Bay of Plenty Dairy Farm

Weather proofing – a simple system delivering high production

Bay of Plenty

Farm Systems Change – 2016 Dairy Farm Case Study

Ministry for Primary Industries
Manatū Ahu Matua

Bay of Plenty Dairy Farm

At a glance

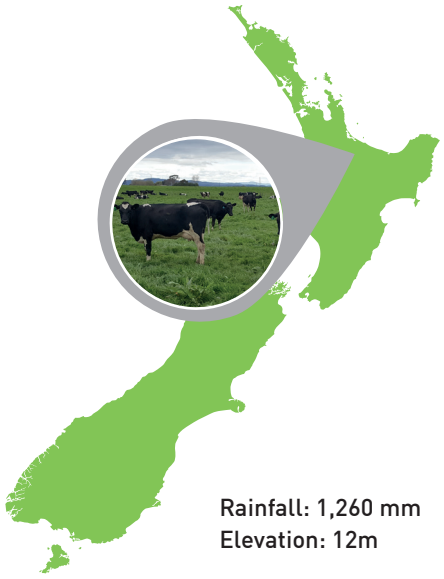
Bay of Plenty Dairy Farm

This flat 105 hectare dairy unit located near Whakatane operates in conjunction with 94 hectares of support land of which 40 hectares is owned and 54 hectares is leased.

The farm owners wanted to weatherproof their farming operation to reduce the impact of floods, wet winter soils and dry summers. They chose to install in-shed feeders into the cowshed as a simple low-labour-input solution. This system has provided greater control over cow feeding levels without incurring any complex changes to the effluent systems, or adding more work.

Season Ended	Total kgMS	FWE/kgMS
2012	152,396	$4.89
2013	131,988	$6.22
2014	171,688	$4.63
2015	185,281	$4.60
2016	191,752	$4.11

At a glance – 2014/15 Season



Rainfall: 1,260 mm
Elevation: 12m

Farm Details

Milking Platform	**105.0 ha**
Dairy support	**40.0 ha**
Total	**145.0 ha**
Effective Milking Platform	**100.0 ha**
Est. kgDM grown (per effective ha/year)	**17,200**
Cows (per effective ha)	**3.2**

Livestock Details

Breed Type	**Friesian**
Peak cows milked	**318**
Production per cow (kgMS)	**583**
Live weight per cow (estimated actual kg)	**580**

Other Details

People working on farm	**2.5**
Peak Production (kgMS/Cow/Day for top month)	**2.4**
Start of Calving	**28 Jul**
Calved in 6 weeks	**90%**
Average Pasture Cover (kgDM/ha at start of calving)	**2,580**
Production (kgMS/effective ha)	**1,853**

Farming focus

"We treat our cows as high performance athletes, training them to convert high levels of dry matter to milk solids on a daily basis."

FOCUS ON WHAT YOU CAN CONTROL

An in-shed feeding system was chosen to bring control over feed quantity and quality whatever the weather. The result is an increase in feed efficiency across the 318-cow herd as reflected in cow performance. An additional effluent tank was added in to the system to increase the effluent storage capacity and mitigate the need to spread effluent on wet soils during the wet spring period. These investments have improved the ability to manage this farm operation and minimise the impact of wet winters.

Read more on Page 5

IMPRESSIVE COW PERFORMANCE

These farmers focus on feeding lactating cows over 4 percent of their body weight for as long as possible throughout lactation. This has resulted in the fully grown Friesians increasing production levels from 152,396kgMS to 191,752kgMS over the last five years. The cows within the 2016 herd produced 105 percent of their genetic live weight in milk solids with production at 609kgMS from 580kg live weight cows up from an already impressive 100 percent (583kgMS/cow/year) in 2015.

Read more on Page 8

Bay of Plenty Dairy Farm

A closer look

Focus on what you can control

The Bay of Plenty climate with extremes of floods and long dry periods poses challenge to those dairy farming.

The owners of this dairy farm have invested in systems to best manage the challenges presented by the climate.

The soils on the farm are often very wet in early spring, so drainage in the form of Novaflow has been installed progressively over the past 20 years to assist with drainage management.

