Dairy and Beef Farm

Adaptive and diversified farm business

Northland

Farm Systems Change – 2016 Dairy Farm Case Study

Ministry for Primary Industries
Manatū Ahu Matua

Dairy and Beef Farm

At a glance

Beef and Dairy Farm

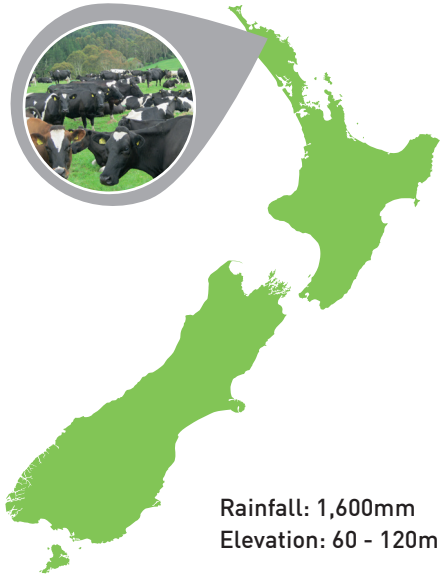
"We have a strong desire not to have all our eggs in one basket."

The owners of this Northland farm are committed to improving their farm and ensuring they are not reliant on just one source of income. They do this by actively taking steps to learn from others about what can be done differently, and applying this to their own farm, diversifying farming activities with a strong focus on the detail.

The founding 80.9 hectares of this farm in Northland were owned by the current owners' grandmother and it has successfully moved through the generations. Over the years, this farm has expanded and diversified with a beef farm bought in 2010 and two blocks of land leased. The farming operation now includes beef and silviculture with various species of trees, aged between 3 years – 23 years, planted as part of the environmental plan to mitigate erosion.

Season Ended	Total kgMS	FWE/kgMS
2012	191,542	$5.71
2013	177,509	$5.84
2014	173,274	$6.81
2015	152,392	$6.58
2016	166,556	No data

At a glance – 2014/15 Season



Rainfall: 1,600mm
Elevation: 60 - 120m

Farm Details

Milking Platform	**137 ha**
Dairy support	**302 ha**
Total	**439 ha**
Effective Milking Platform	**127 ha**
Est. kgDM grown (per effective ha/year)	**12,800**
Cows (per effective ha)	**2.8**

Livestock Details

Breed Type	**Friesian**
Peak cows milked	**358**
Production per cow (kgMS)	**441**
Live weight per cow (estimated actual kg)	**580**

Other Details

People working on farm (FTE)	**4**
Peak Production (KgMS/ Cow/Day for top month)	**2.1**
Start of Calving	**19 Jul**
Calved in 6 weeks	**83%**
Average Pasture Cover (kgDM/ha at calving)	**2,404**
Production (kgMS/effective ha)	**1,200**

Farming focus

Dairy and beef are farmed on this challenging property in the Mangakahia River Valley. The land's operational constraints have been overcome by adaptive management and responsive diversification of farming activities.

ADAPTIVE MANAGEMENT

With a focus on continuous improvement, these farmers invest in adapting to the changing dairying environment in order to maintain and strengthen their overall performance. The hilly landscape is not where you would expect to see big Friesian cows. However, these farmers have focused on ways to maximise the feed consumption of the herd and lift production per cow from 396 kgMS in 2012 to 494 kgMS in 2016 – up 25 percent.

Read more on Page 5

DIVERSIFICATION OF FARMING ACTIVITIES

Determined never to be reliant on just one source of income, the farming business diversified with the purchase of a neighbouring beef farm in 2010. The land and other resources have been used more effectively by combining the dairy and beef operations, achieving overall net animal sales of $2.17 per kgMS.

Read more on Page 10

Dairy and Beef Farm

A closer look

Adaptive management

Continuously reviewing their farming practices, these farmers consider new approaches and use management information, to evaluate alternative options for the effect on their land, pasture, animals, team and of course production.

They were early adopters of winter milk supply contracts beginning supply in 2002, and managed the complexity of split calving (40/60) for over 10 years. However, they concluded there was insufficient return to justify the wear and tear on people and farm resources so they decided to cancel the winter milk contracts at the end of the 2012/2013 season.

This decision had implications across their farming operation. From the 2013/2014 season, the milking platform reduced from 227 hectares to 137 hectares and cows calved dropped back from 527 to 358. These changes coincided with the end of a lease of land across the road from the milking platform.

While the total production dropped from 191,542 kgMS in 2012 to 166,556 kgMS in 2016 through the change from winter milk supply back to seasonal milk supply, the total days in milk has held steady at 267.

A return to seasonal milk supply gives the team greater opportunity to focus on the quality and quantity of feed delivered to the cows which is a major contributor to the level of production.

This Friesian-based herd with 100 percent recorded ancestry has BW 87/45 and PW 94/5 on the new recalibrated LIC figures. The care and attention to breeding and raising replacements is reflected in R2 heifers calving at approximately 92 percent of mature cow genetic live weight.

