective milking area of the farm. The systems are as follows:

System 1. *Self contained – no imported feed*
No supplement fed, except supplement harvested off the effective milking area and no grazing off the effective milking area

System 2. *4 – 14% of total feed imported*
Feed imported, either supplement or grazing off and fed to dry cows

System 3. *10 – 20% of total feed imported*
Feed imported to extend lactation (typically autumn feed) and for dry cows

System 4. *20 – 30% of total feed imported*
Feed imported and used at both ends of lactation and for dry cows

System 5. *More than 30% total feed imported*
Feed imported for use all year, throughout lactation and for dry cows. Split calving is common to this system

The analysis was performed between groups for each of the three seasons to identify differences between systems.

Table 1: Number of owner-operator farms in each farm system for the years 06/07, 07/08 and 08/09 in DairyBase

	System 1	System 2	System 3	System 4	System 5	Total
2006/07	79	235	186	85	25	610
2007/08	68	185	206	121	29	609
2008/09	46	130	194	89	28	487

The next step in the research process was then to run ANOVA statistics on the farms in the relative system groups to test if there was a statistically significant difference in production, cost of production and profitability in the different systems.

The Du Pont model was used to analyse the drivers of RoA, the operating profit margin (OPM) and asset turnover (ATR) as follows:

RoA = OPM * ATR

where RoA = (operating profit – rent) / opening assets
OPM = operating profit / gross farm revenue
ATR = gross farm revenue / opening assets

A farm with a relatively high OPM and ATR will yield a relatively high RoA and vice versa. However, as Langemeier (2010) concludes farms with high ATRs are not necessarily those with high OPMs so farms with the same RoA could have a quite different ATR and OPM. The interpretation of the results from these drivers is, however, complicated by farms that lease land. In particular, as noted by Langemeier (2010), the ATR will be lower for those farms that own a high percentage of their land; the more land that is leased the higher the ATR. Conversely, if the rental cost is deducted from the operating profit before calculating the OPM (as it is in the Langemeier, 2010 analysis) the OPM will be lower for those farms with a higher proportion of lease land.

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While this analysis cannot remove the impact of lease land on the ATR, it has removed it from the OPM by not deducting the rental costs in the OPM calculation. The OPM used is an accurate measure of the efficiency with which the operating profit is generated from the revenue irrespective of how the business is owned or funded.

Return on Equity (RoE) includes the ratio and cost of debt to the RoA equation as follows:

RoE = (operating profit – interest & rent)/ opening equity
where opening equity = opening assets – opening liabilities
and opening liabilities = fixed liabilities + (current liabilities – current assets)

The cost of production per kilogram of milksolid is the sum of the operating expenses (OE) and the cost of funds (CF) as follows:

CoP = (OE +CF) / kilograms of milksolids
where OE = cash farm working expenses + feed inventory/run-off adjustments + depreciation + value of family labour & management
and CF = opening assets * 4%

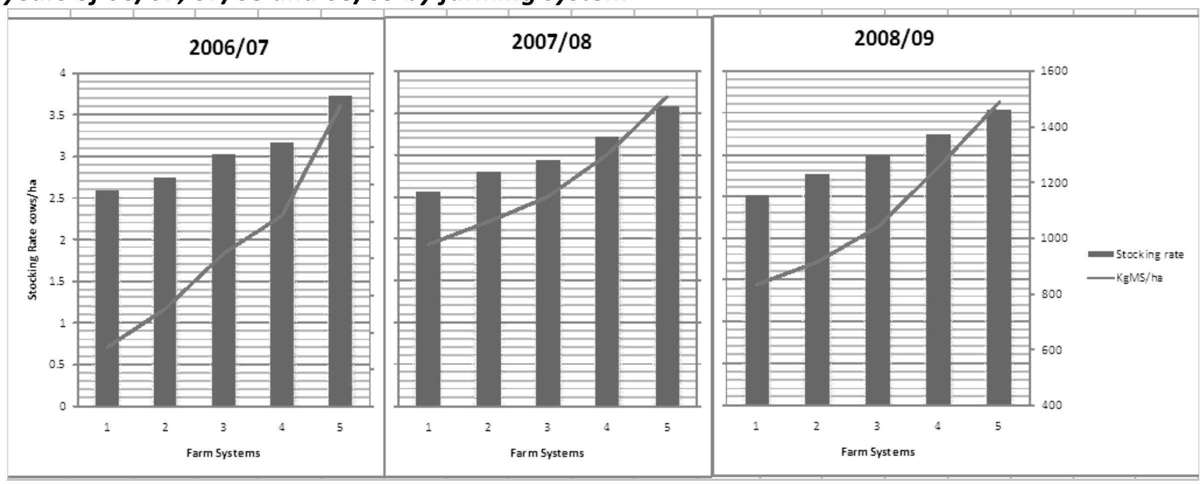
Both OE and CoP are relevant indicators for this analysis; as explained by Thorne & Fingleton (2006) the OE is a useful measure of the short to medium term competitiveness of a business while the CoP is the measure of future competitiveness as it includes the opportunity cost of owned resources.