Historically, good production years have been cut short by dry summers. In response, systems available to mitigate the farms exposure to climatic conditions and enable greater sustainability of this farming operation year-on-year have been investigated.

In-shed feeders at a cost of $70,092 were identified as the best fit for this farming system as an alternative to a feed pad. An in-shed system was installed in the milking shed during April 2014. This in-shed system has the advantages of a low labour input, high percentage of feed utilisation and little additional infrastructure in terms of set-up cost or feed storage facility. As the cows already go through the milking shed, this system did not require significant investment in the existing effluent system.

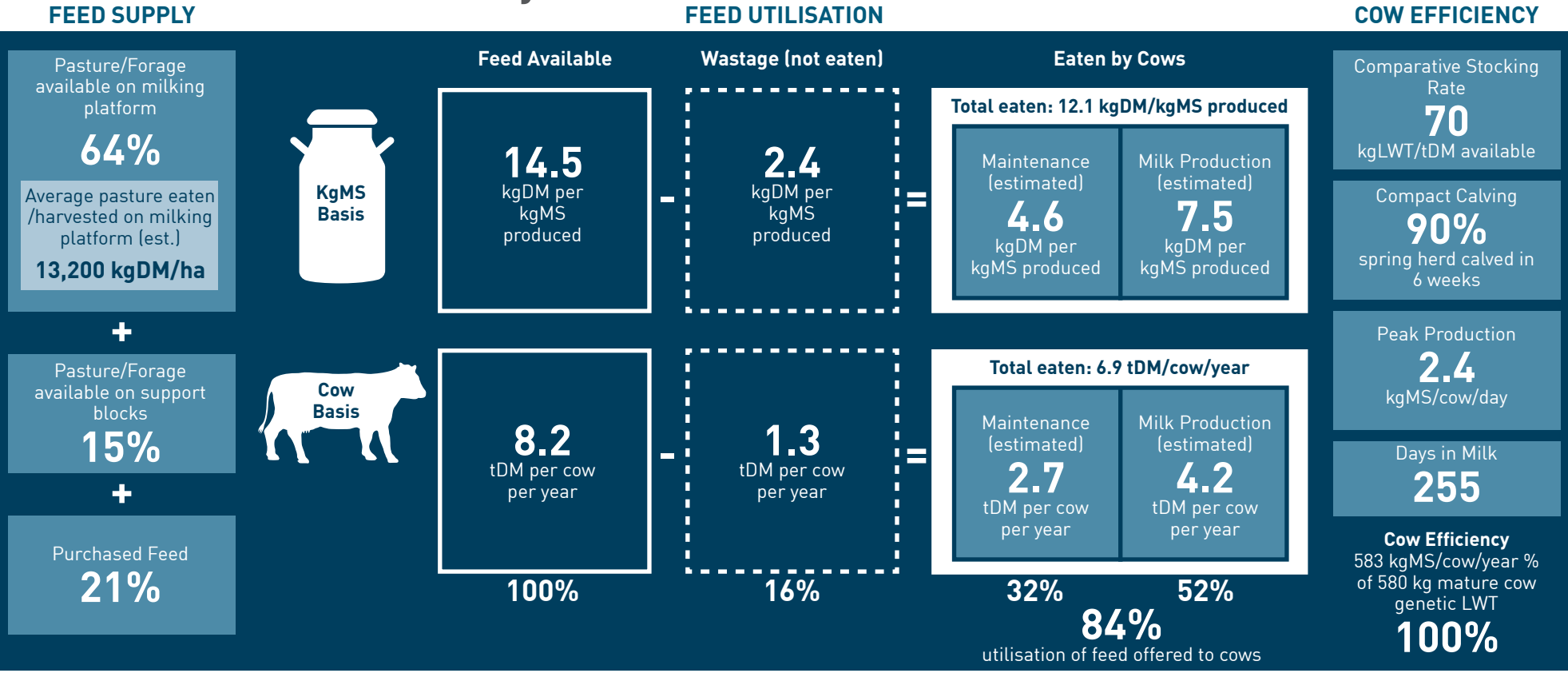
The level of feed purchased was increased from 15 percent of feed available in 2012 to 22 percent in 2016. While this contributed to the lift in production of 39,356kgMS, the regular reassessment of feed inputs to ensure profitable outcomes is an ongoing management task.

