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Are there economies of scale in dairying? If so, what is the most economic size?

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SUMMARY

1. Over 95% of the expenses in pasture-based dairying businesses are directly correlated to either land area or cow numbers.
2. The investment per hectare in land, buildings, livestock, vehicles, plant & machinery, and other dairy related assets is relatively similar across a majority of farm sizes.
3. Given the high proportion of variable expenses and a similar investment per hectare of land, there are no significant economies of scale in pasture-based dairying.
4. Farms with fewer than 150 cows are disadvantaged as a result of the small proportion of 'fixed' expenses that are unrelated to land area or cow numbers, plus the cost to have at least one capable manager in a dairy business. In addition, the value of capital infrastructure (housing and dairy in particular) per hectare that is often associated with small farms disadvantages these businesses.
5. There are normally losses in efficiency once the owner/operator is substantially removed from the interface between cows, pastures and supplements, which is likely to occur when more than 800-900 cows are being farmed. This loss of efficiency is due to the complexities of managing pasture-based dairy businesses and hence the influence of the person physically managing this interface. This can at times be offset by the lower value of capital infrastructure (dairy in particular) per hectare that is sometimes associated with larger farms.
6. As a result of the comparative disadvantages of either small or large farms, the most economic size is between 200 and 750 cows.
7. Given the complexities of managing pasture-based dairy systems and the resultant influence of the person operating the business, it is therefore not reasonable to conclude that farms with less than 200 cows or over 750 cows cannot be highly profitable.
8. It would also be reasonable to conclude that dairy business owners should strive to produce more milk and therefore grow their business over time. The need to grow a business over time is unrelated to any potential economies of scale. This alternative business principle is that productivity improvements are necessary for industries to remain competitive, and part of improving productivity is to increase milk production over time.

DEFINING ECONOMIES OF SCALE

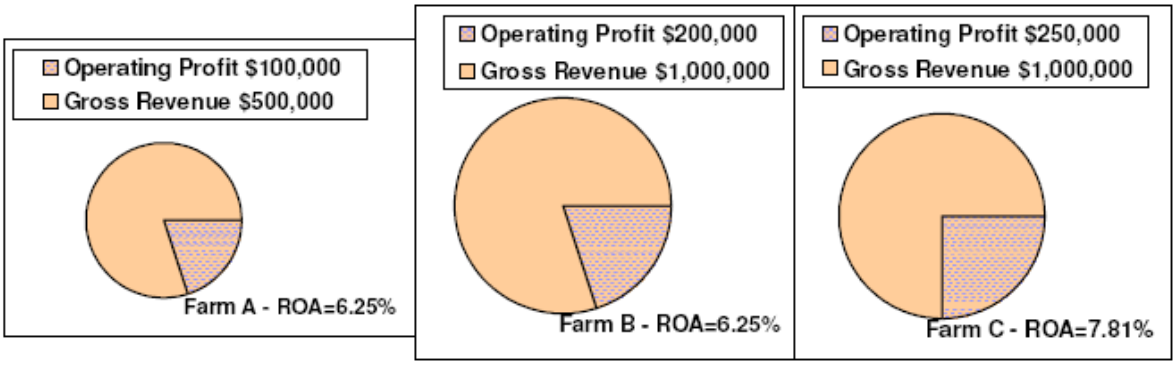
It is important that the principle inherent in any discussion on economies of scale is agreed at the outset. For instance, we will take the case of a farmer who owned a 100 hectare/200 cow business and who on average produced an Operating Profit of $100,000 from a total investment valued at $1.6m (see Farm A in Figure 1).

The farmer then doubled the size of their business to a 200 hectare/400 cow business, and in this instance their total investment was now valued at $3.2m (exactly twice the 100 hectare/200 cow investment). If the farmer then on average increased Operating Profit to $200,000, the decision to expand the business would not have increased the businesses comparative profitability (see Farm B in Figure 1).

