Addendum to Evaluating the Loss of Profitability and Declining Milk Production in the Australian Dairy Industry

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Introduction

There was a wider analysis undertaken to complete the paper titled "Evaluating the Loss of Profitability and Declining Milk Production in the Australian Dairy Industry" (Beca, 2020) than could be included in the published version. Some of this wider analysis provides additional understanding of how the dairy industries in each of the six countries that were studied have been developing, including Australia's comparative performance. This unpublished addendum to the paper provides this further detail.

The abstract from the published paper read:

The question explored is whether and, if so, why a significant proportion of dairy farm businesses in Australia have lost their competitiveness compared to other major dairy producers in the world. Since 2001 the Australian dairy industry has been contracting in size (reducing total milk production), unlike any of the other major exporting countries outside the European Union. Although many reasons have been proposed to explain this contraction in milk supply, it could reasonably be interpreted as confirmation that a significant proportion of Australian dairy farmers are not sufficiently profitable to maintain and grow their businesses. In this paper, comparisons between dairy farmers in six countries (Australia, New Zealand, United States, Argentina, Uruguay and South Africa) are utilised to determine whether factors "outside the farm gate" can explain the loss in profitability in the industry, and to determine what factors "inside the farm gate" are involved. Factors examined include milk price, weather/drought, industry deregulation, farm size and production system including pasture harvest and major cost centres. This paper proposes that the choice of production system by farmers is the primary determinant of the loss in profitability within the Australian industry and the contraction in milk supply. Furthermore, if in the future a lower cost of production system is adopted by Australian dairy farmers on their farms, these individual farms will improve their profitability and, if this is done by significant numbers of dairy farmers, the Australian dairy industry could return to a position of annual increases in milk supply of 2-3 per cent.

As with the published paper, all financial graphs are in USD, with the average foreign exchange rate for each year applied to that year. All milk ratios are reported in 'energy corrected milk' (**ECM**) with this corrected to 4.0% fat and 3.3% protein using the formula: ECM = milk production x ((0.383 x fat% + 0.242 x protein% + 0.7832) / 3.1138).

Abbreviations for countries include the following: Australia - **AUS**, New Zealand - **NZ**, Argentina - **ARG**, Uruguay - **URU**, South Africa - **RSA** and United States - **US**. Abbreviations for Australian states include the following: Victoria - **VIC**, Tasmania - **TAS**, New South Wales - **NSW**, Queensland - **QLD**, South Australia - **SA** and Western Australia - **WA**.

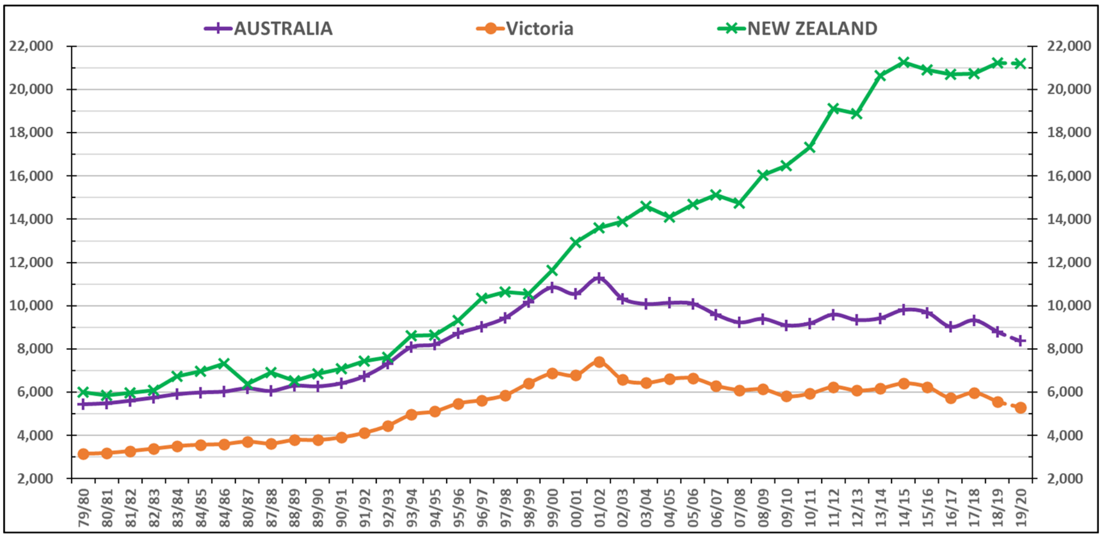
Additional information on the comparative performance of the six dairy industries

Why is there an advantage for industries to make comparisons with similar industries in the same market from other countries, and for these comparisons to cover a lengthy time period (as it would be for individual businesses)?

The combination of external comparisons over lengthy timelines ensures recent experiences are not unduly weighted in their impact. The risk from not doing this appears to be evident in the AUS dairy industry, where proposed reasons for the absence of growth in milk production (and loss of profitability) have included low milk prices, influence of supermarkets and/or international ownership of milk processors, poor weather including drought, and government regulation or deregulation. As reported by Beca (2020), changes in the production system adopted by AUS farmers has been the primary factor that has caused the loss in profitability and the lack of milk supply growth.

Figure 1 highlights the potential benefit of external comparisons. The AUS and NZ dairy industries have been diverging in growth in milk production for 20 years. Given the biological nature of livestock farming, where changes in business performance are likely to take five or more years to emerge, it would appear reasonable to assume that the underlying reasons for Australia's lack of milk supply growth will have started to emerge in the mid 1990's if not earlier. An industry trend that is over 20 years in length is unlikely to be caused by one-off milk price or weather events. Conversely, farmers in all six countries complain of the influence of supermarkets and/or 'adverse' ownership of milk processors, all countries with the exception of NZ have dry variable continental climates, while Argentina and South Africa could reasonably lay claim to having the most difficult social and governmental challenges of the six countries.