To enable greater precision of effluent spreading, a 940,000 litre above ground storage tank was installed at a cost of $70,000 in 2014/15. This allows effluent application to be managed to suit soil and weather conditions, thereby reducing potential nutrient loss and solid fertiliser requirements.

Another area of focus on this farm is herd management with well grown heifers reaching 500kg live weight, which is 86 percent of mature cow genetic live weight, 60 days pre-calving. At this level, these heifers have a greater chance of being retained in the herd as three-year-olds, with 84 percent of heifers still in the herd in their second year and a typical replacement rate of 21 percent heifers going into the herd. The empty rate is around 12 percent.

Given the level of cow losses is also very low at less than 1 percent in the 2014/15 year, the farm has a margin of 7 percent of cows that can be culled. This provides opportunity to further improve the overall quality of the herd by culling cows for low production or high cell count.

Feed to milk efficiency 2014/15 season



What does this show?

Feed Supply

The farm produces an estimated 14.6tDM per hectare in a drought year and 17.9tDM per hectare in a year with a wetter autumn. A comparative stocking rate of 70 means these large NZ Friesians are offered 8.2tDM/year. This is made up of 64 percent pasture grazed on the platform and a further 15 percent of feed from dairy support blocks supplemented by maize silage, grass silage and pasture and bought in feed (21 percent) including DDG, PKE and molasses. Having this amount of feed on offer means daily dry matter intake levels must be high to utilise it, and conversion efficiency must be excellent to make it economic. It is estimated these cows consume 6.9tDM/cow per year with feed conversion efficiency of 14.5kgDM offered per kg of milk solids produced.

Feed Utilisation

Farm feed efficiency is achieved through having the correct Comparative Stocking Rate (CSR) and ensuring the cows have the ability to consume in excess of 4 percent of live weight for the majority of the lactation period over time. The CSR has reduced from 80kgLWT/tDM to 70kgLWT/tDM. This leads to stability of body condition, favourable reproductive performance without the need to intervene and persistent lactation curves. The cow conversion efficiency figures have steadily improved from 13.4kgDM eaten per kg of milk solid produced in the 2011/2012 year to 12.1kgDM/kg MS produced in the 2014/2015 year. This is reflected in the percentage of the metabolic energy in feed used to produce milk increasing from 46 percent in 2012 to 52 percent in 2015.

Cow Efficiency

Good feed conversion efficiency is only achieved with fully grown young stock and cows, minimal cow losses and minimal cow days out of the vat due to illness. This combined with maximum days in milk, quality feed on offer and low levels of wastage leads to good conversion numbers. The herd's conversion efficiency has steadily improved through attention to detail in all these areas.

The combination of a compact calving for the 2014/15 year of 90 percent calved in 6 weeks, a peak of 2.4 kg MS/cow/day and long Days-in-Milk with minimal cows days out of the vat, have resulted in cow efficiency at 100 percent of live weight.

