Melrose Dairy Limited

Proud farming family

Canterbury | Mark & Devon Slee

Farm Systems Change – 2016 Dairy Farm Case Study

Ministry for Primary Industries
Manatū Ahu Matua

Melrose Dairy Limited

At a glance

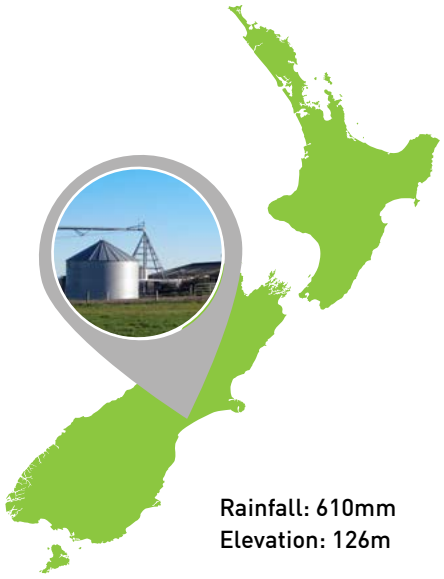
Melrose Dairy Limited

"To create a profitable and sustainable business providing enjoyment, employment, challenge and opportunity"

Mark and Devon continue to improve and add to the original farm converted by Mark's parents in 1987. They have created a highly productive and profitable irrigated dairy farm, which milks through three dairy sheds. Together with the dairy support land, the combined operation includes 1,011.6 hectares of farmland. It is a great example of a sustainable, modern, efficiently-run family business in Canterbury with an exceptional team culture and great staff retention.

Season Ended	Total kgMS	FWE/kgMS
2012	1,213,779	$3.43
2013	1,210,991	$3.98
2014	1,251,663	$4.18
2015	1,247,709	$3.54
2016	1,245,034	$3.50

At a glance – 2014/15 Season



Rainfall: 610mm
Elevation: 126m

Farm Details

Milking Platform	**780.6 ha**
Runoff	**231.0 ha**
Total	**1,011.6 ha**
Effective Milking Platform	**705.0 ha**
Est. kgDM grown (per effective ha/year)	**19,500**
Cows (per effective ha)	**3.8**

Livestock Details

Breed Type	**Crossbreed**
Peak cows milked	**2,644**
Production per cow (kgMS)	**472**
Live weight per cow (estimated actual kg)	**475**

Other Details

People working on farm	**14**
Peak Production (kgMS/ Cow/Day for top month)	**2.1**
Start of Calving	**2 Aug**
Calved in 6 weeks	**88%**
Average Pasture Cover (kgDM/ha at start of calving)	**2,400**
Production (kgMS/ effective ha)	**1,770**

Farming focus

"The dairy industry is full of challenges and we're not going to solve these all overnight, but with time, education, resources and technology, we can do an even better job to gain a position of sustainability."

– Mark Slee

WELL BRED AND WELL FED COWS

Mark and Devon have focused on farming quality crossbred cows and feeding them well to consistently achieve high per cow production. The cows produce close to their weight in milk solids, with an average production level of 472kgMS/cow from a 475kg live weight animal.

Read more on Page 5

ENVIRONMENTAL FOCUS NOW AND INTO THE FUTURE

Mark and Devon have run the property for many years and over this time have continuously improved their systems and infrastructure towards greater resource use efficiency. They, together with their team, use agricultural technology to optimise the use of water and effluent application through their irrigation system. With a passion for running the farm sustainably, they've invested in technology and infrastructure to support quality decisions, and improve the precision of their farming.

Read more on Page 10

HIGHLY EFFICIENT, COST EFFECTIVE FARM OPERATION

As the farm has expanded, the focus has been on achieving efficiencies across their farming operation. The inclusion of dairy support land within the home unit supports efficiencies in the day-to-day running of the farm. In addition, investment in technology to effectively use the irrigation system has contributed to a cost effective, sustainable and resilient business. Mark and Devon monitor their business performance using a range of benchmarking tools to identify areas for further improvement and to support their business decisions.

Read more on Page 12

Melrose Dairy Limited

A closer look

Well bred and well fed cows

Mark's number one focus is to feed his cows well every single day.

Mark and Devon's high per cow production is achieved by consistently doing the dairy farming fundamentals year after year. These include:

- Cows calving at BCS 5 in order to maximise their potential.
- A compact calving spread. Between 86 percent and 93 percent of the herd is calved within six weeks.
- Calving timed for the best fit with pasture growth to allow ample cover at calving to reduce the need for purchased feed.