Results & Discussion

Production

As farm systems adapt from low input to high input there is a noticeable increase in stocking rate and production per hectare. This is apparent in all three years of the analysis (Figure 1). Apart from the increase in production per hectare difference between system 2 and system 1 in 2008/09 and the increase in stocking rate between system 2 and 1 in 2006/07 and 2008/09 all other differences between systems for both production per hectare and stocking rate are significant.

Figure 1: Stocking rate (cows/ha) and production (kilograms milksolids (MS)/ha) for the three years of 06/07, 07/08 and 08/09 by farming system



Profitability

Operating Profit /hectare: the relationship between production and operating profit per hectare is not as consistent (Table 2). If the P-value is less than 0.05 then there is a significant difference between some or all of the systems. In 2006/07 the significant difference between systems was between system 4 and system 1 and system 4 and system 2, otherwise no systems differed

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significantly. In 2007/08 the increase in operating profit per hectare from system 1 to 5 was significant in all cases apart from between system 2 and system 1 and system 5 and system 4.

Only when milk prices were high was there a significant increase between systems 1 to 3. System 4 outperformed systems 1 and 2 in 06/07, in 07/08 both system 4 and system 5 outperformed systems 1, 2 and 3.

In 2008/09 there was no significant difference between the operating profit per hectare of the five systems. In 2008/09 milk price decreased but many input prices did not. This was partly because the forecast milk price decrease did not happen until part way through the season and farmers were committed to contracts for feed that had been based on the higher milk price, but also because input prices such as fertiliser were still high.

When, in 2007/08, milk price increased significantly this was reflected in the operating profit per hectare. For system 2 farms, for example, the operating profit increased from $1040/ha in 06/07 to $2770/ha in 07/08. This increase was all the more notable as input prices also increased significantly in that year and most farms experienced extreme drought conditions.

Table 2: Operating Profit $/ha for the three years of 06/07, 07/08 and 08/09 by farming system

Operating Profit $/ha	2006/07	2007/08	2008/09
System 1	997	2559	974
System 2	1040	2770	865
System 3	1111	3067	823
System 4	1300	3837	619
System 5	1334	4401	428
P value (0.05)	0.010916	2.15E-14	0.072899

It is not surprising that operating profit per hectare is used so frequently by NZ media and commentators and is touted by some as the most relevant measure of profitability (Roche and Newman, 2008). It is relatively easy to calculate and is well understood. In 2006/07 and 2007/08 this metric would have led to the conclusion that intensification to system 4 is the profitable alternative for NZ farmers. Again in 2008/09 it could be concluded from this metric that system 4 was still a good strategy. .

But as pointed out by Shadbolt (1997), operating profit per hectare is a misleading metric. When comparing farms within a production system it cannot reflect the fact that not all hectares are of equal quality and therefore are not of equal value. When comparing between systems it does not reflect the additional capital invested as farms intensify - the extra cows as stocking rate increases, extra cooperative shares as production per hectare increases and the machinery, building and infrastructure changes required to manage more intensively.

As described in most management texts, the measure of profit most relevant to business owners is the return on their equity (RoE) as this determines how effectively they have employed their capital. It also provides awareness of where change might be required.