Although Operating Profit has doubled from $100,000 to $200,000, the return on assets has remained static. In this case the return on assets was 6.25% for the 100 hectare/200 cow business ($100,000 profit divided by $1.6m assets). It has remained at 6.25% for the 200 hectare/400 cow business ($200,000 profit divided by $3.2m assets).

For this doubling in business size to have demonstrated the positive impact of economies of scale, then if the value of the assets has also doubled it will require the larger business to consistently produce significantly more than $200,000 in Operating Profit (see Farm C in Figure 1).

Figure 1: Demonstration of Impact of Economies of Scale



VARIABILITY OF EXPENSES IN DAIRY BUSINESSES

To determine whether there are likely to be economies of scale in dairying then there is a need to examine the variability of costs in the business. Businesses that demonstrate significant economies of scale have a high proportion of comparatively fixed costs so that when businesses expand in size there is an increasing opportunity to reduce the cost of production.

For instance, might the same stocking rate of cows and/or milk production per cow be able to be sustained on a larger farm with significantly lower costs per cow or per hectare? To look at this in more detail it is worth examining all major cost centres in pasture-based dairying.

In the first column of percentages in Table 1 below, these expenses are proportionately assigned to each code. This split has been derived from the Red Sky database for Victoria and Tasmania, with lesser weighting from South Australia. It would be expected that there would be a significant variation around these figures, although this would not alter the conclusion to be drawn from the table.

This examination should then involve determining firstly whether these costs are strongly variable on a per cow basis. If some or all of these costs are not related to the number of cows being farmed, then are these costs strongly variable on a per hectare basis. If some or all of these costs are not related to the number of cows or the number of hectares being farmed, then these costs are either variable on some other factor or are effectively a fixed cost associated with running a dairy business.

Table 1: Variability of Expenses in Dairy Businesses

EXPENSES	Percent of Total Expenses	Basis for Split of Each Code			Split of Code as % of Total Exp.		
		Per Cow	Per Hectare	Neither [Fixed]	Per Cow	Per Hectare	Neither [Fixed]
Administration	2.0%	15%	50%	35%	0.3%	1.0%	0.7%
Animal Health	2.8%	90%	10%	0%	2.5%	0.3%	0.0%
Breeding & Herd Testing	2.7%	95%	5%	0%	2.6%	0.1%	0.0%
Dairy Shed Expenses	1.7%	75%	25%	0%	1.3%	0.4%	0.0%
Electricity	1.8%	80%	10%	10%	1.4%	0.2%	0.2%
Feeds / Supplements (Total)	35.9%				33.9%	2.0%	0.0%
- Grazing / Agistment	5.7%	90%	10%	0%	5.1%	0.6%	0.0%
- Cropping (green feed)	0.4%	15%	85%	0%	0.1%	0.3%	0.0%
- Grains, Pellets & Concentrates	22.6%	100%	0%	0%	22.6%	0.0%	0.0%
- Forages (incl. hay, silages, byprod)	7.2%	85%	15%	0%	6.1%	1.1%	0.0%
Fertiliser (Total)	9.3%				2.1%	7.2%	0.0%
- Nitrogen	4.5%	30%	70%	0%	1.4%	3.2%	0.0%
- Phosphate & All Other Fertiliser	4.8%	15%	85%	0%	0.7%	4.1%	0.0%
Freight	0.4%	100%	0%	0%	0.4%	0.0%	0.0%
Irrigation	3.0%	10%	80%	10%	0.3%	2.4%	0.3%
Other Expenses	0.3%	50%	50%	0%	0.2%	0.2%	0.0%
Pasture Maintenance & Renovation	1.6%	15%	85%	0%	0.2%	1.4%	0.0%
Repairs & Maintenance	3.9%	50%	50%	0%	2.0%	2.0%	0.0%
Standing charges	3.5%	30%	45%	25%	1.1%	1.6%	0.9%
Vehicle Expenses (incl. fuel & oil)	2.8%	65%	35%	0%	1.8%	1.0%	0.0%
Weed & Pest Control	0.5%	10%	90%	0%	0.1%	0.5%	0.0%
Management & Staff Expenses	22.3%				17.3%	5.0%	0.0%
- Wages, Salaries & Employ. Exp.	11.5%	85%	15%	0%	9.8%	1.7%	0.0%
- Imputed Labour & Management	10.8%	70%	30%	0%	7.6%	3.2%	0.0%
Depreciation	5.5%	45%	55%	0%	2.5%	3.0%	0.0%
Gross Expenses	**100.0%**				**69.9%**	**28.1%**	**2.1%**