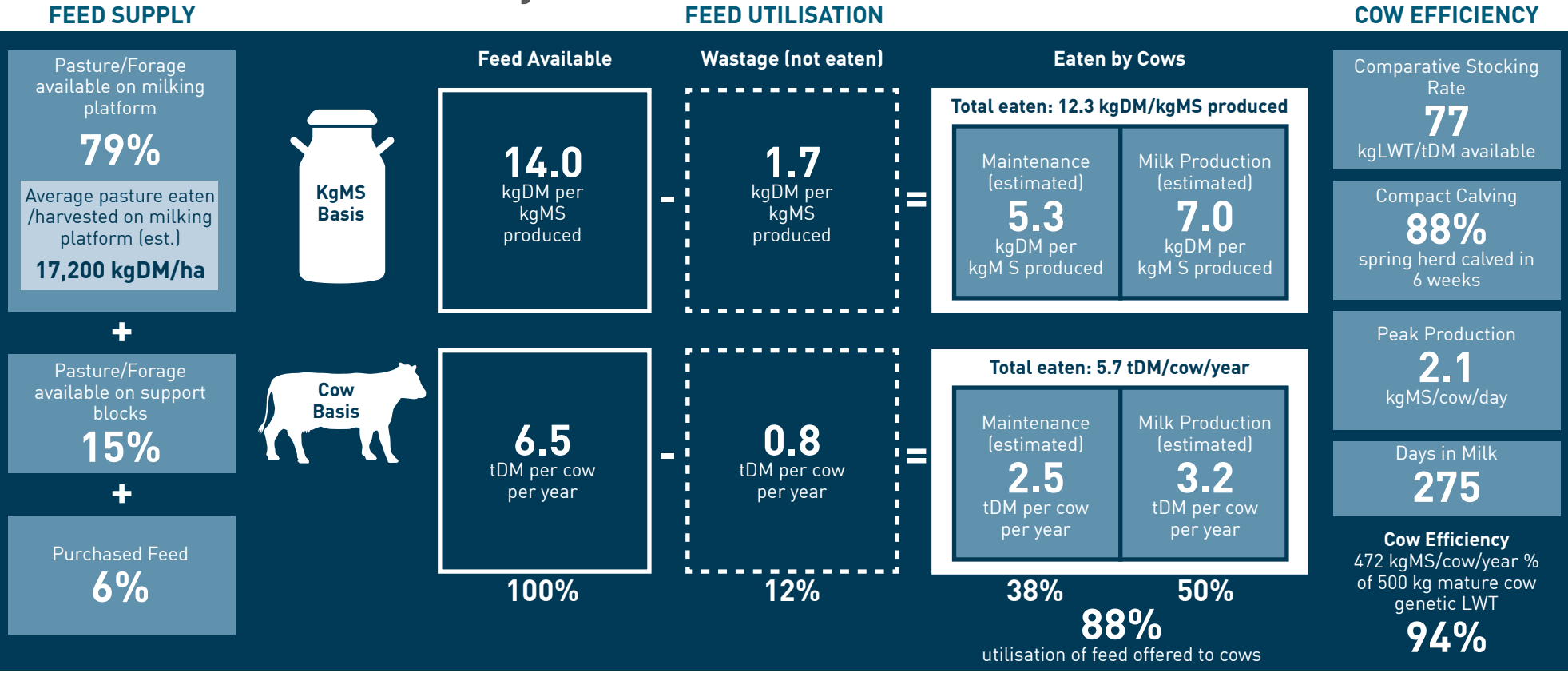
Good average pasture cover of 2,400kgDM/ha at calving ensures cows are well fed. Maintaining pasture cover levels to remain within the 2,000kgDM to 2,400kgDM band throughout the season reduces production dropping off from the peak.

Maximising the number of cows producing at the same time as pasture quality is high to achieves a greater number of days of peak milk production. The peak production is 2 to 2.3kgMS/cow/day over the top month of production. The drop off from peak over three months is between 17 percent to 19 percent, well within the industry target of less than 7 percent drop off per month.

The herd has 98 percent recorded ancestry and above average genetics with BW85/46 and PW109/66. The new recalibrated average for crossbreds is now BW73.7 and PW103.3.

Fodder beet has progressively provided a greater proportion of feed for the herd. Initially used as a winter feed crop, it is now being trialled over both the autumn and early spring for the milking herd, reducing the quantity of purchased feed required. As well as providing high-quality, low-cost feed, using fodder beet has also reduced the exposure to off-farm feed costs. Mark has also discovered that "double fencing" the crop breaks minimises the risk of the cows breaking through and overfeeding, which can be hazardous to animal health. Crop rotation also allows for regular pasture renovation.

Feed to Milk Efficiency 2014/15 Season



What does this show?

Feed Supply

It is estimated that 17.2tDM/ha is eaten or harvested from the dairy platform from an estimated 19,500kgDM/ha grown. In total 79 percent of the herd's requirements come from pasture and fodder beet, which is home grown. A further 15 percent is grown on support areas and only 6 percent of feed is purchased.