These farmers together with their long-term employee work together to carefully manage pasture. They prepare a weekly feed plan to ensure average pasture levels are maintained throughout the year, staying within the 2,000 to 2,400 kgDM/ha range.

Beginning in October they pre-graze mow. The extent to which they mow the paddock depends upon the contour. The move from less PKE to more Dried Distillers Grain (DDG) has improved the quality of the overall ration and has helped increase the cows ability to consume more pasture. They aim for the best return in terms of protein to cost. They added red clover to their mix of silage, increasing the level of protein by 22 percent. The clover silage was fed over the summer months when grass protein was low and there was risk of drought. The nitrogen fixing capabilities were an added bonus. Once the clover crop was established they took four cuts between October and April. It was dormant over the winter months and then with careful weed management the clover crop would burst back into life to give three seasons from each planting.

Unfortunately red clover was a difficult crop to manage and the red clover paddocks were badly damaged and heavily silted during the 2014 floods. When spring came there was patchy growth which made weed control problematic and expensive. As a result, the decision was taken not to re-sow the red clover as the challenges of managing this crop outweighed the benefits.

The feed pad was built in 2006 and at that time, the herd was run in two mobs. So the feed pad area had sufficient capacity for up to 260 cows. However, with the end of winter milking in 2012/2013, the decision was taken to run the herd as one mob. To accommodate this, the feed pad was extended in January 2014 to 300m^2. At the same time, the effluent ponds and feed storage area were also extended.

The cows spend approximately two hours a day (an hour at each milking) eating at the feed pad. The feed pad has over a metre of feed space per cow allowing the cows relaxed eating so each cow gets their required ration without bullying. The ration, including minerals, is loaded into the forage wagon before discharging onto the concrete and then is reloaded to ensure even mixing of all the ingredients.

Complementary feed is used during the dry period in February to sustain the milk production. The purchased feed has increased from 6 percent in 2012 to 14 percent in 2016 – comprising a mix of PKE, DDG and molasses.

These farmers are happy with their decision to return to seasonal milk supply. With a happier team on the farm and peak production of 1.5 kgMS in 2012 lifting to 2.0 kgMS per cow per day for the top 30 days in 2016 – a 33 percent increase, they've seen better outcomes all round.

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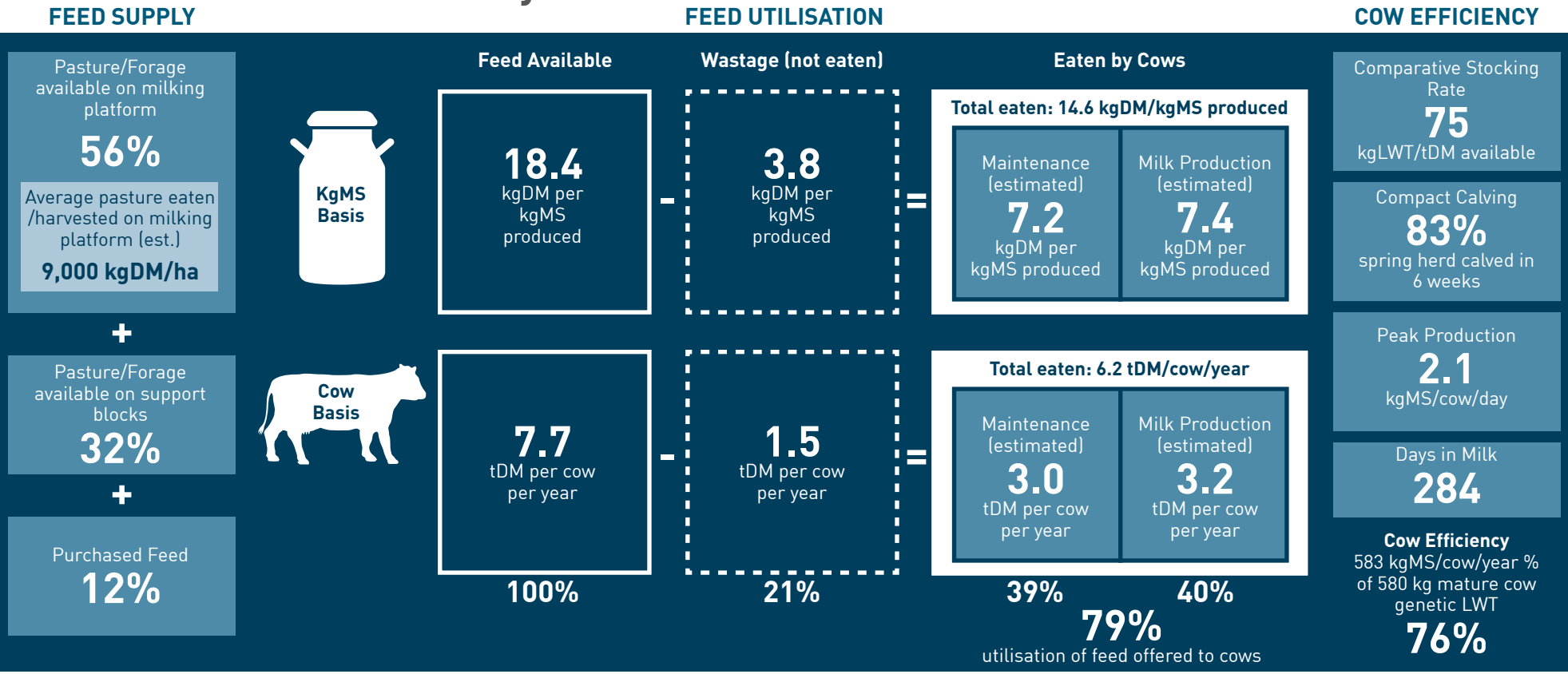
Feed to milk efficiency 2014/15 season