Figure 1. Milk production (m litres) for Australia, Victoria (AUS) and New Zealand



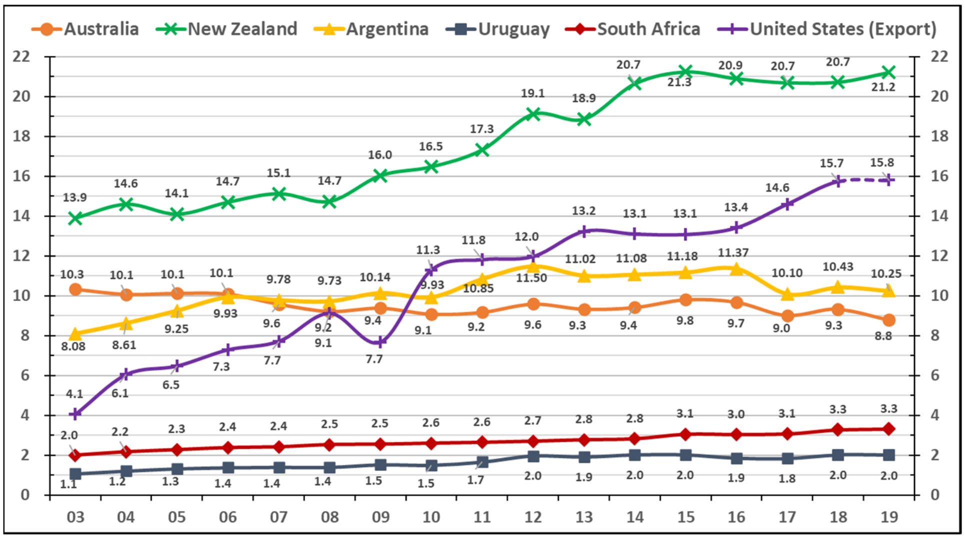
Source: Dairy Australia, DairyNZ

If Australian and Argentinean milk production continues to reduce, and given Australia and Argentina are two of the larger international exporters of milk products, then might this put upward pressure on milk prices over time?

Figure 2 outlines how milk production has changed for the six countries in billions of litres from 2003 to 2019. The US volumes are solely the export volumes, whereas the total volume of milk produced in the US is approximately four times larger than in NZ. The rapid rise in exported US milk products demonstrates how a country such as the US can be expected to fill any gap in international demand, including in response to reductions in supply from other countries.

A challenge for the US dairy industry is that as export volumes increase, this will average down the price of milk paid to farmers, as the internationally traded value of milk is lower than the US domestic price of milk. This may put a limitation on the growth in future exported volumes of milk from the US. However, there is opportunity for existing or emerging milk exporting countries to supply any foreseen unfulfilled demand for milk products.

Figure 2. Milk production (b litres) for AUS, NZ, ARG, URU and RSA plus US export volumes



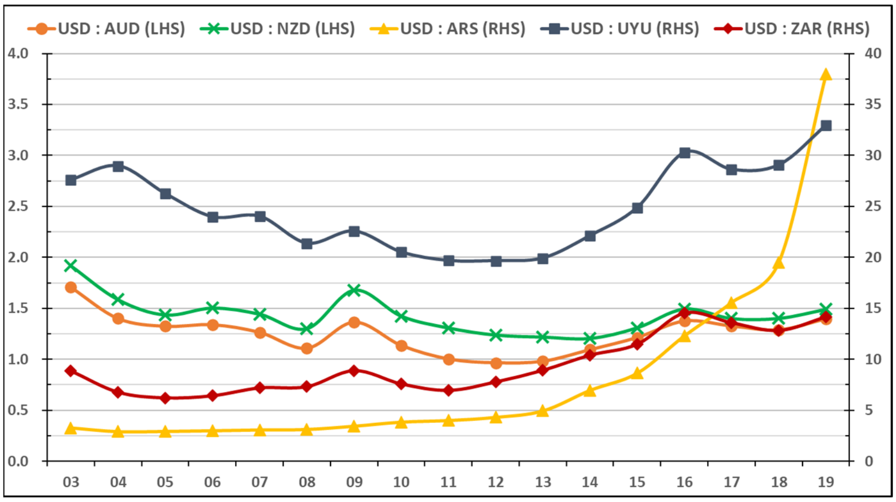
Source: Dairy Australia, DairyNZ, MAGYP, INALE, MPO, USDA

Why use US dollars as the basis for international comparisons of dairy industries?

Milk products are traded internationally in USD with five of the six countries being major exporters of milk products, and the other country (RSA), being a minor exporter though having a domestic market that is exposed to imports. In addition, a substantial proportion of inputs into dairy farms are either imported and traded in USD or are produced in local currency and exposed to international trade of these products in USD. As a result, USD is the only sound currency option to use for a study such as this and reduces or eliminates the need to consider the inflation rate in each country. Financial results in this study were not adjusted for inflation.

Figure 3 outlines how foreign exchange rates to the USD have changed from 2003-2019. AUD and NZD rates are on the left axis and ARS (ARG), UYU (URU) and ZAR (RSA) are on the right axis. There is some similarity in trends for all currencies with the exception of ARS (ARG).

Figure 3. USD foreign exchange rates



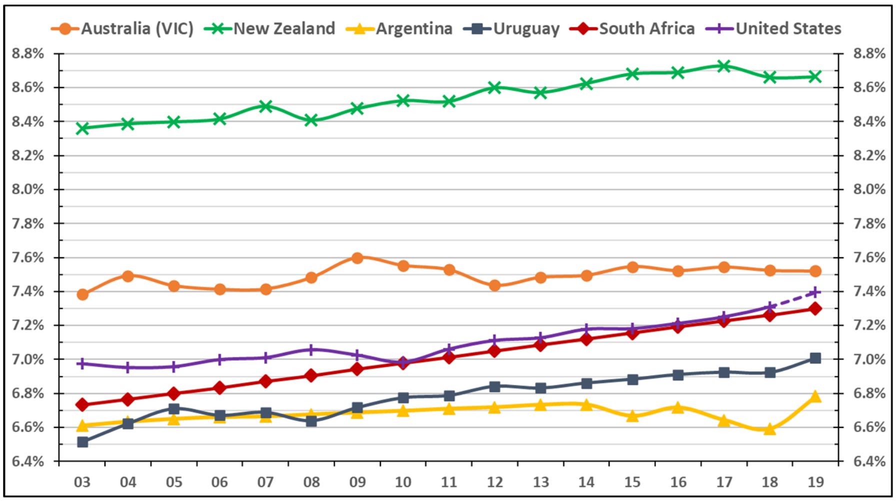
Source: OFX (OzForex Limited)

How have milk components (solids per cent) been changing and what, if anything, might this indicate about the focus of farmers in these countries?