Return on Equity: In 2006/07 and 2007/08 there was no significant difference between the RoE for the five farm systems. No one system performed better than another. Any conclusions that system 4 or 5 was better, based on operating profit per hectare, were negated when return on equity was compared. So the additional capital invested as systems intensify, while enabling the farms to produce more milk, did not deliver a greater return on equity. There was also no significant difference over the three years in the debt servicing capacity of the farm systems. The level of commitments (interest and rent) does not differ. This is contrary to popular belief that suggests the intensive farmers carry more commitments.

Similarly, in 2006/07 and 2007/08 there was no significant difference between the RoA for the five farm systems (Figure 2); in other words the additional capital required to achieve the higher production delivered a consistent return per unit of capital.

Table 3: Return on Equity % for the three years of 06/07, 07/08 and 08/09 by farming system

Return on equity %	2006/07	2007/08	2008/09
System 1	0.7%	6.7%	-1.9%
System 2	-0.1%	7.7%	-2.1%
System 3	-0.6%	10.1%	-3.9%
System 4	-0.8%	9.6%	-5.1%
System 5	-2.9%	8.2%	-6.6%
P value (0.05)	0.343481	0.076249	0.011223

However, in 2008/09, the inability to produce a higher operating profit per hectare coupled with the additional assets required per hectare resulted in a significantly worse outcome under intensification. For the RoE both system 4 and system 5 performed significantly worse than systems 1 and 2. For the RoA systems 3, 4 and 5 all performed significantly worse than system 1 (Figure 2).

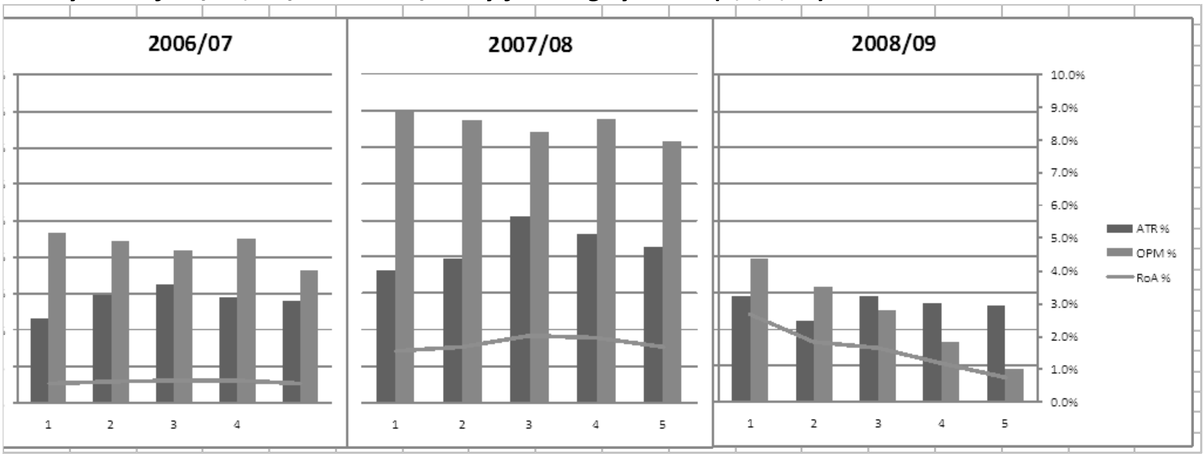
The impact of the unfavourable milk price/ input cost relativity in 08/09 was therefore felt most strongly by the high input farms. These farms, while able to continue to produce at higher levels (Figure 1), mitigating climate risk, are more affected by market risk – both input costs and output prices. Even though production per hectare and operating profit per hectare increased, the combination of unfavourable milk price/input cost relativity and the additional capital required to generate that production and profit was unfavourable in both higher input systems.

Return on Assets: given the similarity in RoA in 06/07 and 07/08 and the difference between systems in 08/09 is there any difference in the ATR, the efficiency with which the assets are used to generate revenue, and the OPM, the efficiency with which that revenue is turned into profit?

In 06/07, apart from a significant difference between asset turnover in systems 1 and 3, there were no significant differences between systems in either asset turnover or operating profit margin. Despite the increase in milk production per hectare the increase in revenue it generated was matched by an increase in the resources required to achieve that production, hence no change in asset turnover. No difference in operating profit margin indicates no deterioration in operating efficiency as systems intensify.