What does this show?

Feed Supply
The pasture/forage available on the milking platform and support blocks are areas where the farmer has oversight. Silage offered to the cows includes both grass and maize. Purchased feed includes dried distillers grain (DDG), palm kernel expeller (PKE) and molasses. The feed mix varies season to season both in the individual feed type and total tonnes purchased.

Feed Utilisation
Since the change back to seasonal milk supply, the herd runs as one mob and prior to each milking has an hour on the feed pad consuming the rations. There is a focus on growing the cows appetite through feeding DDG and then delivering the right feed to fulfil demand.

Pasture utilisation has improved from 65 percent in 2012 to 76 percent in 2016. Over the same period, wastage has reduced from 6.1kgDM/kgMS to 3kgDM/kgMS which reflects their effective management of the feed supply to provide the quality and quality to meet cow demand.

This is a very difficult farm with steep hills which requires the cows to expend a greater level of energy in walking and foraging compared to cows grazed on flatter pastures.

Cow Efficiency
The aim is to maximise the milk production from each cow. The level of potential milk production is based upon the genetic live weight of a mature cow – acknowledging that cows use feed firstly for growth and maintenance. A result closer to or greater than 100 percent demonstrates maximisation of cow efficiency.

By continuing to pay close attention to all aspects these farmers can control (feed choices, feed mixes, feed presentation, quality replacement rearing, transition management and use of other stock classes) cow performance is steadily improving.

For the 2014/2015 season the average production of the cows was 441kgMS and this lifted in 2015/2016 season to 496kgMS resulting in a further lift in cow efficiency from 76 percent in 2014/2015 to 85 percent in 2015/2016.

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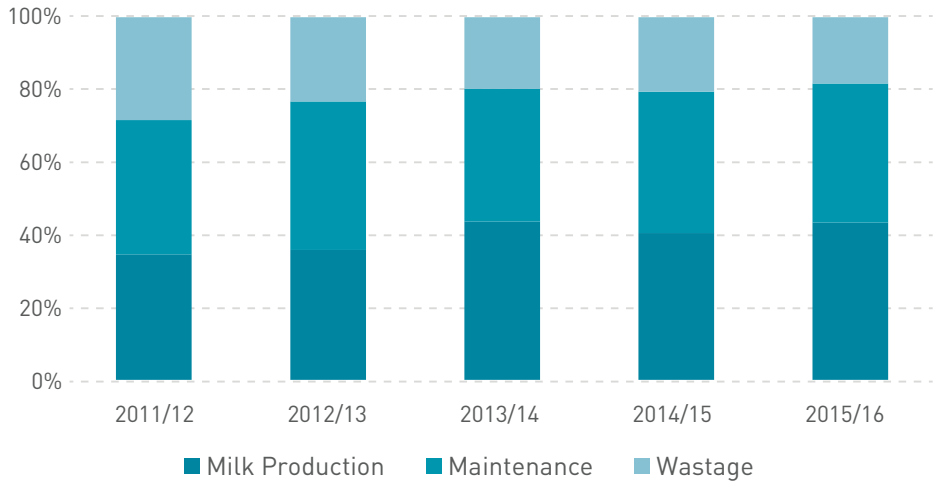
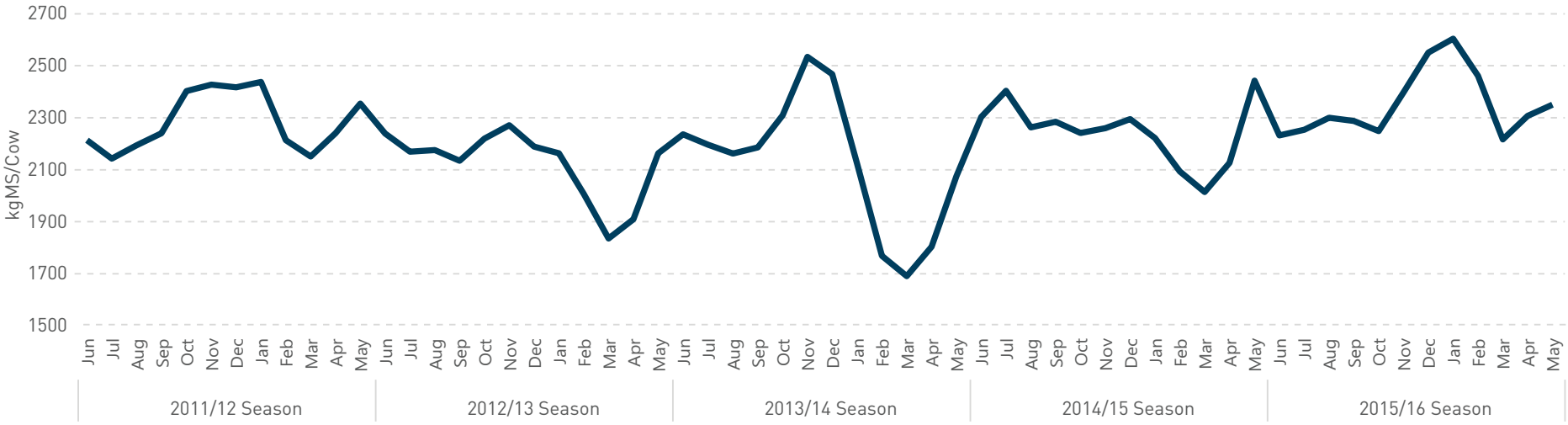
Feed to milk efficiency performance over time