The purchased feed includes barley, PKE and molasses (a total of 330kgDM per cow), with the balance of the feed supplied through silage and fodder beet. In earlier years, purchased feed was as high as 12-13 percent of the cow diet.

Feed Utilisation

Total feed available per kgMS produced has ranged from 13.5 to 14.2kgDM/kgMS. The farm's estimated feed use or conversion of feed to production is consistently excellent at 12.3kgDM eaten/kgMS produced with only 1.7kgDM/kgMS lost as wastage. On a per cow basis 6.5tDM/cow are supplied with 5.7tDM/cow or 88 percent utilised, leaving 0.8tDM/cow or 12 percent as wastage. The average Melrose Dairy Limited cow operates at 50 percent efficiency in terms of converting the mega joules of metabolisable energy (MJME) in all feed available into the MJME sold in milk solids, with the other 38 percent used for maintenance of the cow.

Cow Efficiency

The comparative stocking rate the farm operates at is 77kg mature cow genetic live weight per tonne of dry matter available.

This level allows the cows to be well fed with minimal wastage. Combined with a compact calving for the 2014/15 year of 88 percent, a peak production level for the month of October at 2.1kgMS/cow/day, a relatively long lactation of 275 days, and aided by the irrigation system, the cow efficiency is high at 94 percent with cows producing 472kgMS and having a genetic mature live weight of 500kg.

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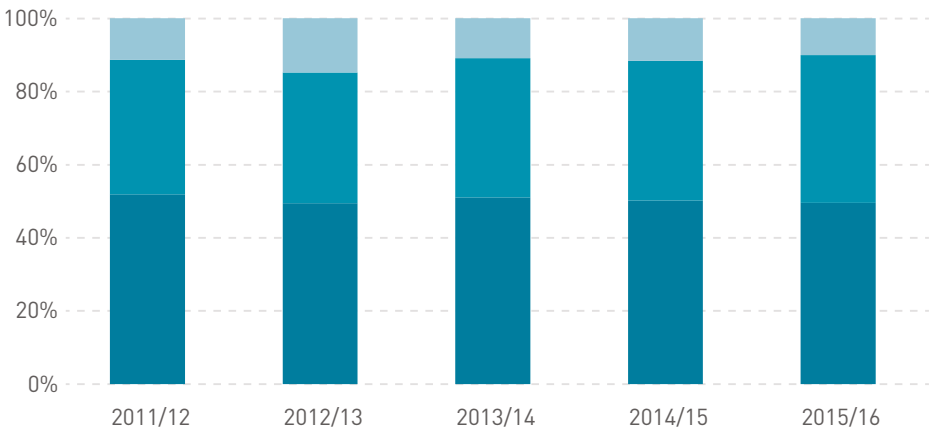
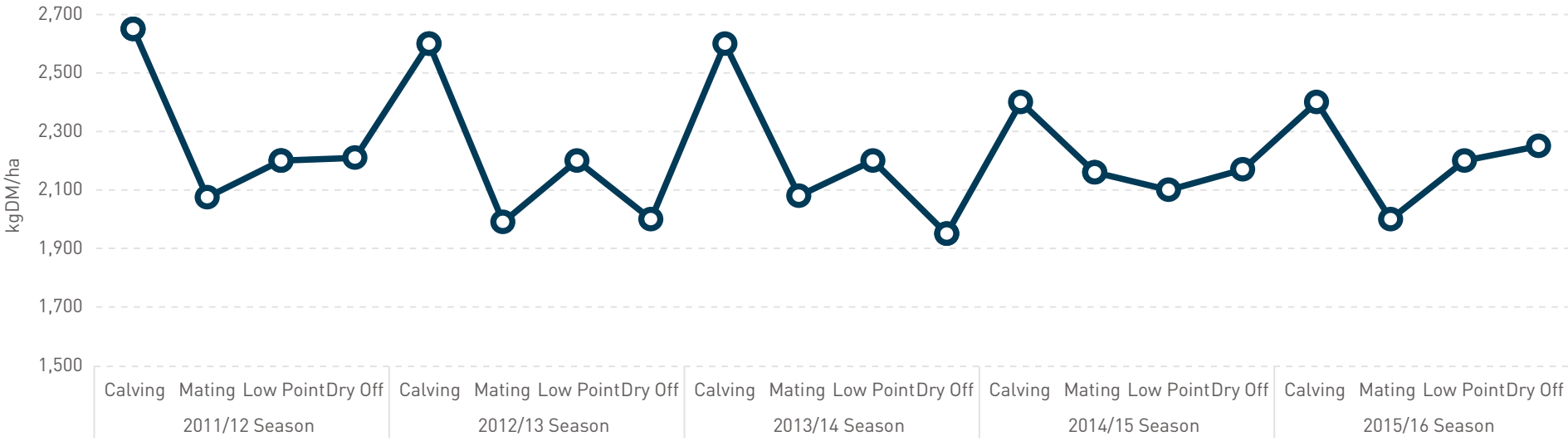
Feed to milk efficiency performance over time