The determination of the split between per cow, per hectare, and 'other' costs has been done on a combination of first principles and observation of database results. There has neither been an attempt to provide an explanation in this paper for the background of how each code was split, nor show statistical variations derived from the Red Sky database. It can also be assumed that for a number of the expenses such as Fertiliser, Repairs & Maintenance, Vehicles and Depreciation that there is a significant variation around these percentages depending on the farming system being run.

However, the split has sufficient validity to produce the final three columns of percentages in Table 1, and in particular the split of Gross Expenses. The conclusion is that approximately 70% of the operating expenses on dairy farms are directly correlated to the number of cows being farmed. A further 28% of expenses are directly correlated to the number of hectares being farmed, with just 2% of operating expenses being either correlated to some other variable or being fixed.

As a result of the relatively insignificant level of fixed expenses, and with the vast majority of expenses being directly correlated to factors that proportionately increase with farm size, it can be concluded that few economies of scale can be derived from this aspect.

OTHER FACTORS IMPACTING ON ECONOMIES OF SCALE

There are other factors in a dairy business that could potentially provide an opportunity to gain from economies of scale. For instance, might the infrastructure available to a larger dairy farm as compared to a smaller farm provide an opportunity to increase efficiencies that were not available to a smaller farm? Could larger farms be able to run more cows per hectare than smaller farms while maintaining a similar or lower per hectare cost structure? Might more milk be able to be produced per cow on larger farms with no more expense per cow than the smaller farms? Might larger farms be able to negotiate higher prices for their outputs and/or lower prices for their inputs? We should examine each of these opportunities.

Might the infrastructure available to a larger dairy farm as compared to a smaller farm provide an opportunity to increase efficiencies that were not available to a smaller farm?

There would appear to be only one prime difference in infrastructure between larger farms and smaller farms (excluding farms under 150 cows), and that is the rotary dairy. These are more prevalent on larger farms. All other significant infrastructure is likely to be proportionately sized to the number of cows or number of hectares being farmed.

It would be justifiable to claim that rotary dairies do offer an opportunity for higher labour efficiency. This would be partially offset by the longer walking times to get larger herds to and from the dairy given the lengthier distances walked. In addition, there is a larger capital cost per set of cups, and a higher rate of depreciation given the increased amount of steel and moving parts. As a result, some initial gains in efficiency are required to offset these comparative disadvantages.

It may still be reasonable to conclude that larger properties have the potential for improvements in efficiency and productivity from the installation of rotary dairies, however there are also some notable increases to costs so that the nett benefit is relatively small.

Could larger farms be able to run more cows per hectare than smaller farms while maintaining a similar or lower per hectare cost structure?

An analysis of the most significant contributors to per hectare costs on a dairy farm will show that there is limited room to increase efficiencies on larger farms. For instance, fertiliser, irrigation and pasture maintenance & renovation (including green feed crops and weed & pest control) are all intrinsically involved with pasture harvest goals and are unlikely to change on a per hectare basis due to farm size. Cows that are run in larger herds and/or on larger farms are on average put under more stress, which often results in higher animal health and breeding costs, as well as more staff time expended per cow. Vehicles and plant/machinery may be larger on larger farms, however they are likely to be worked as hard and cover larger distances.