Feed to Milk Efficiency

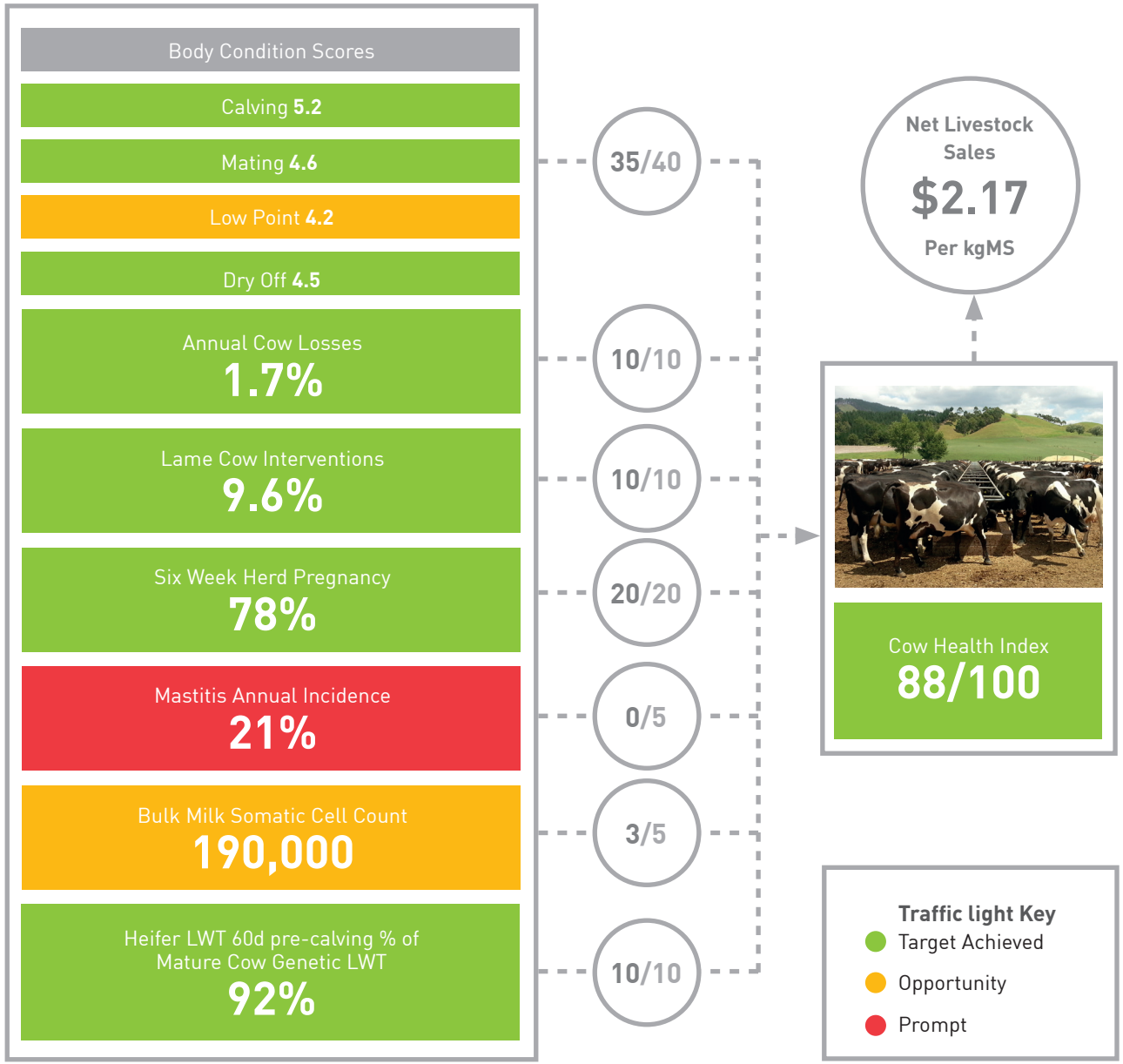


	Season Ended				
	2012	**2013**	**2014**	**2015**	**2016**
Comparative Stocking Rate kgLWT/tDM available	70	77	72	75	73
Farm Feed Conversion kgDM/kgMS produced	21.5	20.8	17.1	18.4	17.2
Cow Feed Conversion kgDM/kgMS produced	15.4	16.0	13.7	14.6	14.0
Feed Wasted kgDM/kgMS produced	6.1	4.8	3.4	3.8	3.2
Feed Grown % of feed available	94%	87%	79%	88%	86%
Feed Purchased % of feed available	6%	13%	21%	12%	14%

Per Cow Milk Solids Production



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.

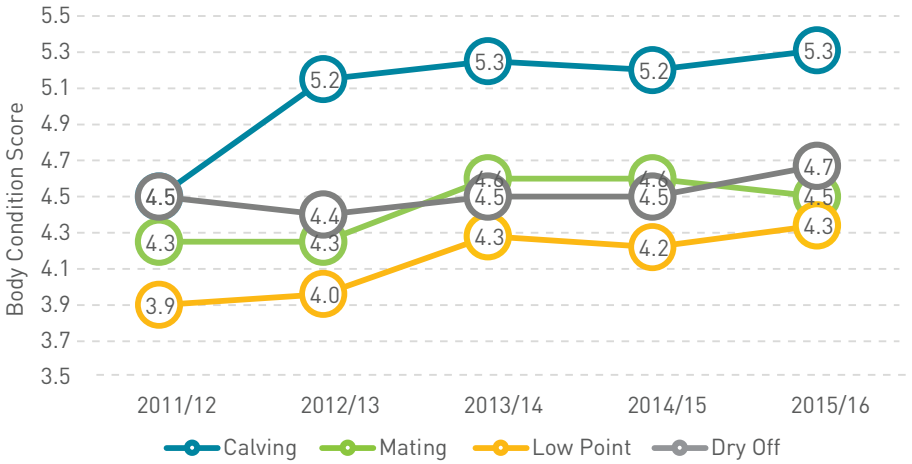
Herd Survivability Metrics

3 year-olds Retention Rate	85%
Replacement Rate at calving	15%
Heifer Mating LWT % Mature Cow LWT	63%
Herd Empty Rate	8%

The three-year-old retention rate of 85 percent and the herd empty rate of 8 percent reduces the number of replacements that are needed and enables culling to be based on cow performance rather than simply the cow being empty. The herd empty rate of 8 percent is particularly low given a mating period of only 9.3 weeks. The cows are well fed and all the farm team have good heat detection skills. A large percentage of the heifers calve early giving them time to settle into milking and feeding routines and get in to calf quickly for the following season. These farmers believe it is important to feed and grow young stock well from day one.

Animal health performance over time

Animal Health



	Season Ended				
	2012	**2013**	**2014**	**2015**	**2016**
Cow Health Index (Max 100)	43	55	91	88	81
Annual Cow Losses	1%	1%	0%	2%	1%
Lame Cow Interventions	19%	10%	9%	10%	18%