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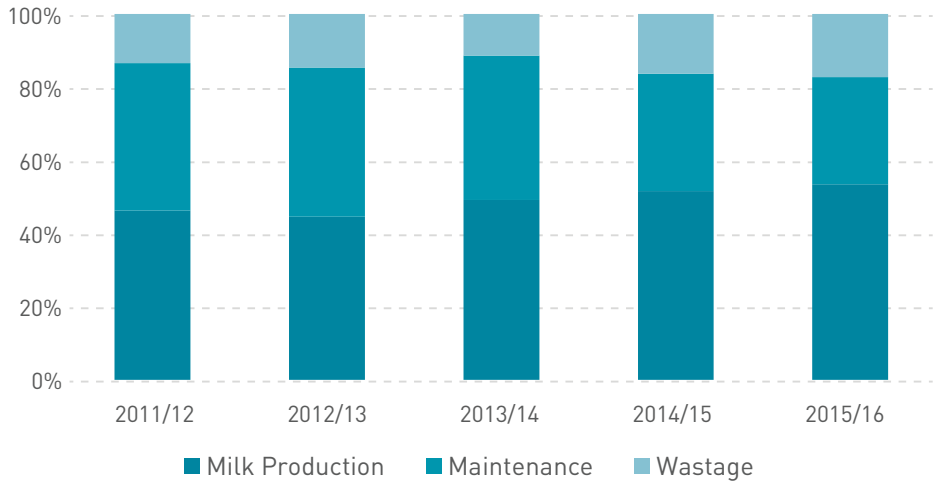
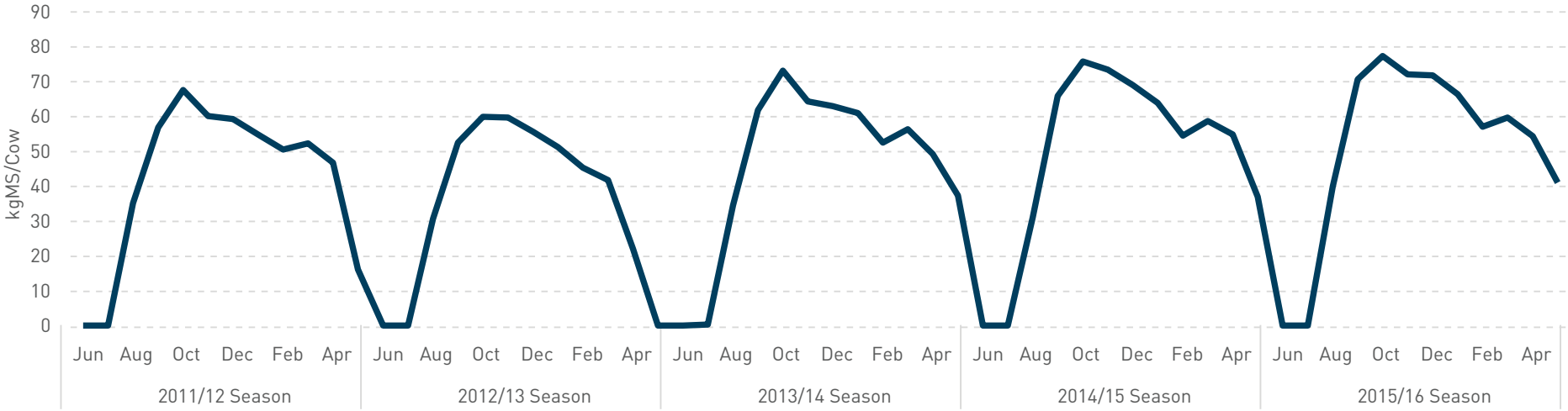
Feed to milk efficiency performance over time

Feed to Milk Efficiency



	Season Ended				
	2012	**2013**	**2014**	**2015**	**2016**
Comparative Stocking Rate kgLWT/tDM available	80	85	76	70	68
Farm Feed Conversion kgDM/kgMS produced	15.5	16.7	15.2	14.5	14.0
Cow Feed Conversion kgDM/kgMS produced	13.4	14.3	13.4	12.1	11.6
Feed Wasted kgDM/kgMS produced	2.1	2.4	1.8	2.4	2.4
Feed Grown % of feed available	85%	86%	84%	79%	78%
Feed Purchased % of feed available	15%	14%	16%	21%	22%