Figure 4 compares solids percentage across the six countries. Solids = fat + protein, where protein is reported as true protein. AUS and US do report true protein with their milk components. NZ, ARG, URU and RSA report protein as total protein rather than true protein, so non-protein nitrogen was assumed to be 5.5 per cent of total protein to correct for this.

It is interesting to note that AUS and ARG are the two countries that have had the lowest increase in solids percentage over the reported period. These are the two countries with the largest changes in production systems (i.e. the greatest reduction in pasture as per cent of the cow's diet), as well as the most significant increases in cost of production and decreases in profitability as reported by Beca (2020). In addition, since 2012, ARG has had a trend of decreasing total milk production in a similar way as AUS has experienced since 2000.

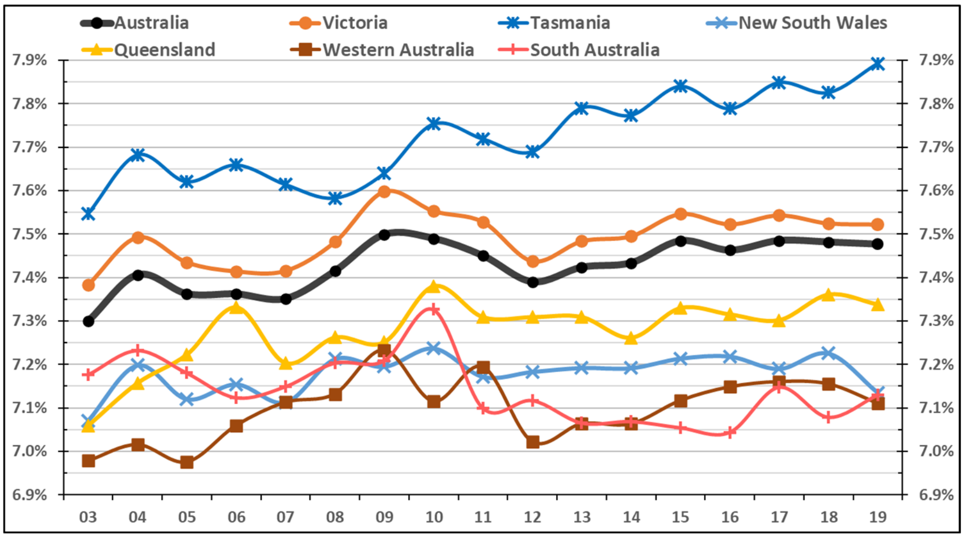
Figure 4. Solids (fat + protein) percentage for the six countries with AUS represented by VIC



Source: Dairy Australia, DairyNZ, MAGYP, INALE, MPO, USDA

Figure 5 compares solids percentage across the States of AUS. Again, it is interesting to note that most states have only had small increases in solids percentage over the reported period. Tasmania is the one state that has had significant increases in solids percentage, and it is the state with the smallest decrease in cost of production and the only state to consistently grow its milk production. South Australia is the one state that has had a decrease in solids percentage, and it is the state with the highest level of milk production per cow and the lowest level of profitability as reported by Beca (2020).

Figure 5. Solids percentage for States of AUS

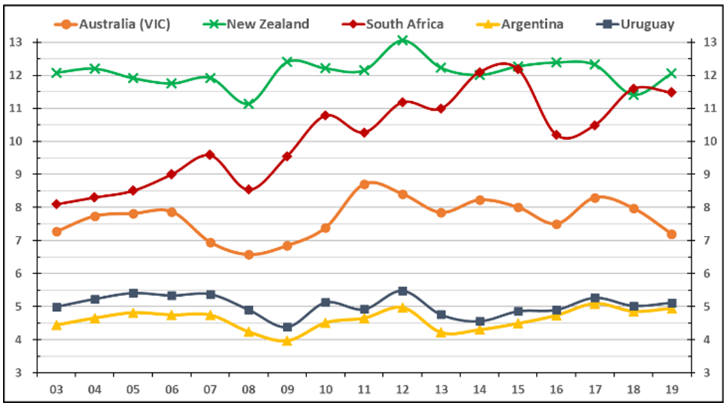


Source: Dairy Australia

How has stocking rate been changing and how has this been related to changes in pasture harvest?

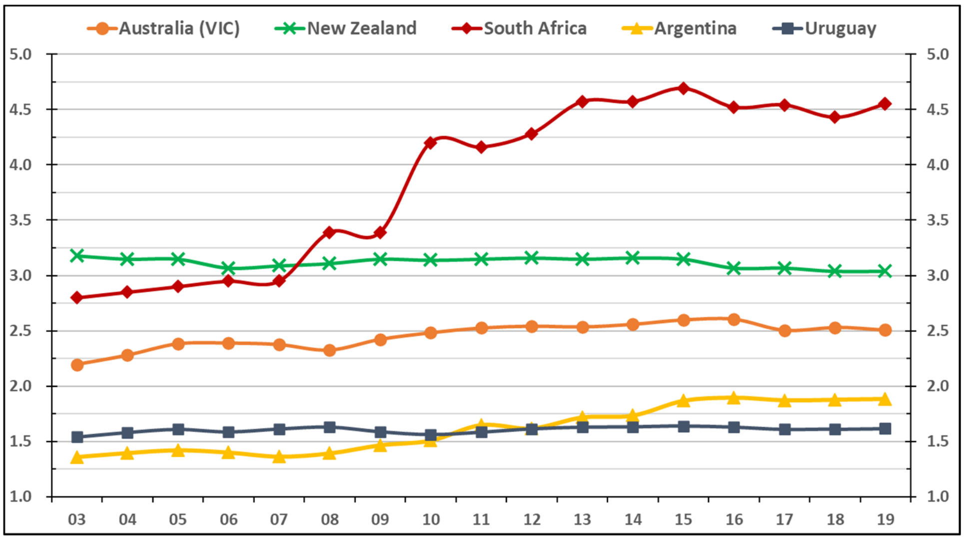
Figure 7 compares stocking rate (cows per effective dairy hectare) across the five pasture-based countries. These stocking rates should be interpreted in conjunction with the levels of pasture harvest across the same countries as reported by Beca (2020) and outlined in Figure 6.