Six Week Herd Pregnancy	No data	No data	78%	78%	72%
Mastitis	16%	12%	16%	21%	14%
BMSCC (000s)	223	258	164	190	166
Heifer LWT 60d pre-calving % of Mature Cow Genetic LWT	82%	91%	91%	92%	92%

What does this show?

The body condition score has lifted consistently from a BCS at calving in 2011/12 of only 4.5 to a level of 5.2 to 5.3 in the following seasons. To maintain desired cow condition additional feed inputs were required which is reflected in higher feed costs in the 2013/2014 year.

With a focus on preventative animal health, lame cows and sick cows are treated promptly. These cows are separated into a once a day herd and kept close to the milking shed until they can be returned to the milking herd. This ensures the cows maintain condition and can complete a full lactation.

The cow losses are exceptionally low reflecting the focus of this farming team on caring for their livestock.

The 2013/2014 period was particularly hard in Northland with a drought during the summer and flooding during the winter. The rainfall was 1,970mm compared to a usual of around 1,600mm. The wet weather conditions at the beginning of the 2014/2015 season contributed to the incidence of mastitis peaking at 21 percent, particularly an issue for the R2 heifers. This has been largely overcome with use of appropriate Dry Cow Therapy and teat seal in the herd and heifers. The result being that mastitis incidence has dropped from 21.5 percent to 14 percent in 2015/2016 and this has also assisted to bring the BMSCC down.

These farmers believe their commitment to young stock rearing is key to the long term performance of their cows.