However, there may be an opportunity to reduce expenditure per hectare on fences, laneways and water supply given there is potentially less of these structures per hectare on larger farms.

The second part of this proposition is whether there is an opportunity to run more cows per hectare on a larger farm without a lift in the cost structure per hectare. This would require some efficiencies in pasture production or

supplementary feeding strategy that enabled the higher stocking rate to be run. There does not appear to be any sound reason or known principle that would allow this proposition to be substantiated.

As a result, it may be reasonable to conclude that larger farms have limited opportunities to run more cows per hectare than smaller farms while maintaining a similar or lower per hectare cost structure.

Might more milk be able to be produced per cow on larger farms with no more expense per cow than the smaller farms?

An analysis of the most significant contributors to per cow costs on a dairy farm will show that there is limited room to increase efficiencies on larger farms. In fact, it may be reasonable to conclude that smaller farms have an advantage in this area over larger farms. The most significant contributor to per cow costs is feed, and cows on smaller farms are likely to have lower maintenance requirements given the smaller distances walked and lower stress levels as a result of being run in smaller herds. Other areas such as animal health and breeding may provide an advantage to smaller farms.

The one area that could provide larger farms an advantage is that of management and staff expenses. This is due to the potential efficiencies from rotary dairies as outlined at the start of this section, as well as the opportunity to average down the hourly rate of staff by utilising a higher proportion of less experienced staff. Though this is a genuine opportunity to lower the cost structure of the business, this can exacerbate the difficulties larger farms have in matching the cow production from smaller farms.

Larger farms require a higher degree of management due to the increased levels of stress on cows being run in larger herds, plus the increased distances they have to walk. The combination of less experienced staff, and the smaller proportion of time that the owner/operator can spend with the herd, is more likely to lead to an erosion in efficiency.

Might larger farms be able to negotiate higher prices for their outputs and/or lower prices for their inputs?

There is certainly some opportunity for larger farms to benefit from higher prices for their milk and livestock, as well as to benefit from lower prices for a number of their expenses. Many milk companies have payment systems that have higher payment bands for increasing levels of milk supply. Similarly, there has often been an opportunity to negotiate lower prices for larger orders of expense items.

How influential might this be on the overall performance of the business? There are firstly a number of expenses such as rates, levies, depreciation and paid staff expenses where there is little, if any, opportunity to negotiate reductions for size of business. There are also a significant proportion of the feed costs (concentrates & forages) plus grazing/agistment expenses that are most significantly influenced by the timing and implementation of the purchasing order, and not the size of the order. These combine to constitute 55%-60% of the costs on most dairy farms.

The balance of the costs in a dairy business have a mix of elasticity. So there is definitely an opportunity for larger farms to negotiate lower costs in some areas, as well as to receive higher prices for their outputs.

Over time this opportunity to negotiate better prices for larger orders has been evident, without having a substantial impact on overall profitability. Farmers have been notably successful in forming groups to negotiate better terms for commodities whenever the disparity between prices being offered to different parties has been significant. This has been one of the drivers to forming cooperatives or selling/purchasing groups for both the bulk sale of milk as well as the bulk purchase of inputs.

SMALL FARMS WITH LESS THAN 150 COWS

There are factors that erode the competitiveness of farms with less than 150 cows. These include the impact of relatively fixed costs such as some of the administration costs. For instance, all businesses need to employ the services of an accountant and have an office/administration centre. Updating the skills and knowledge of the owner/operator is likely to be a similar cost for a small and a medium sized farm. Tractors and plant/machinery cannot be proportionately downsized for small farms as some minimum size is required to accomplish standard farm tasks.

These are not major items in themselves, but the combined effect becomes more significant as farm size drops. Of more significance is that there is effectively little or no room for staff on farms of less than 150 cows if the farms are to be competitively profitable with their peers. The owner/operator needs to complete the majority of the work with a small amount of part-time assistance. The result is that the cost of labour is usually high on small farms as the labour is being supplied by the owner/operator or a skilled manager, who command a higher rate of pay.