Figure 6. Pasture harvest (tDM/ha/yr) Beca (2020)



NZ has had little change in stocking rate which matches the minor change in pasture harvest over the period in this study. RSA has had a substantial change in stocking rate (approx plus 50 per cent) which matches a large increase in pasture harvest. AUS and ARG have had a smaller but significant increase in stocking rate over the period in this study, although this has not been matched by an equivalent increase in pasture harvest. This mirrors the decrease in pasture as a per cent of the cow's diet and the increase in cost of production reported by Beca (2020).

Figure 7. Stocking rate expressed in cows per hectare with AUS represented by VIC

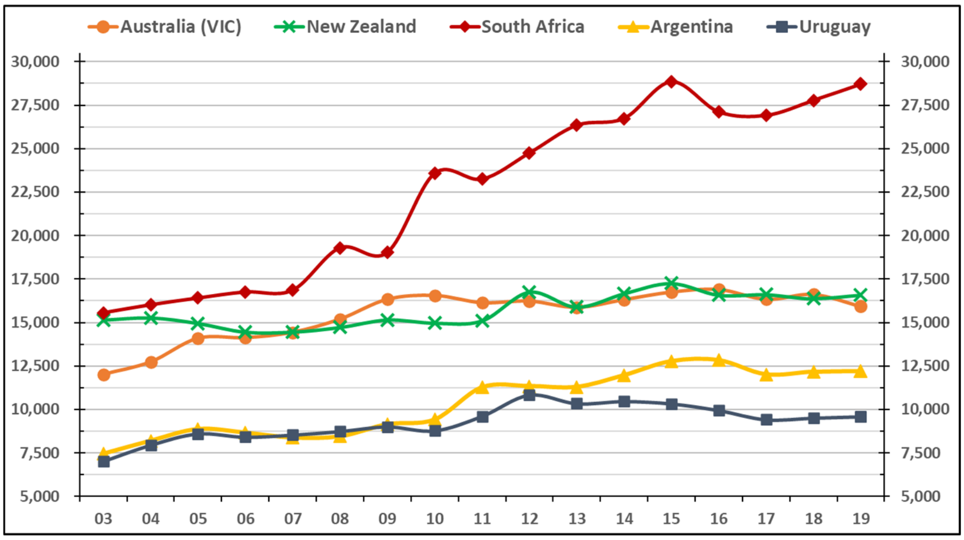


Source: Red Sky, Dairy Farm Monitor Project, DairyBase, AACREA, FUCREA

How has milk production per hectare been changing and how has this been related to changes in stocking rate?

Figure 8 compares milk production per hectare across the five pasture-based countries. This confirms RSA as the outstanding performer on this measure, with this high and increasing level of milk production per hectare based on a high and increasing stocking rate and pasture harvest. AUS and ARG are the two other countries with a significant increase in milk production per hectare over the period in this study, with this supported by both an increasing stocking rate and an increasing level of milk production per cow as reported by Beca (2020). However, the increase in milk production per hectare for these two countries has not been matched by a higher pasture harvest, with the additional milk primarily coming from higher feeding rates of supplement (concentrate) per cow, resulting in a decrease in pasture as a per cent of the cow's diet and an increase in the cost of production as reported by Beca (2020).

Figure 8. Milk production per hectare expressed in litres (ECM) with AUS represented by VIC

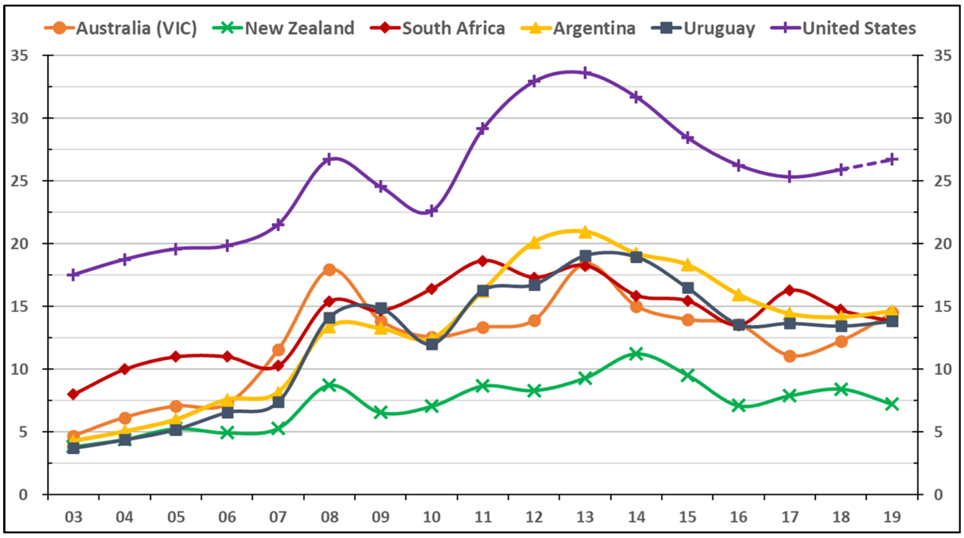


Source: Red Sky, Dairy Farm Monitor Project, DairyBase, AACREA, FUCREA

How has supplement cost per litre been changing and how has this been related to changes in stocking rate and pasture as a per cent of the cow's diet?