The calf house bedding is hoed every day to promote aerobic fermentation and eliminate smell so the calves are always clean and dry.

The calves are fed milk until weaning at just under 100 kilograms and meal is offered along with ad lib hay and clean water. The milk production invested in the calf rearing is approximately 100,000 litres each year.

The focus on feeding the replacements well flows through into achieving the R2 live weight 60-days pre-calving rising from 450kg in 2011/2012 to 533kg in 2015/2016. The R2 heifers join the herd fully grown and developed for milk production.

Diversification of farming activities

These farmers have a very considered approach when developing the plans for their farm. During the 1980s, they observed the challenges of farmers who had a reliance on only one source of income and the detrimental impact that had for their farming business. It is with this in mind that they sought to protect themselves as far as practicable from the significant fluctuations to income and cash flows experienced by farmers as a result of environmental factors – specifically the dry summers and wet winters experienced in Northland and the flow on effects of changing global markets.

By developing and growing a diverse income stream from dairy and beef, even when they were sharemilking, they have been able to significantly increase livestock sales as a proportion of gross income.

The decision was made to purchase a neighbouring beef farm in 2010 and it is run in conjunction with the dairy operation so the two are complementary.

With the philosophy that "cashflow is king", the objective of a more constant cashflow position across the year was achieved through a 50/50 split of income between dairy and beef.

Historically 30 to 40 empty dairy cows would be carried through winter to produce milk supply for the 80 to 100 calves reared. These empty cows would then be put to the bull and sold in-calf or alternatively as cull cows, thereby adding to livestock sales.

Given the importance of livestock sales to this business, a real commitment is made to managing all the calf rearing (approximately 120 dairy calves and 125 beef calves). The feeding of dairy replacements is prioritised by selling the excess dairy calves prior to December - thereby maximising feed availability in the event of a dry summer.

In addition, a close eye is kept on opportunities to buy in stock which can be grown out alongside the home-grown. From April through to August, most of the beef is sold as finished into the local trade market.

While building their dairy and beef income flows, these farmers have also invested in silviculture. Over the past 25 years they have planted a range of trees which also provides an alternative income flow.

Environmental performance

This dairy and beef farm includes a challenging combination of hill country, erosion-prone gullies, wetlands and river flats which are subject to repeated annual flooding.

The rolling steeper soils of Northland are prone to erosion, especially in heavy rain events. This can lead to a high loss of sediment and phosphorus to receiving water bodies and harbours. Where possible, it is important to protect soil from damage under grazing and cropping regimes, and to slow down the overland flow of water. With a moderate rainfall of 1,600 mm, the challenge is predicting when the rain falls. The past three years in Northland have seen floods and heavy rain events, which have made farming increasingly challenging. The uncertain weather conditions make it important to have buffer areas to winter stock and provide feed for critical times of the year.

Good environmental practices

All stock are excluded from waterways. Natural water flow paths have been identified across the farm, protected and fenced off. There is an extensive network of riparian areas in the valley systems.

A natural wetland has been fenced off and protected from stock, and gullies have trees planted to stabilise and protect them from erosion. This helps with slowing down the overland flow of water and sediment. Sediment carries phosphorus with it, and is mostly lost to receiving water bodies in heavy rain events.

Steeper areas of the farm have been retired and production forestry species have been planted with a focus on adapting the most suitable land use for the land class.