In 2007/08 system 3 had a significantly greater asset turnover than systems 1 and 2 but otherwise there were no significant differences between asset turnover and operating profit margin between systems. Once again there was no significant difference between the operating profit margins indicating the efficiency of production (costs spent per income generated) is maintained as farms intensify. This asset turnover driven performance is commensurate with firms pursuing cost leadership strategies (Little et al, 2009).

Figure 2: Return on Assets (RoA), AssetTurnover (ATR) and Operating Profit Margin (OPM) for the three years of 06/07, 07/08 and 08/09 by farming systems (1,2,3,4+).



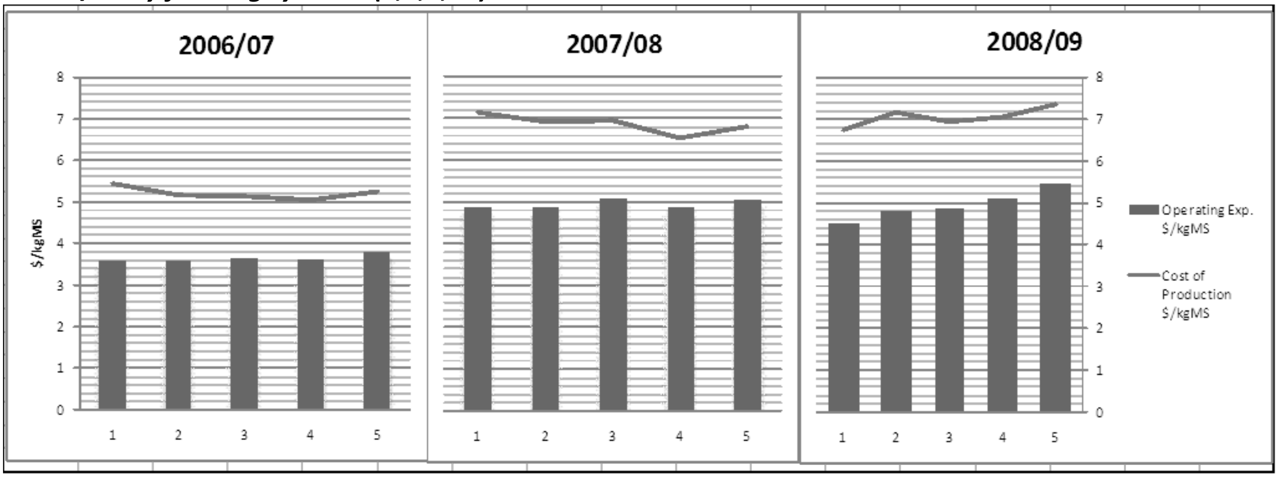
In 08/09 the drivers of RoA presented a different picture. System 2 delivered a significantly lower asset turnover than system 1 then systems 3 and 4 delivered a significantly higher asset turnover than system 2. While asset turnover differences were inconclusive there was significant deterioration in operating efficiency as systems intensified. System 4 and system 5 were significantly less than systems 1 and 2 and system 3 is significantly less than systems 1. Differences in RoA in 08/09 can be explained by operating profit margin and not asset turnover. As operating efficiency declined so also did return on assets. Achieving the higher production and asset turnover with intensification came at an unacceptable price.

Cost Leadership

So, if all farm systems are operating under the same competitive strategy of cost leadership, was there any difference in their cost of production? Both farm working expenses and operating expense per kilogram of milksolids are frequently used by NZ media and commentators as the most relevant measures of cost of production. However they, like operating profit per hectare, can be misleading metrics. Both fail to recognise the asset base required to deliver the production in each system and therefore the cost of that asset base. As such they are valid for short to medium term comparisons but for the longer term competiveness as explained by Thorne & Fingleton (2006) it is the full economic costing of the CoP that is relevant.