Figure 9 outlines the supplement cost per litre across the six countries (supplement cost includes concentrate and forage cost but excludes pasture cost). This demonstrates one of the outcomes for AUS as a result of increasing stocking rate without this matching an improvement in pasture harvest, and decreasing pasture as a per cent of the diet. For the period of 2003-2006, AUS had a relatively similar supplement cost per litre to NZ. However, since then the supplement cost per litre has been significantly higher than NZ. The same trends are evident with ARG and URU. These results are similar to the impact on total feed cost per litre, which includes pasture cost, as reported by Beca (2020).

Figure 9. Supplement cost expressed in USD cents/litre and ECM



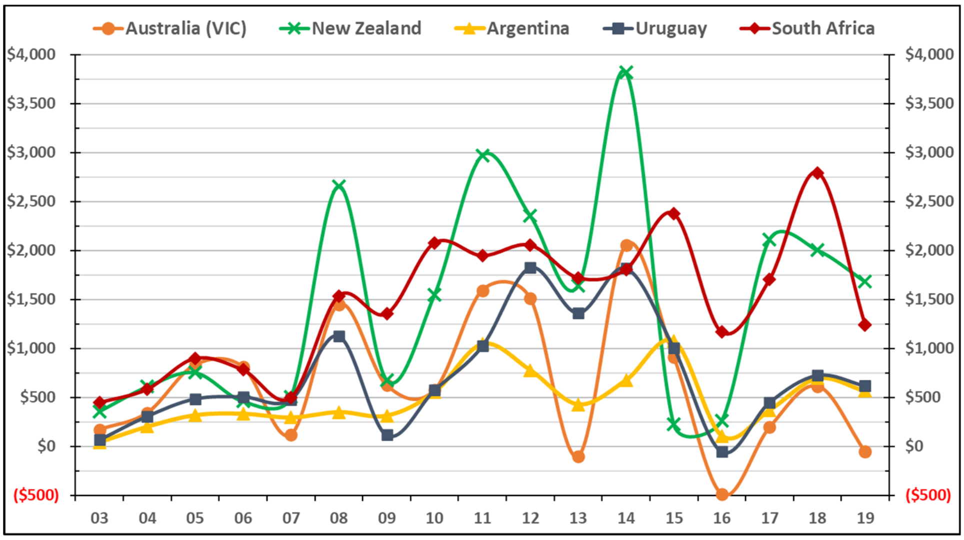
Source: Red Sky, Dairy Farm Monitor Project, DairyBase, AACREA, FUCREA, USDA, Genske Mulder

How has profit per hectare been changing?

Figure 10 compares profitability across the five pasture-based countries based on profit per hectare in USD, where ***profit per hectare*** = operating profit divided by effective dairy hectares (grazed by the cows). This confirms profitability per hectare for many AUS (Victoria) dairy farmers has progressively fallen behind other countries, with many recent years producing near zero or below zero profitability. This trend is similar to the trend reported by Beca (2020) for profit per cow and return on total capital.

AUS dairy farmers carry higher levels of debt than the other countries listed with the exception of NZ farmers, so when financing costs are included, a majority of AUS dairy farmers have struggled to breakeven in recent years and have at times suffered significant losses. Although profit per hectare is not a complete measure of business profitability given it refers only to a portion of the capital employed in the business (i.e. the land and buildings), there is a strong correlation between profit per hectare and return on total capital.

Figure 10. Profitability expressed as profit per hectare in USD with AUS represented by Victoria

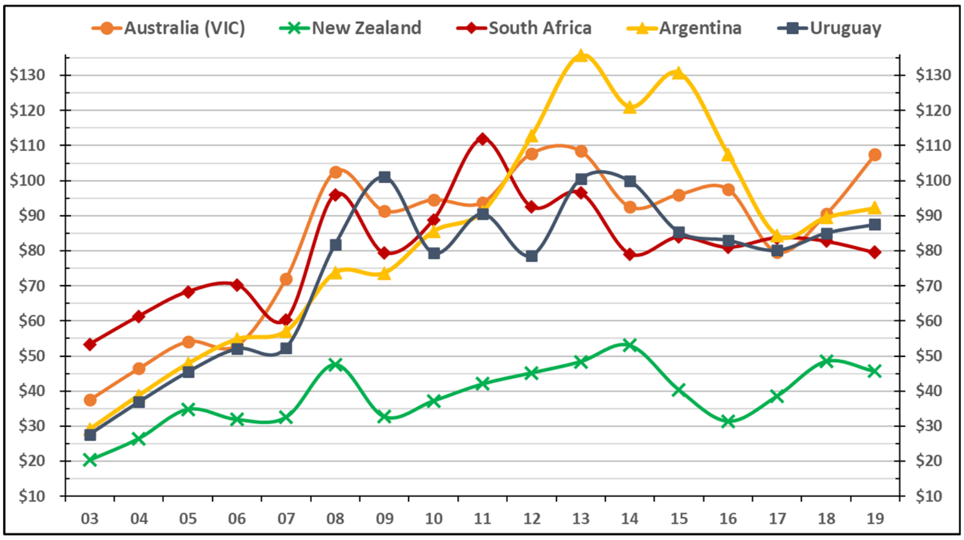


Source: Red Sky, Dairy Farm Monitor Project, DairyBase, AACREA, FUCREA

How has pasture cost per tonne dry matter been changing and what are the implications of pasture cost on the international competitiveness of dairy industries?

Figure 11 outlines the pasture cost per tonne dry matter of pasture harvest across the five pasture-based countries, where ***pasture cost per tonne dry matter*** = (pasture maintenance and renovation plus green feed crops grazed in situ plus fertiliser including nitrogen plus pasture irrigation costs plus silage and hay costs for pasture conserved on the dairy farm) divided by total dry matter of pasture harvested.