Feed to Milk Efficiency

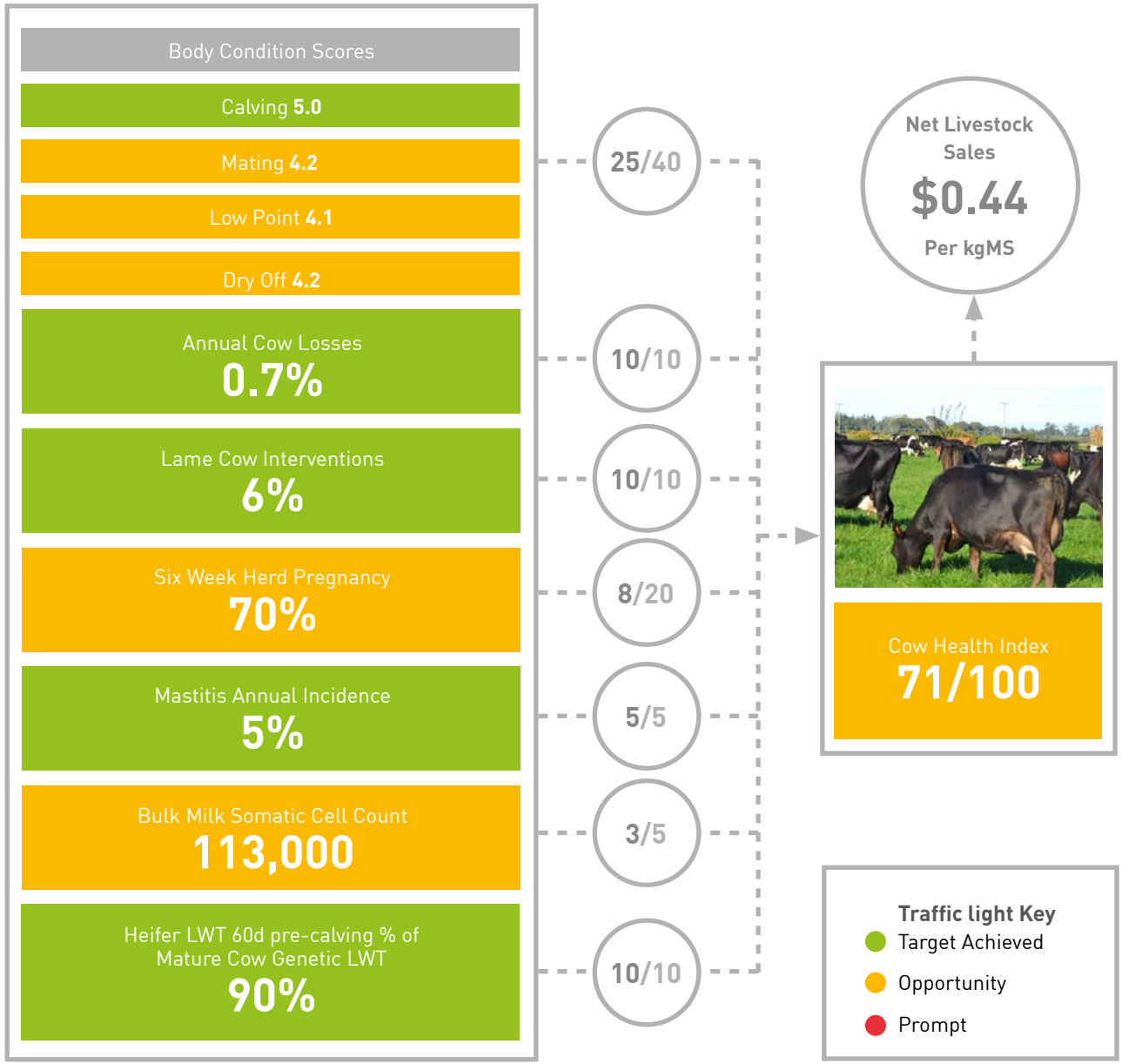


	Season Ended				
	2012	**2013**	**2014**	**2015**	**2016**
Comparative Stocking Rate kgLWT/tDM available	79	76	80	77	79
Farm Feed Conversion kgDM/kgMS produced	13.5	14.2	13.7	14.0	14.2
Cow Feed Conversion kgDM/kgMS produced	12.0	12.1	12.2	12.3	12.7
Feed Wasted kgDM/kgMS produced	1.5	2.1	1.5	1.7	1.5
Feed Grown % of feed available	88%	89%	87%	94%	93%
Feed Purchased % of feed available	12%	11%	13%	6%	7%

Average Pasture Cover



Animal Health 2014/15 Season



What does this show?