In addition, the value of capital infrastructure per hectare is often higher with farms of less than 150 cows. This is primarily due to the value associated with the housing and the dairy, which cannot normally be reduced below a minimum level. This disadvantages these smaller businesses given the higher capital investment requires a higher operating profit per hectare to produce a similar return on assets.

These combined factors do not mean that farms of less than 150 cows cannot be financially sustainable for many years to come. However, the owner/operator may need to accept a lower return for their effort than their skills would command were they to take a job elsewhere. In addition, these smaller farms may need to maintain a higher level of equity in their business so that a higher proportion of their operating profit can be retained as drawings, as opposed to being required to service debt.

LARGE FARMS WITH MORE THAN 800-900 COWS

There are factors that erode the competitiveness of farms with more than 800-900 cows. These factors are related to the losses in efficiency that emerge when the owner/operator or business manager is removed from the interface between cows, pastures and supplements.

Pasture-based livestock businesses are particularly complex businesses to manage. Both ruminant livestock production and high-quality pasture production are governed by a number of curvilinear relationships. These relationships include outcomes where the addition of inputs that can initially result in increased outputs, can subsequently result in a decrease in outputs.

These relationships are not simply ones of diminishing returns, but ones of negative returns. These negative returns can be the result of some relatively minor management change, where for example a change to rotation length can result in lower feed quality and a drop in milk production despite there being more pasture available. Another example could be where the timing of when a variety of feeds are delivered to cows can result in a drop in milk production (potentially from acidosis) despite similar or more feed being made available. Alternatively, these negative returns can be as a result of environmental changes that are entirely outside the control of the business manager.

This combination of factors results in the person who physically manages the interface between cows, pastures and supplements having a decisive impact on business performance. Once businesses have more than 800-900 cows then there is a requirement for the owner/operator or business manager to spend a majority of their time in an administrative and organisational role. This includes a more significant time managing the staff rather than directly managing the cows.

This change in role generally impacts negatively on performance for a number of reasons. Firstly, there is the loss in performance from the reduced focus on the interface between cows, pastures and supplements by the owner/operator or business manager. Secondly the owner/operator or business manager of most dairy farms has little or no experience in managing larger organisations, especially in regards to staff and financial management. As a result, it can take a number of years to develop these skills. And thirdly, the actual goal is to minimise loss in efficiencies in larger organisations as it is an accepted business principle that as businesses grow and the workforce expands that it is not possible to maintain the same degree of focus and/or accuracy when implementing management practice.

The result of these factors is that there is a loss in comparative efficiency with larger farms, especially those with more than 800-900 cows. This loss in efficiency is likely to erode any benefits from economies of scale.

INCREASES IN FARM SIZE AND MILK PRODUCTION PER FARM WILL CONTINUE

If there is no imperative to grow dairy business size to gain from economies of scale (with the possible exception of farms under 150 cows), are there other factors that will continue to drive the historical annual increase in farm size?

The answer is yes. And the reason is that dairy farmers, like all other business owners, must harness productivity improvements over time or their business viability will decrease. This is due to the continual increase in costs of each unit of input. Part of these productivity improvements will come from increased milk production per hectare. However, for the increasing costs not to erode business viability then the business owner must develop more efficient management practices.

For instance, these could involve ways to run more cows per full-time staff equivalent, or ways to get higher pregnancy rates from the same number of inseminations, or ways to deliver more feed to cows with the use of less fuel, or ways to harvest more pasture from the same amount of applied nutrients.

Further improvements in business performance can then come from harnessing these improvements in efficiency to manage a larger business without an increase in inputs. Under this scenario, increasing the overall business size should result in the business owner retaining a larger cash surplus, which is also required to ensure that the nett value of their endeavours is not eroded. As a result, we should expect farm size to continue to increase over the coming years regardless of the apparent lack in benefits from economies of scale.