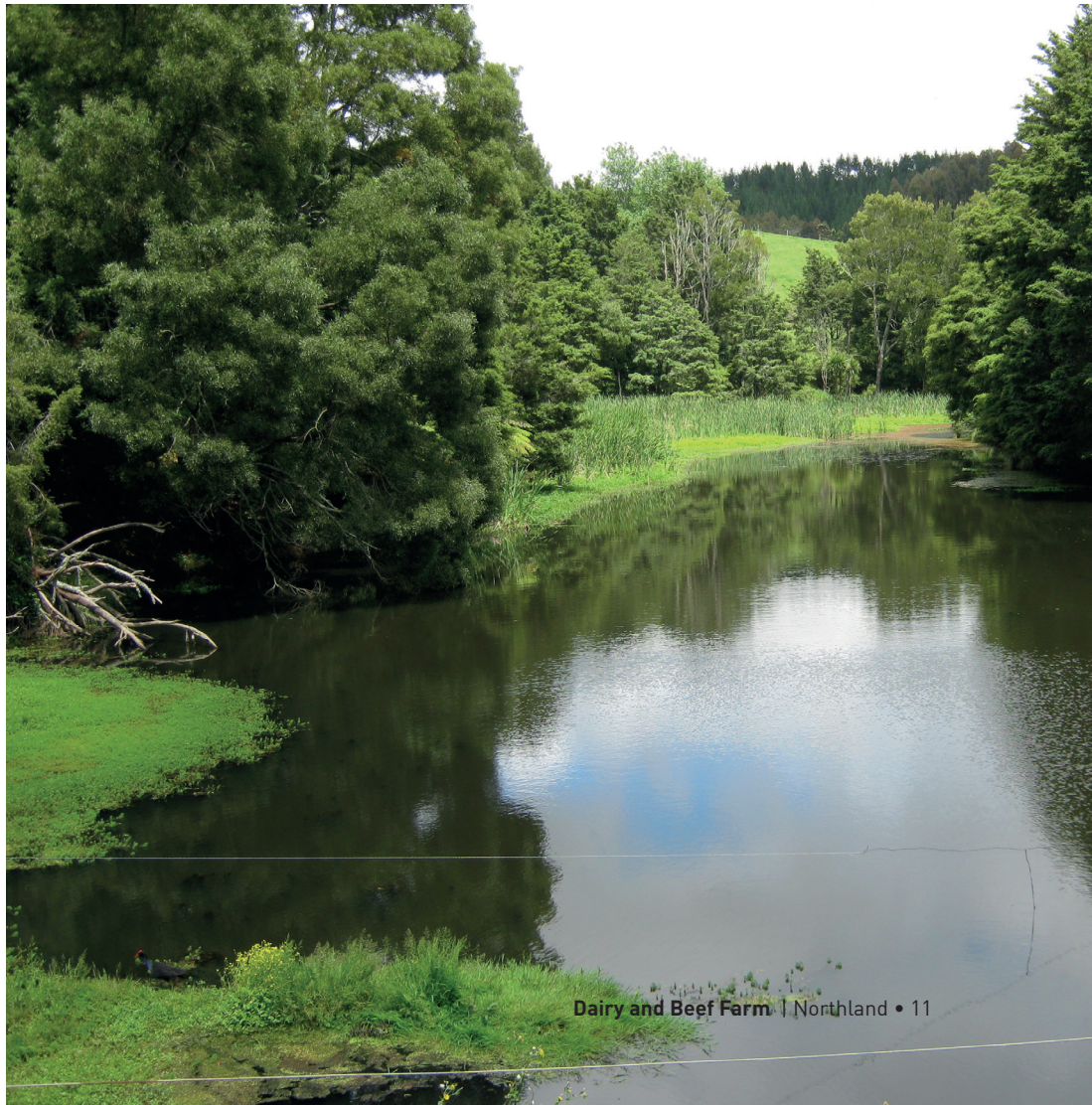
A dairy platform has been established inside their wider farm. To improve overall efficiency, the milking platform and dairy operation have been confined to the most efficient areas – better suiting the land and infrastructure. They run a very efficient system, with a feed pad to minimise soil damage and subsequent sediment and pathogen losses, prevent wastage of feeds, and enhance high performance from the milking herd.

There is a large storage pond for effluent, and the area that receives effluent has been expanded by 30 percent onto areas that are suitable for irrigating. Records are kept to ensure all paddocks in the irrigation block receive specified amounts of effluent. The effluent is spread using a travelling irrigator and low-rate application system (pods).

The dairy herd provides a source of beef calves for the wider farming operation. The milking platform is part of a wider mixed system, with support areas providing extra feed, winter grazing for cows, and replacement grazing.

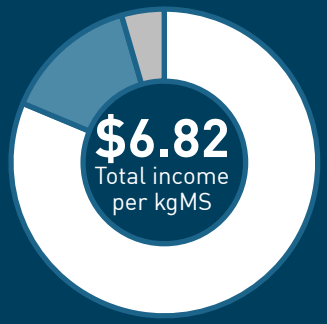
Improved environmental practice in the future

Already demonstrating a high degree of environmental stewardship, plans are afoot to continue to improve the farming system and wider environmental protection - nurturing the re-establishment of native species in their protected areas and managing pests (possums, rats, cats and mustelids) to enhance the continued improvement of the property.



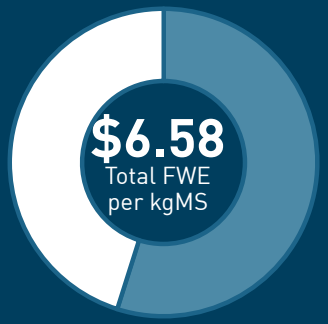
Financial performance 2014/15 season

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	662	$1,850	$4.35
Livestock Trading & Other Income	377	$1,053	$2.47
Total Income	1,039	$2,903	$6.82
Feed Costs	337	$941	$2.21
Other FWE	666	$1,861	$4.37
Total FWE	1,003	$2,802	$6.58
EBITDA	36	$101	$0.24

Breakeven Milk Price
(per kgMS)

What does this show

This farm's financial performance reflects the combined dairy and beef operations of the farming business. The Farm Working Expenses are high (relative to dairy farm norms) as they reflect the expenses for the entire farming operation, the dairy, beef and silviculture operations (not just the dairy herd).

The direct comparison of the expenses per kgMS to other dairy farmers is not relevant for this farm. Rather there are opportunities to consider the effect of lifting the Livestock Trading and Other Income relative to Farm Working Expenses. These farmers use DairyBase to benchmark their own performance year-on-year.