The Cow Health Index is a weighted score out of 100 comprising body condition score, cow losses, lame cow interventions, herd pregnancy rate, mastitis, somatic cell count and heifer live weight.

The measures are coded using the traffic light system. Green indicates areas where targets have already been achieved, orange where there is opportunity to improve, and red where performance has been less than desired.

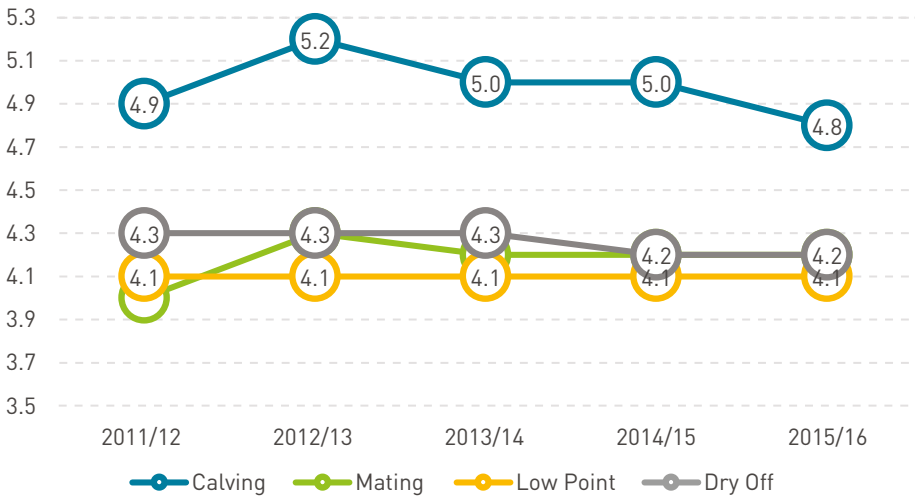
Herd Survivability Metrics

3 year-olds Retention Rate	87%
Replacement Rate at calving	20%
Heifer Mating LWT % Mature Cow LWT	59%
Herd Empty Rate	13%

The herd survivability metrics all combine to influence the costs associated with maintaining herd numbers. Herd replacements are well grown, with heifers reaching 90 percent of mature cow genetic live weight 60 days pre calving.

Animal health performance over time

Animal Health



	Season Ended				
	2012	**2013**	**2014**	**2015**	**2016**
Cow Health Index (Max 100)	61	71	76	71	53
Annual Cow Losses	0.4%	1.1%	1.7%	0.7%	2.1%
Lame Cow Interventions	6.0%	6.7%	5.6%	6.0%	9.0%
Six Week Herd Pregnancy	79%	76%	74%	70%	65%
Mastitis	5%	3%	2%	5%	3%
BMSCC (000s)	123	122	112	113	114
Heifer LWT 60d pre-calving % of Mature Cow Genetic LWT	No data	No data	95%	90%	90%

What does this show?

The cow losses are exceptionally low for such a large operation, as are the incidences of lameness and mastitis. The low level of mastitis is also reflected in a low level of bulk milk somatic cell count, consistently between 112,333cells/ml and 122,667cells/ml across three cowsheds. Mark uses teat seal to protect both cows and heifers from mastitis and considers prevention far better than cure.

The cow condition is good at calving and lifting cow condition at other times of the year is an area that Mark and Devon continue work on. They know it is important to understand feed demand and have the ability to maintain delivery of feed through the season to maintain the condition of the cows.

The six-week in-calf rate of 70 percent for the 2014/15 year, dropped to 65 percent in 2015/2016. The lower in-calf rate reflects the colder winter and slow start to spring which impacts on cow condition at mating.

The Dairy Cattle Code of Welfare issued in June 2014, and the Veterinary Council of New Zealand Statement on the Induction of Calving in Cattle, issued in June 2015, are the regulations which impact upon mating and calving practices. These updated rules make it even more important to have all cows in-calf in a timely manner and require on-farm changes that take time to implement.

Mark and Devon focus on achieving the ideal mating weight for their heifers. The couple share the motto "if you don't measure you don't know", and weigh all heifers. For 2014/2015, 88 percent of cows calved in the first six weeks after the planned start of calving. Cows calving outside this period are less likely to cycle and mate to an earlier period for the following season. Therefore, a combination of factors may contribute to an improvement in both the six week pregnancy rate and the cows calved in six weeks. These include calving the cows in slightly better condition, reducing the number of weeks of mating, using short gestation bulls and ensuring an improving positive feed regime at mating time.

Environmental focus now and into the future

Mark and Devon's farm sits on flat Lismore and Balmoral soils near Ealing in Mid Canterbury. They have run the property for many years and over this time have continuously improved their systems and infrastructure to achieve greater resource use efficiency.