CAN A DATABASE OF INFORMATION ON FARM BUSINESS ANALYSIS ASSIST OUR UNDERSTANDING OF ECONOMIES OF SCALE?

Information on farm performance analysis can assist our understanding of the factors that drive farm profitability, including helping determine the impact on economies of scale. For instance, determining which costs are correlated with cow numbers, which are correlated to hectares, and which are correlated to other variables or are relatively fixed, can be undertaken.

We can also determine from a database of farm business analysis what distinguishes the more profitable farmers from the less profitable ones. However, it must be through the use of science, maths and the application of proven business principles that we deduct the primary cause of differences in farm business performance.

This requirement for disciplined, reasoned thought (and where possible science and maths) to confirm business principles will always be essential. This is due to the demand to demonstrate (or prove) a causal relationship between two factors that are positively correlated. In many instances the factors that correlate with profit may have little or no relevance in producing this profit.

Farm size is a classic case in point. As I have outlined in this paper, there are few economies of scale in pasture-based dairying. However, many databases demonstrate that the top performers have larger businesses than average or poorer performers. So there is often a demonstrable correlation between farm size and profitability.

In most databases of business performance (not just dairying) this correlation between business size and profit exists. The primary reason is that business owners who are successful tend to expand their business over time, while business owners who are relatively unsuccessful tend to either expand at a slower pace or do not expand at all. So we have a simple and clear explanation of a correlation that has no causal impact from economies of scale.

Attached as an Appendix are some results from the Red Sky database for 6 districts/countries. These benchmarks of dairy business performance may not be considered statistically relevant and are as much provided to highlight the potential risk in drawing conclusions based on correlations alone.

The districts/countries include Gippsland (Victoria), South-West (Victoria), Northern Victoria, Tasmania, South Australia and New Zealand. In three instances there appears to be a moderately positive correlation between farm size and profitability, in one instance there appears to be a comparatively weak positive correlation, in one instance there appears to be a comparatively weak negative correlation, and in the final instance there appears to be a strong negative correlation.

As this demonstrates, we are no wiser in determining whether there are economies of scale in dairying by correlating profitability with farm size. However, we can use correlations of lower-level indicators (expenses with cow numbers or hectares) to build a reasoned case for whether there are economies of scale in dairying.

DEFINITION OF TERMS

Return on Assets = (Operating Profit – Lease on Land & Buildings) / Total Assets at Start of Year x 100. This percentage measure of profitability records the return on total assets employed in the business.

Operating Profit = Total Operating Revenue – Total Operating Expenses – ***Adjustments (to Operating Profit)***. This is a measure of profit and can be used for comparative farm analysis when divided by farm area (i.e. Operating Profit per Hectare).

Adjustments (to Operating Profit) – this includes all 'book' or non-operating adjustments to Operating Surplus. These adjustments include Livestock Values, Feeds /Supplements on Hand, Imputed Labour & Management, Depreciation, Other Revenue and Expenses Adjustments.