There was no significant difference between the operating expenses per kilogram of milksolids in all systems in 06/07 and 07/08. In 08/09, system 5 had significantly higher operating expenses than systems 3,2 and 1 and system 4 was significantly higher than systems 2 and 1 (Figure 3). The phenomenon described by Smyth et al (2009) as 'stickiness of costs' in which there is little mobility in costs, a limited ability of farmers to manage costs down, could explain the significant difference noted in the higher input systems. In the Lincoln University Dairy Farm Focus Day report (July 1st, 2010) it was noted that in 2008/09 there was a strong and negative relationship between operating expenses per kilogram of milksolids and operating profit per hectare. The results presented in Table 2 and Figure 5 echo that relationship in 2008/09 for system 5 (and to a lesser extent system 4) but not for systems 1, 2 and 3.

Figure 3: Operating Expenses and Cost of Production ($/kgMS) for the three years of 06/07, 07/08 and 08/09 by farming systems (1,2,3,4+).



In contrast, and as with the Thorne and Fingleton (2006) study when comparing the cost of production per kilogram of milksolids (the full economic costing) the competitive position of the systems changed. In 06/07 systems 2, 3 and 4 were all significantly less than system 1. In 07/08 the system 4 cost of production was significantly less than systems 1, 2 and 3. However, in 08/09 there was no significant difference between any of the systems. Smyth et al (2009) determined that costs decreased as stocking rate increased, suggesting scale and improving efficiency are key to reducing costs. As shown in Figure 1 there was a significant increase in stocking rate between systems, system 4 achieves cost benefits from this in two of the three years analysed.

The benefit of increased production levels on cost of production, the denominator effect, while apparent in 06/07 and, to a lesser extent, in 07/08 was not present in 08/09 due to it being insufficient to counteract the combination of the high input costs and additional capital required to generate higher production levels. Increasing production intensity improved cost leadership in average and favourable market conditions but this advantage disappeared under unfavourable milk price to input cost ratios. The concern that New Zealand's competitive advantage that has relied heavily on the use of low cost grazed pasture is being eroded by more intensive production systems is refuted by these results. When using a metric that incorporates opportunity cost of capital it can be seen the cost of production per kilogram of milksolids at worst doesn't change and, at best, reduces as systems intensify.

Conclusion

The more intensified systems consistently produce more milk per hectare than the other systems. However in 06/07 and 07/08 there was no difference in profits (RoA and RoE). Although in 06/07 and 07/08 the more intensified systems achieved a lower cost of production they were not able to achieve a higher RoA or RoE. As all systems are following the same strategy of cost leadership these results would concur with the conclusion of Pertusa-Ortega et al (2010) that while organizational structure can influence competitive strategy it will not directly influence performance and that strategy influences performance most as it directly influences costs and revenues.

System 1 is the traditional NZ pastoral farming system in which cost control is a key driver in profitability. As this system intensified the operating efficiency did not change across systems indicating that cost control is maintained. When market conditions deteriorated in 08/09 it was the inability of the more intensive systems to maintain their operating efficiency that resulted in their inferior performance despite maintaining capital efficiency.

While 08/09 was an unusual season, input prices usually reduce as output prices fall and vice versa, it is a concern that the intensive systems performed so poorly and were unable to adjust within the season to price changes. Further research on the degree of flexibility that each system exhibits is called for to determine how resilient each is to market volatility. Tracking individual farms through the seasons is also required to determine if and when they might switch between systems; the season specific analysis carried out in this research was not able to examine such time lines.

New Zealand's competitive advantage still relies heavily on the use of low cost grazed pasture, and the results show (when calculated using metrics as advocated in this paper) that this is not being eroded by more intensive production systems.

In conclusion, it is apparent that the cost leadership strategy is pursued by all pastoral dairy farming systems analysed over the three seasons of 06/07 to 08/09. The resource configuration of each system in most years led to no significant difference in either OPM or ATR, the drivers of RoA, or RoE. This similarity is in stark contrast to the conclusions drawn when examining the commonly used metrics of production and operating profit per hectare and demonstrates how misleading they are.

Profitability differs little between systems so what benefits are there from changing systems apart from an improvement in cost leadership that disappears when market conditions are unfavourable? It is possible to conclude from the data from the first two years that the choice of system a farmer makes could be based purely on personal preference and attitude to different sources of risk as it made no difference, on average, to returns.

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