The farm is supplied water from the Mayfield Hinds Irrigation Scheme and is governed by the Scheme's obligations to Rangitata Diversion Race Limited's land use consent with Environment Canterbury. All water users of this Scheme must have an up to date Farm Environment Plan. These Farm Environment Plans require farm managers to outline their actions toward efficient use of nutrients, irrigation and effluent, plus management of soil structure and sediment loss. The effluent area is 465 hectares, which is 52 percent of Melrose Dairy Limited's total land area. The effluent system operates with a two pond system to manage effluent which is applied via the pivot.

The farm lies within the Lower Hinds/Hekeao Plains catchment as defined by Environment Canterbury's Land and Water Regional Plan. In this catchment the concentrations of nitrogen in the shallow wells have been trending upwards while the water availability has been decreasing. As a result of a community engagement process facilitated by Environment Canterbury, farmers are being asked to make reductions in estimated nitrogen losses associated with their farming operations as calculated by Overseer.

Improving irrigation water use efficiency is an effective way for many irrigating farmers to improve their resource use efficiency and reduce the total kilograms of nitrogen lost from their farm systems. The complexity is that the concentration of nitrogen lost via drainage water sometimes increases as water use efficiency improves even though the total amount of nitrogen lost should reduce. This is due to less water being drained. The Catchment Plan requires farmers to manage their total nitrogen loss (calculated in kgN/ha/yr using Overseer) and as a catchment they are required to adopt "managed acquifer recharge" which is hypothesised to address the increases in concentration.

Given the rainfall of approximately 610mm/yr and the PET (evaporation) of 774mm/yr, the property is reliant on availability of irrigation water during the growing season.

Environmental focus now and into the future (continued)

Irrigation management was identified as one of the biggest drivers of nitrogen loss on the farm and therefore the efficient use of water was a logical area to focus investment. Aside from its importance in managing nitrogen loss, particularly on free draining soils, efficient water use is a fundamental factor in ensuring great pasture production, which has a direct impact on profitability.

Mark and Devon have invested in an on-going irrigation development programme to secure a sustainable farm system for on-farm irrigation water storage. This has allowed them to take their surface water scheme irrigation allocation and use it far more effectively. Having freshwater storage has also allowed for the upgrade to a pivot irrigation system and the ability to change irrigation decisions in response to soil moisture readings and weather predictions.

Mark and Devon, together with their management team, use technology to optimise the use of water and effluent applied through their irrigation system. This includes soil moisture monitoring (Aquaflex tapes) and GPS recording to provide proof of placement. These systems guide decisions and help ensure that water and effluent applications can be targeted to the appropriate soil moisture conditions and avoid unwanted drainage events. This maximises the amount of nitrogen available in the soils and minimises the nitrogen losses from the bottom of the root zone.

In 1992, when water was applied using border dyke, the irrigation usage was estimated at 800mm/ha. By 2014, with the introduction of the pivot systems, the usage was estimated at 383mm/ha. Using the Overseer modelling the change in irrigation system is estimated to have improved efficiency from 14.7kgMS per kg of nitrogen loss to 38.4kgMS per kg of nitrogen loss.

With $4,943/ha already invested in improving the irrigation infrastructure, Mark and Devon have achieved sustainable improvements in pasture production, water use efficiency, nitrogen loss and resource use efficiency.

Mark and Devon are passionate about running their farm system sustainably and were the National Award winners of the 2014 Ballance Farm Environment Awards. In the future they intend to continue their focus on efficiency and expect to become increasingly precise with farm inputs as costs and returns for each technology option allows.

Highly efficient, low-cost farm operation

Mark and Devon acquired a further 123.1 hectares to add to their dairy support land, giving them sufficient critical mass to start focusing on how to benefit from economies of scale.

The farm operates with three cowsheds which each have their own herds. To enable easy identification, coloured ear tags are used to differentiate the cows in each herd.

Although each herd is managed separately, there is coordination across the entire farming operation to use the infrastructure effectively and leverage economies of scale. As a result:

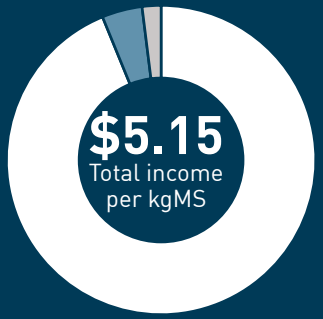
- The grazing expenses have substantially reduced over the last five years and total feed costs (which had been as high as $1.50/kgMS) have decreased to $0.75/kgMS in the 2014/2015 year.
- The increased capacity to manage the costs of production delivered total farm working expenses at a low of $3.43kgMS in 2011/2012, a high of $4.18kgMS in 2013/2014 and back to $3.54kgMS for 2014/2015.

With such a large operation, staff training and retention is critical to the successful operation of the farm. Having a strongly cohesive team culture ensures the farm is a happy work place with greater staff retention and all the benefits that go with this.