Figure 11. Pasture cost per tonne dry matter of pasture harvest expressed in USD/tDM with AUS represented by VIC



Source: Red Sky, Dairy Farm Monitor Project, DairyBase, AACREA, FUCREA

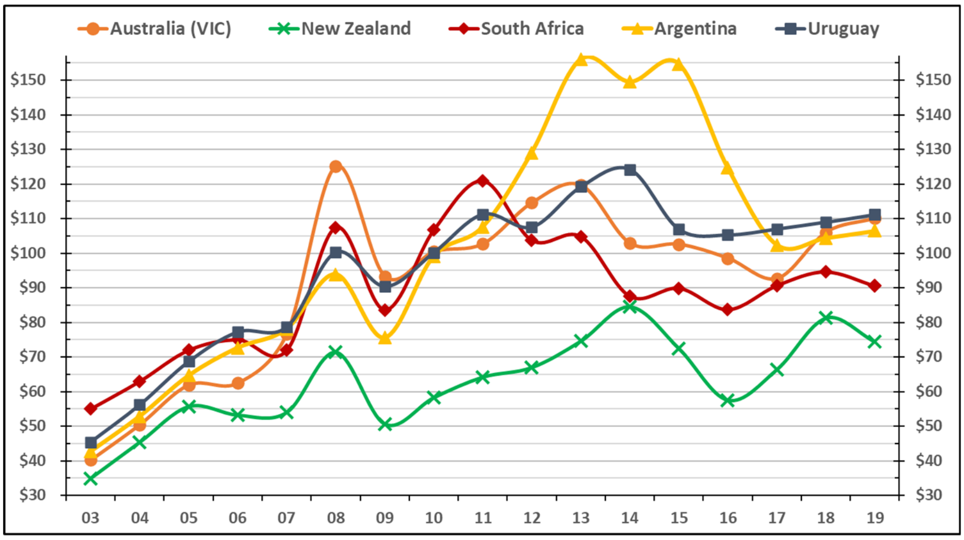
This highlights the large competitive advantage NZ has compared to all the other countries, with this resulting from the low cost of production system (high per cent of pasture in the diet) that has been retained over time plus the natural advantage NZ has for producing high volumes of high quality pasture due to its southerly latitude and climate. Although RSA farmers have significantly increased their level of pasture harvest, their production system is not as low cost as NZ, and the much higher nitrogen application rates and irrigation costs result in a pasture cost similar to the other countries in the study. AUS (along with ARG and URU) had a much higher increase in pasture cost than either NZ or RSA around 2007-2008 to the extent that AUS pasture cost has more recently remained around 100 per cent higher than NZ.

How has 'core per hectare cost per tonne dry matter of pasture harvest' been changing and what is the relevance of this specific land or area cost ratio?

Figure 12 outlines the core per hectare cost per tonne dry matter of pasture harvest across the five pasture-based countries. This ratio was developed by Red Sky so that a group of costs related to the land area (effective hectares) that do not include supplements or people (both of which require their own targeted ratios) could be monitored. This ratio is the most relevant (due to its correlation with profit) for determining the performance of a dairy business in controlling farm area or 'hectare' costs, which to be relevant needs to reference the amount of pasture harvested per hectare. The calculation of ***core per hectare cost per tonne dry matter of pasture harvest*** = [100% x (Administration fees & overheads excl. industry levies + Fertiliser excl. nitrogen + Green feed crops grazed in-situ + Pasture maintenance & renovation) + 30% x Vehicle expenses + 50% x (Depreciation + Repairs & maintenance)] divided by effective dairy hectares divided by tonne of dry matter harvested per hectare.

For the period of 2003-2006, AUS had a relatively similar core per hectare cost per tonne dry matter of pasture harvest to NZ. However, since then this cost has been significantly higher than NZ. The same trends are evident with ARG and URU. RSA has improved its performance from 2014 onwards and now has the second lowest cost after NZ.

Figure 12. Core per hectare cost per tonne dry matter of pasture harvest expressed in USD with AUS represented by VIC



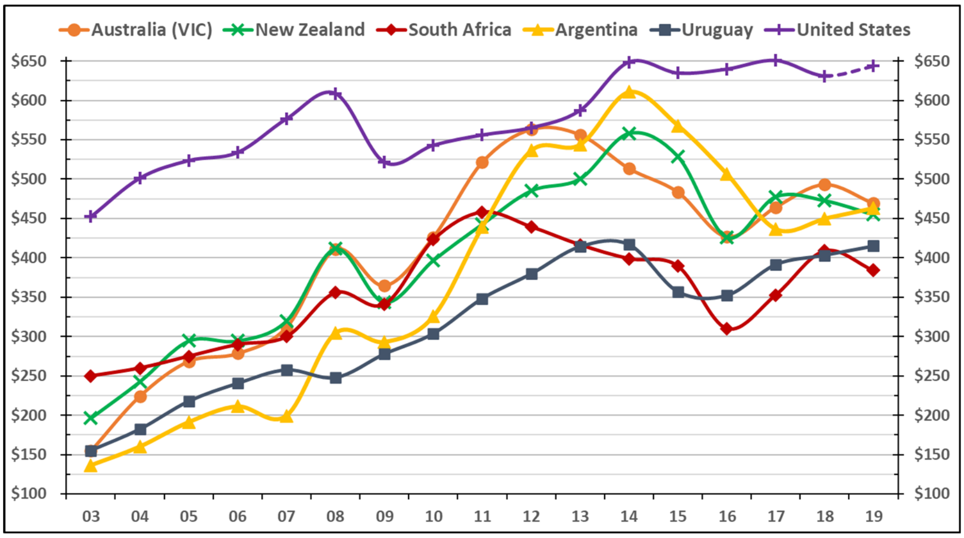
Source: Red Sky, Dairy Farm Monitor Project, DairyBase, AACREA, FUCREA

How has 'core per cow cost' been changing and what is the relevance of this specific cow cost ratio?

Figure 13 outlines the core per cow cost across the six countries. This ratio was developed by Red Sky so that a group of costs related to the cows that do not include supplements or people (both of which require their own targeted ratios) could be monitored. This ratio is the most relevant (due to its correlation with profit) for determining the performance of a dairy business in controlling cow costs. The calculation of ***core per cow cost*** = [100% x (Animal health + Breeding & herd testing + Dairy shed expenses + Electricity + Freight + Grazing/Support area expenses + Industry levies) + 70% x Vehicle expenses + 50% x (Depreciation + Repairs & maintenance)] divided by total cows in herd.