Summary Farm Performance - Dairy

Appendix I

Victoria vs Tasmania vs South Australia vs NZ

	2004/05 Gippsland Average	2004/05 Gippsland Top 10%	2004/05 South-West Average	2004/05 South-West Top 10%	2004/05 North Vic Average	2004/05 North Vic Top 10%	2004/05 Tasmania Average	2004/05 Tasmania Top 10%	2004/05 South Aus Average	2004/05 South Aus Top 15%	2004/05 NZ Average	2004/05 NZ Top 10%
PHYSICAL PARAMETERS												
Peak Milking Cow Numbers	**254**	**354**	**326**	**398**	**273**	**401**	**344**	**454**	**368**	**252**	**417**	**441**
Effective Milking Hectares	108.4	134.0	171.4	182.6	93.9	109.2	148.1	172.5	226.7	96.4	132.3	124.6
Milking Cows per Milking Hectare	**2.34**	**2.64**	**1.90**	**2.18**	**2.91**	**3.67**	**2.32**	**2.63**	**1.62**	**2.62**	**3.15**	**3.54**
Litres per Cow	**5,582**	**6,340**	**5,846**	**6,660**	**5,772**	**6,104**	**4,852**	**5,220**	**6,754**	**6,853**	**4,162**	**4,704**
Milkfat per Cow	235	260	243	261	246	255	216	231	271	268	201	227
Milksolids per Cow	**422**	**471**	**437**	**480**	**442**	**461**	**382**	**412**	**490**	**491**	**353**	**399**
Litres per Milking Hectare	**13,079**	**16,749**	**11,119**	**14,516**	**16,781**	**22,430**	**11,269**	**13,726**	**10,967**	**17,925**	**13,118**	**16,650**
Milkfat per Milking Hectare	551	687	462	570	715	937	501	608	441	701	635	803
Milksolids per Milking Hectare	**988**	**1,244**	**830**	**1,045**	**1,284**	**1,693**	**886**	**1,084**	**796**	**1,283**	**1,114**	**1,411**
Litre Price (cents/litre)	**32.69**	**32.57**	**32.33**	**31.36**	**32.97**	**33.07**	**32.74**	**33.61**	**30.61**	**30.18**	**38.97**	**38.88**
Milkfat Price ($/kgMF)	**$ 7.76**	**$ 7.94**	**$ 7.79**	**$ 7.98**	**$ 7.74**	**$ 7.91**	**$ 7.36**	**$ 7.59**	**$ 7.61**	**$ 7.72**	**$ 8.05**	**$ 8.07**
Milksolids Price ($/kgMS)	**$ 4.33**	**$ 4.39**	**$ 4.33**	**$ 4.35**	**$ 4.31**	**$ 4.38**	**$ 4.17**	**$ 4.26**	**$ 4.22**	**$ 4.21**	**$ 4.59**	**$ 4.59**
Pasture Dry Matter Harvested (tDM/Ha)	**7.9**	**9.5**	**6.8**	**8.1**	**8.8**	**11.1**	**9.1**	**11.0**	**5.3**	**9.2**	**11.9**	**14.1**
KEY PERFORMANCE INDICATORS												
Operating Profit per Hectare	**$ 1,223**	**$ 2,200**	**$ 944**	**$ 1,770**	**$ 1,142**	**$ 2,310**	**$ 996**	**$ 1,873**	**$ 164**	**$ 1,159**	**$ 1,350**	**$ 2,698**
Operating Profit per Cow	$ 522	$ 833	$ 496	$ 812	$ 393	$ 629	$ 429	$ 712	$ 101	$ 443	$ 428	$ 762
Total Assets per Ha at Start of Year	$ 15,209	$ 15,354	$ 12,050	$ 12,144	$ 14,704	$ 14,514	$ 11,751	$ 12,689	$ 12,052	$ 16,906	$ 32,610	$ 31,291
EQUITY %	**67.7 %**	**61.4 %**	**67.8 %**	**63.4 %**	**60.6 %**	**55.5 %**	**74.5 %**	**73.7 %**	**68.5 %**	**78.2 %**	**53.7 %**	**54.5 %**