Devon and Mark have developed robust farm systems and then trained the team in those systems. This has achieved low bulk milk somatic cell counts, well grown and recorded replacements and lower costs of production.

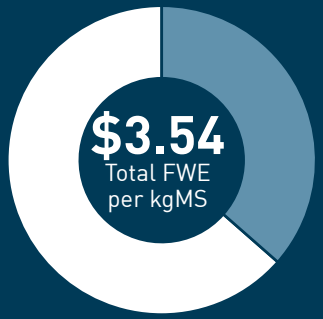
Financial Performance 2014/15 Season

Income per kgMS



Milk Income per kgMS
Livestock Trading per kgMS
Other Income per kgMS

FWE per kgMS



Feed Expenses per kgMS
Other FWE per kgMS

Profit and Loss

	$000s	Per Cow	Per KgMS
Milk Income	5,434	$2,055	$4.35
Livestock Trading & Other Income	993	$376	$0.80
Total Income	6,427	$2,431	$5.15
Feed Costs	937	$354	$0.75
Other FWE	3,485	$1,318	$2.79
Total FWE	4,422	$1,672	$3.54
EBITDA	2,005	$759	$1.61

Breakeven Milk Price
(per kgMS)

What does this show

Melrose Dairy Limited has been developed with considered alignment between plans for farm improvement and the financial capacity of the farming operation. Mark and Devon have built an effective advisor network to support their analysis of the farm results and to provide them with access to good quality information for decision-making.

During the years of high milk prices, Mark and Devon invested the cash surplus in the further development of the three dairy units. As a result, under the lower milk price of the last few years, the farming business remains secure.

Feed costs have reduced as a proportion of total farm working expenses from around 34 percent in 2012/13 to 21 percent in 2014/2015, reflecting the focus on self-sufficiency. The increased use of home-grown fodder beet will continue to reduce feed costs in future years.

Mark and Devon endeavour to make year-on-year improvements in cost management, their view is it is all the little increments that matter. They use their own benchmarking from Lincoln and DairyBase to highlight areas where opportunities may exist to alter the ways of working to further improve their financial performance. Between 2012 and 2015 they have reduced animal health expenses from $127 per cow to $89 per cow reflecting changes in farm management.

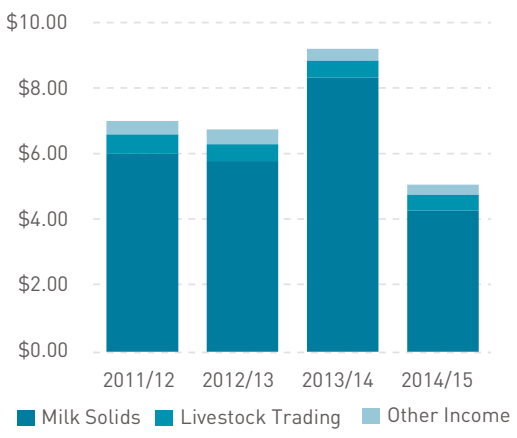
Although land values have trended up, the level of production achieved results in the total capital employed being relatively low at between $42 and $48 per kgMS produced in the years between 2012 and 2015.

Mark and Devon have expanded the farming business on a sound foundation and with a focus on a sustainable future.

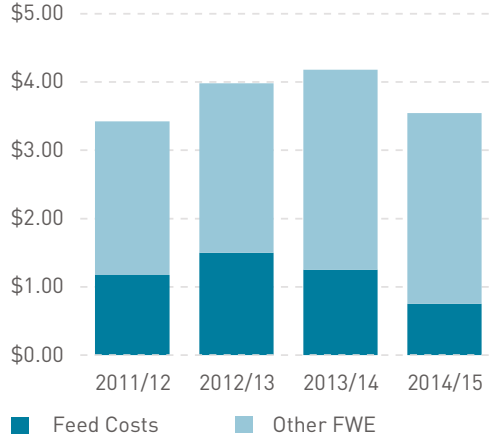
Financial Performance Over Time

	Season Ended			
Financial Efficiency	**2012**	**2013**	**2014**	**2015**
Feed cost per kgMS	$1.18	$1.50	$1.25	$0.75
Other FWE per kgMS	$2.25	$2.48	$2.93	$2.79
Breakeven Milk Price	$2.43	$3.01	$3.29	$2.75
Return On Assets %	7%	5%	10%	2%
Capital employed per kgMS	$42	$48	$45	$43
Milk Price	$6.12	$5.88	$8.45	$4.35