With this ratio, the steep increase in cost in AUS has been largely mirrored by NZ and ARG. RSA and US have had the lowest percentage increase over the period in the study, although the US cost remains significantly higher than all the other countries. This should be a cautionary message for those farmers in pasture-based dairy industries considering adopting a US-type production system.

Figure 13. Core per cow cost expressed in USD/cow with AUS represented by VIC

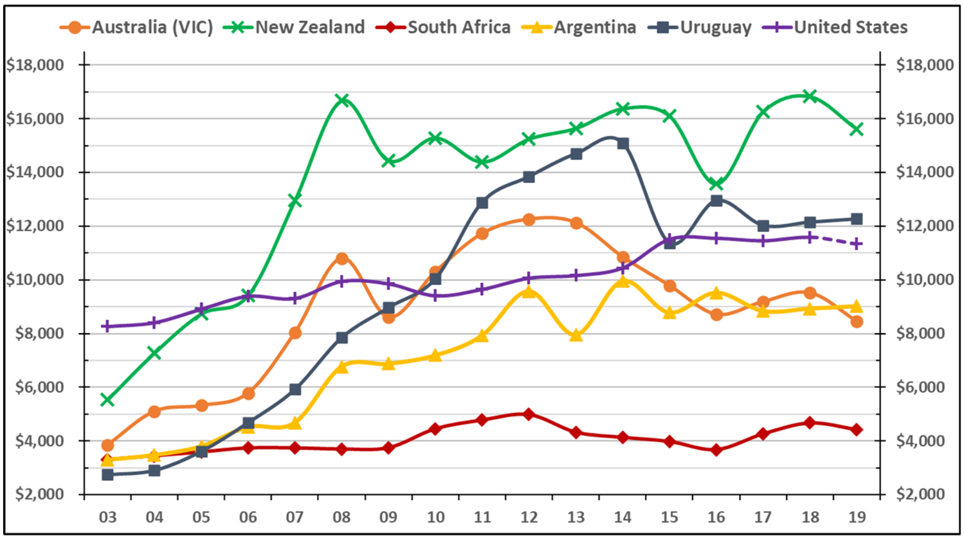


Source: Red Sky, Dairy Farm Monitor Project, DairyBase, AACREA, FUCREA, USDA, Genske Mulder

How has the value of assets been impacting on profitability from the aspect of return on total capital, and have asset valuations been contributing to Australia's loss in comparative profitability?

Figure 14 outlines the value of total assets employed per cow across the six countries. Figure 14 is intended to highlight the 'hurdle' in total asset value against which the farmers in each country are endeavouring to earn a financial return. NZ has been in the most uncompetitive position, in particular due to the large year-on-year increases in land values from the mid 1990's through to 2008. RSA has been in the strongest position and although there has been substantial land appreciation over the last 10-15 years, this has been largely offset by the increase in stocking rate. AUS has been in a competitive or sound position compared to all the other countries with the exception of RSA, which confirms asset values have not been a factor that has contributed to the industries loss in profitability.

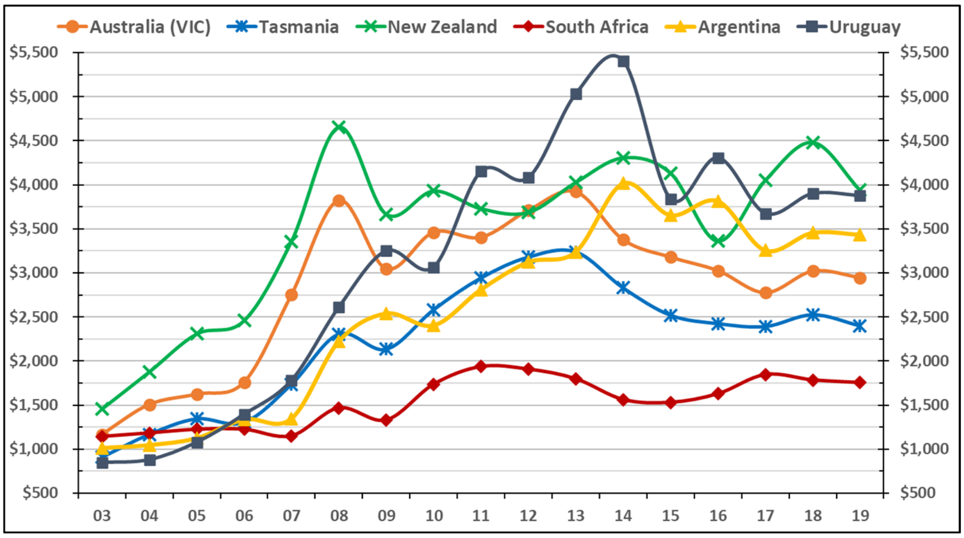
Figure 14. Total assets employed per cow expressed in USD



Source: Red Sky, Dairy Farm Monitor Project, DairyBase, AACREA, FUCREA, USDA, Genske Mulder

Figure 15 outlines the value of total assets employed per tonne dry matter of pasture harvest across the five pasture-based countries plus Tasmania. This ratio is intended to allow further interrogation of Figure 14 and to provide a broader understanding of the value of total assets. NZ remains in a comparatively uncompetitive position and RSA remains in a strong position, although variations to the other countries have reduced. AUS (represented by Victoria) and Tasmania have improved positions compared to the other countries under this ratio, further confirming that asset values have not been a factor that has contributed to the AUS dairy industries loss in profitability.

Figure 15. Total assets employed per tonne dry matter of pasture harvest expressed in USD



Source: Red Sky, Dairy Farm Monitor Project, DairyBase, AACREA, FUCREA

Discussion and Conclusions

The information presented in this addendum further supports the conclusions drawn in the paper titled "Evaluating the loss of profitability and declining milk production in the Australian dairy industry" (Beca, 2020). These conclusions included:

Decreasing pasture as a percentage of the cow's diet results in an increase in both accounting and economic cost of production. This increase in cost of production is primarily due to the increase in total feed cost per litre and due to the lower cost pasture being replaced with higher cost supplement.

and

Over the last 20 years, a majority of Australian dairy farmers have been changing their production system and … The adoption of this production system, that has as its ultimate expression the US confinement (feedlot) production system, has resulted in the average cost of production in AUS increasing to such an extent that there is no longer a sustainable profit margin for a majority of dairy farmers to be consistently profitable.