RETURN ON ASSETS (ROA)	**7.2 %**	**13.9 %**	**7.8 %**	**13.6 %**	**6.7 %**	**12.6 %**	**6.7 %**	**12.9 %**	**2.1 %**	**6.7 %**	**3.9 %**	**7.9 %**
ROA including Capital Gain	13.8 %	19.8 %	12.6 %	19.5 %	9.8 %	17.0 %	11.7 %	18.2 %	6.0 %	15.7 %	10.1 %	15.7 %
RETURN ON EQUITY (ROE)	**8.2 %**	**17.5 %**	**7.3 %**	**17.4 %**	**5.1 %**	**15.3 %**	**6.5 %**	**15.1 %**	**-0.7 %**	**6.3 %**	**0.3 %**	**8.8 %**
ROE including Capital Gain	18.4 %	27.8 %	14.5 %	27.1 %	10.2 %	23.2 %	13.1 %	22.5 %	5.0 %	18.2 %	11.9 %	23.8 %
OPERATING PROFIT MARGIN	**25.7 %**	**36.7 %**	**24.2 %**	**35.6 %**	**18.6 %**	**28.3 %**	**24.3 %**	**36.4 %**	**4.2 %**	**19.4 %**	**23.4 %**	**37.5 %**
Cost of Production per Litre	23.3	19.5	23.9	19.1	26.2	22.8	23.9	19.9	29.1	23.7	28.7	22.7
Cost of Production per kg Milkfat	$ 5.55	$ 4.74	$ 5.75	$ 4.87	$ 6.14	$ 5.45	$ 5.37	$ 4.50	$ 7.24	$ 6.06	$ 5.92	$ 4.70
Cost of Production per kg Milksolids	$ 3.09	$ 2.62	$ 3.20	$ 2.66	$ 3.42	$ 3.02	$ 3.04	$ 2.53	$ 4.01	$ 3.31	$ 3.38	$ 2.68
Total Operating Expenses as % Gross Revenue	62.7 %	54.4 %	64.9 %	54.6 %	70.9 %	63.4 %	55.4 %	50.4 %	80.8 %	64.5 %	64.7 %	56.7 %
Financing Costs as % Gross Revenue	10.6 %	12.9 %	11.8 %	10.0 %	12.1 %	11.3 %	9.5 %	7.6 %	9.2 %	7.1 %	25.5 %	17.8 %
Core per Cow Cost	**$ 353**	**$ 330**	**$ 351**	**$ 336**	**$ 372**	**$ 312**	**$ 347**	**$ 330**	**$ 534**	**$ 427**	**$ 428**	**$ 360**
Core per Hectare Cost	**$ 604**	**$ 680**	**$ 514**	**$ 519**	**$ 805**	**$ 930**	**$ 646**	**$ 583**	**$ 590**	**$ 803**	**$ 943**	**$ 941**
Management + Staff Costs per Cow	$ 360	$ 300	$ 345	$ 284	$ 382	$ 355	$ 320	$ 274	$ 524	$ 338	$ 351	$ 280
Cows per Full Time Staff Equivalent	**113**	**138**	**117**	**145**	**103**	**118**	**125**	**159**	**96**	**118**	**114**	**152**
Total Feed/Supplement Costs per Cow	$ 565	$ 540	$ 590	$ 604	$ 568	$ 564	$ 366	$ 410	$ 931	$ 688	$ 377	$ 395
Pasture as % of Total Consumed	**63.5 %**	**64.0 %**	**63.9 %**	**63.3 %**	**58.7 %**	**55.9 %**	**78.3 %**	**79.3 %**	**54.1 %**	**58.4 %**	**80.0 %**	**77.3 %**
Average Cost of All Consumed Feed (/tDM)	**$ 195**	**$ 183**	**$ 190**	**$ 176**	**$ 224**	**$ 206**	**$ 190**	**$ 166**	**$ 239**	**$ 211**	**$ 232**	**$ 200**
Pasture Cost (Per tDM)	**$ 155**	**$ 144**	**$ 154**	**$ 130**	**$ 205**	**$ 179**	**$ 160**	**$ 129**	**$ 207**	**$ 188**	**$ 208**	**$ 172**
Forage Cost (/tDM Consumed incl.wastage)	**$ 203**	**$ 178**	**$ 196**	**$ 185**	**$ 174**	**$ 179**	**$ 185**	**$ 200**	**$ 205**	**$ 175**	**$ 316**	**$ 287**
Concentrate Cost (/tDM Consumed incl.wastage)	**$ 282**	**$ 274**	**$ 277**	**$ 272**	**$ 287**	**$ 268**	**$ 340**	**$ 317**	**$ 304**	**$ 267**	**$ 366**	**$ 304**