Over the five year period, peak cows have decreased from 500 to 358 and total production has decreased from 191,542kgMS to 152,392kgMS. However, there has been an almost 100kgMS increase in average production per cow from 396kgMS in 2011/2012 to 494kgMS in 2015/2016 for milk sold. These calculations include the calf milk used for calf rearing.

It is the effective use of the 100,000 litres of milk for calf rearing that generates the higher level of livestock trading income. This shows the value of analysing both income and expenses in a meaningful way to understand the drivers of financial performance.

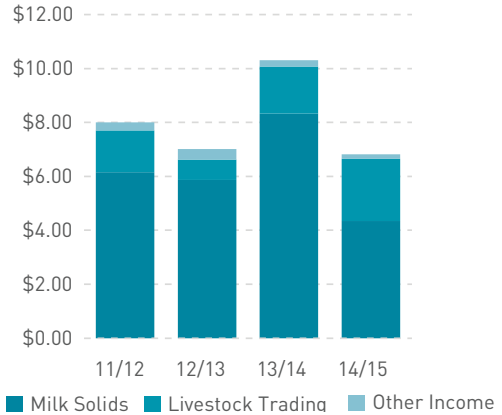
These farmers are absolutely focused on cashflow and reinvest the cash available to improve the farm infrastructure and satisfy regulatory requirements. An example is the upgrading of the milk chiller unit (to satisfy Fonterra guidelines for milk cooling). The chiller has been designed to recycle water lowering the temperature in order to reduce electricity usage. In addition, the reliability of the milk chiller unit has improved. This investment will lower Farm Working Expenses, another incremental change to improve use of resources and financial performance.

By constantly challenging the norm, these farmers are always looking for better ways to manage their farming business. Through a process of regularly evaluating their farming practices, they seek advice and make change for tangible results in the most efficient manner.

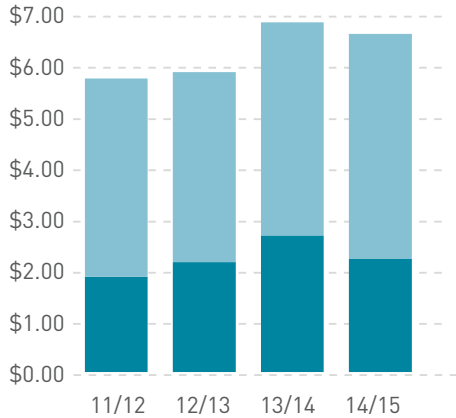
Financial performance over time

	Season Ended			
Financial Efficiency	**2012**	**2013**	**2014**	**2015**
Feed cost per kgMS	$1.86	$2.14	$2.66	$2.21
Other FWE per kgMS	$3.86	$3.70	$4.15	$4.37
Breakeven Milk Price	$3.86	$4.71	$4.84	$4.11
Return On Assets %	4%	1%	6%	-1%
Capital employed per kgMS	$56	$58	$52	$55
Milk Price	$6.15	$5.87	$8.33	$4.35

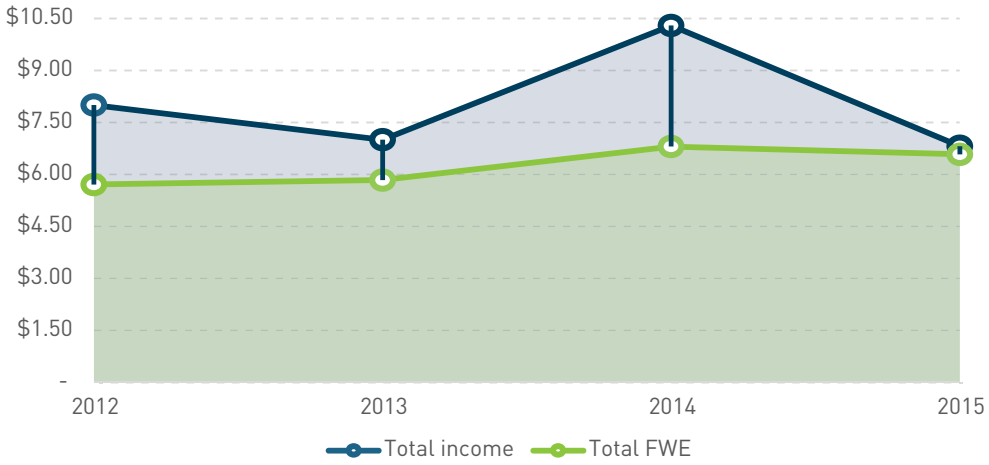
Income per kgMS



Expenses per kgMS



Profit and Loss to EBITDA per kgMS



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, euthanised, 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 Livestock Improvement Corporation (LIC) (modified by ancestry) for a fully grown mature cow (5 – 7 years) at BCS 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/kgDM) 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 Nitrogen input (Nitrogen input includes fertiliser, supplement and Nitrogen 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
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.
Milk Price	Total milk income divided by total kgMS

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