There is another aspect to these country comparisons that is highlighted by Figure 11 in particular, which outlines the pasture cost per tonne dry matter of pasture harvest across the five pasture-based countries. The huge advantage NZ has in pasture cost compared to all other countries, which then positively influences total feed cost per litre for NZ given the high per cent of pasture in the NZ cow's diet, provides NZ a long-term comparative advantage to all the other countries. This is supported by the southerly latitude and climate of NZ which is not fully replicated elsewhere in the Southern Hemisphere other than in a small region of Chile. For other countries such as AUS to compete with NZ long-term, then farmers would be advised to consider where they might gain advantage compared to NZ. It has often been proposed that an advantage would be the lower cost of concentrate per tonne in countries like AUS, ARG, URU and RSA, however this would require pasture as a per cent of the cow's diet to decrease which has proven to disadvantage farmers compared to NZ as reported by Beca (2020).

This would suggest that AUS farmers (and others outside NZ) must look at other ways to lower their cost of production. As Table 1 outlines and as reported by Beca (2020), total feed cost usually comprises around 40-60 per cent of total costs for pasture-based farms and 60-70 per cent of costs for confinement (feedlot) farms. As a result, this has the largest, if not dominant, impact on cost of production. The next largest area of expense is labour cost, which comprises 17-23 per cent of total operating expenses in AUS, NZ, ARG and URU, and just 11-12 per cent in RSA and US. All other individual expenses comprise such a small per cent of total operating expenses that there is insufficient scope to provide one country an advantage over the others.

Given existing labour legislation in AUS, ARG, URU and RSA, it is difficult to understand how labour costs could be substantially reduced compared to NZ on a per litre basis, and then have this advantage retained long term. So it would be reasonable to conclude that for pasture-based dairy industries in countries like AUS, ARG, URU and RSA to compete with NZ long-term, total feed costs per litre would need to match or better those in NZ. Presently the only conceivable option to accomplish this would be for a similar per cent of pasture to be included in the cow's diet, and for this pasture to be produced at a low cost.

Table 1. Primary cost areas expressed as USD cents/litre and as percentage of total expenses

2010-2019	Total Expenses per Litre	Total Feed Cost/litre	Total Labour Cost/litre	"All Other" Costs/litre	Feed Cost as % Total Exp.	Labour Cost as % Total Exp.	"Other" Costs as % Total Exp.
Victoria (AUS)	34.0	18.9	6.6	8.5	55.6%	19.4%	24.9%
Tasmania (AUS)	31.7	15.8	7.1	8.8	49.8%	22.4%	27.8%
New Zealand	27.0	11.9	6.0	9.1	44.1%	22.2%	33.7%
United States	41.9	28.3	4.6	9.0	67.5%	10.9%	21.6%
Argentina	32.9	19.3	6.1	7.4	58.8%	18.5%	22.6%
Uruguay	36.6	20.3	6.3	10.0	55.4%	17.3%	27.3%
South Africa	32.3	20.0	3.8	8.5	61.9%	11.9%	26.2%

Source: Red Sky, Dairy Farm Monitor Project, DairyBase, AACREA, FUCREA, Genske Mulder

For cows to efficiently produce milk with low levels of concentrate in the diet (say under 1.0 tonne per cow per year) in Southern Hemisphere countries that are of a more northerly latitude than NZ, then the cow genotype may need to be similar to a NZ-type cow or potentially be of less US-type genotype than the average NZ cow. The implications of a change in production system and cow genotype such as this in these countries could be worthy of further study.

References

Beca, D. (2020), 'Evaluating the Loss of Profitability and Declining Milk Production in the Australian Dairy Industry', *Australasian Agribusiness Perspectives* 23, Paper 9, 136-164.

Sources of data

AACREA (Asociación Argentina de Consorcios Regionales de Experimentación Agrícola) www.crea.org.ar; producer-owned organisation in Argentina that has as its main purpose to help producers improve the economic and financial results of their farm business. AACREA has the largest dataset of dairy farm performance in Argentina.

Dairy Australia www.dairyaustralia.com.au.

Dairy Farm Monitor Project (Australia) www.dairyaustralia.com.au/farm/farm-business-management/dairy-farm-monitor-project.

DairyBase (New Zealand) www.dairynz.co.nz/business/dairybase.

DairyNZ www.dairynz.co.nz.

FUCREA (Federación Uruguaya de Grupos CREA) www.fucrea.org; producer-owned organisation in Uruguay that has as its main purpose to help producers improve the economic and financial results of their farm business. FUCREA has the largest dataset of dairy farm performance in Uruguay.

Genske Mulder (United States) www.genskemulder.com; the largest dairy farm accountancy practice in United States. Genske Mulder produce benchmark data for dairies in Arizona, California, Colorado, Idaho, New Mexico, Texas and Washington and in the regions of the Upper Midwest and Lower Midwest.

INALE (Instituto Nacional de la Leche) www.inale.org; the Uruguayan National Milk Institute is a non-state public entity with its main task being to advise the government on dairy policy. The aim is to contribute to a joint public-private partnership aimed at the development of the Uruguayan dairy industry.

MAGYP (Ministerio de Agricultura, Ganadería y Pesca) www.argentina.gob.ar/agricultura-ganaderia-y-pesca; the Argentinian government's Ministry of Agriculture, Livestock and Fishing.

Red Sky Agricultural ('**Red Sky**') www.redskyagri.com; commercial provider of farm business analysis and benchmarking software that is primarily operating in Australia, New Zealand and South Africa. Red Sky's major shareholder is the author of this paper.

USDA (United States Department of Agriculture) www.usda.gov.