Income per kgMS



Expenses per kgMS



	Season Ended			
Profit and Loss to EBITDA (per kgMS)	**2012**	**2013**	**2014**	**2015**
Milk income	$6.12	$5.88	$8.45	$4.35
Dividends	$0.34	$0.40	$0.28	$0.22
Livestock trading	$0.59	$0.51	$0.53	$0.49
Other operating income	$0.06	$0.06	$0.08	$0.08
Total income	**$7.12**	**$6.85**	**$9.34**	**$5.15**
Feed costs	$1.18	$1.50	$1.25	$0.75
Other FWE	$2.25	$2.48	$2.93	$2.79
Total FWE	**$3.43**	**$3.98**	**$4.18**	**$3.54**
EBITDA	**$3.69**	**$2.88**	**$5.16**	**$1.61**

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Definitions

Definitions

General

kgDM	Kilograms of Dry Matter at 11MJ ME
kgMS	Kilograms of Milk Solids
MJ ME	Mega Joules of Metabolic Energy

Animal Health

Actual LWT (Live weight)	Actual live weight of mature cows (5 – 7 years) with Body Condition Score of 4.5 at 100 days in milk
Annual Cow Losses	All cows which died (died, euthanized, pet food) during the season divided by cows calved
BW (Breeding Worth)	The index used to rank cows and bulls based on how efficiently they convert feed into profit. This index measures the expected ability of the cow or bull to breed replacements that are efficient converters of feed into profit. BW ranks male and female animals for their genetic ability for breeding replacements. For example a BW68 cow is expected to breed daughters that are $34 more profitable than daughters of a BW0 cow.
BMSCC (Bulk Milk Somatic Cell Count)	Arithmetic average of Bulk Milk Somatic Cell Count for the season
BCS (Body Condition Score)	An assessment of a cow's body condition score (BCS) on a scale of 1-10 to give a visual estimate of her body fat/protein reserves
Cow Health Index	Weighted score out of 100 comprising BCS (40), Heifer LWT (10), Reproductive outcomes (20), Lameness (10) , Cow losses (10), Mastitis (5) and Bulk Milk Somatic Cell Count (5)
Genetic Mature Cow LWT (Live weight)	Live weight Breeding Value from LIC (modified by ancestry) for a fully grown mature cow (5 – 7 years) at Body Condition Score 4.5 at 100 days in milk
Lame Cow Interventions	The recorded incidence of new lame cow treatments per cows that have calved in the season (new being the same leg after 30 days or a new leg)
Mastitis	The recorded incidence of new cases per the number of cows, including heifers, calved for the season (new being the same quarter after 14 days or a new quarter)
PW (Production Worth)	An index used to measure the ability of the cow to convert feed into profit over her lifetime.
Recorded Ancestry	This is an "identified paternity" measure. The higher the level the more accurate the BW and PW information. It indicates the level of recording of an animal's dam and sire and includes all female relatives related through ancestry (ie sisters, nieces, etc) and is used when she is a calf. The evaluation of untested animals is based solely on ancestry records.
Reliability	A number on a scale of 0 to 99 which measures how much information has contributed to the trait evaluation for the animals, and how confident we can be that a Breeding Value is a good indication of the animal's true merit. The more herd testing data available the higher the score.
Replacement Rate	The number of heifers to calve divided by the total herd to calve for the season, expressed as a percentage

Feed Efficiency	
Comparative Stocking Rate	Total kilograms of mature cow genetic live weight of cows calved divided by tonnes of dry matter available
Cow Feed Efficiency – Eaten	Standardised (11 MJ ME/kg DM) kilograms of dry matter eaten per kilogram of milk solids produced
Farm feed Efficiency – Available	Standardised (11MJ ME/kgDM) or kilograms of dry matter per kilogram of milk solids produced
PKE	Palm Kernel Expeller
DDG	Dried Distillers' Grain
Environmental	
Green House Gas Emissions	Green house gases on a whole farm basis expressed as CO^2 equivalents
Nitrogen Conversion Efficiency	A ratio of product divided by N input (N input includes fertiliser, supplement and N fixation), expressed as a percentage
N loss (Nitrogen loss)	An estimate of the Nitrogen that enters the soil beneath the root zone, expressed as kg N/ha/year
P loss (Phosphorus loss)	An estimate of the phosphorus lost to water as surface and subsurface run off, expressed as kg P/ha/year
PET	The amount of evaporation that would occur if a sufficient water source were available (potential evaporation).
Financial	
Net Livestock Sales	Net Income from Livestock sales (sales less purchases)
Breakeven Milk Price	The breakeven milk price is the payout needed per kgMS to cover the direct costs of production
EBITDA	Earnings Before Interest, Tax, Depreciation and Amortisation and is the cash surplus available from the farming business
Feed Costs	All feed purchases, irrigation, nitrogen, grazing, silage/hay contracting, cropping costs, regrassing, pest and weed control, leases, related wages
FWE (Farm Working Expenses)	Direct farm working costs including owner operator remuneration before interest, taxation, depreciation, amortisation
Livestock Trading	The income from livestock trading including both Net Livestock Income and accounting adjustments for changes to both the number of cows and the value of cows on hand at year end.

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