Per Cow Milk Solids Production

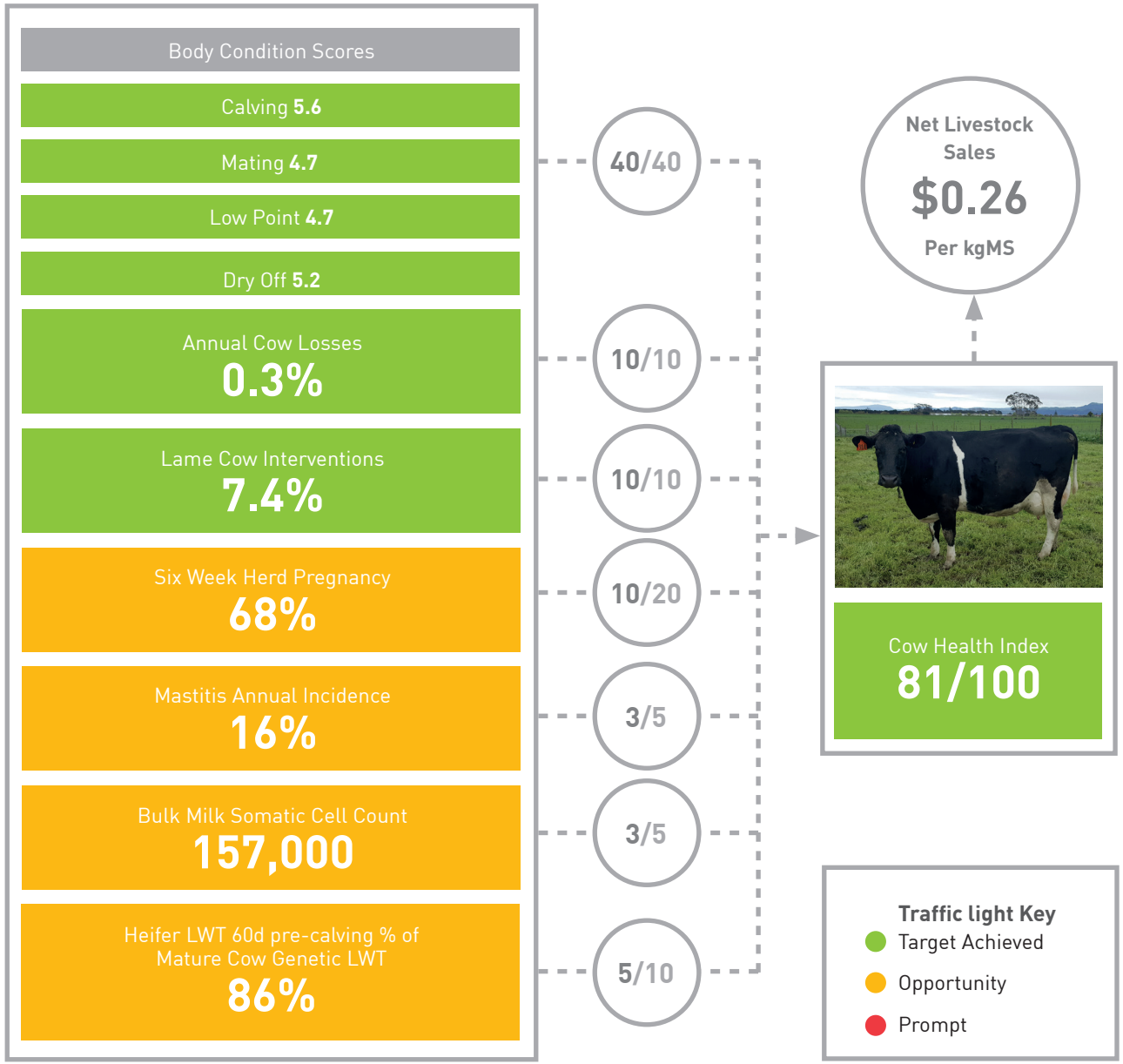


Impressive cow performance

This Bay of Plenty herd produced 105 percent of their genetic live weight in milk solids during the 2015/2016 season. The ability to gain high per cow production year after year is achieved through a focus on consistently doing the basics right. These basics include:

- Well grown young stock entering the herd in excess of 90 percent of mature cow genetic live weight within 60 days of calving. The calves are fully fed (12 percent live weight) on milk until over 120kg before weaning. An average daily gain of over 0.75kg/day is achieved through having no hungry days and quality feed on offer. If pasture supply is not adequate a blend of DDG and PKE is fed to ensure average daily gain targets are met.
- The well timed start of calving maximising days-in-milk. The cows are dried off in late May and begin calving in late July. The longer days in milk is due to good cow condition at calving of 5.5. The cows are grazed off the dairy platform over winter to reduce pasture damage and can therefore calve on pasture covers of at least 2,400kgDM/ha. While at the dairy support block the cows are fed 14.5kgDM/day of grass silage, maize silage and pasture. The cows calve at the dairy support block and are then brought home to the milking platform.
- A formal transition programme is in place to minimise animal health issues during calving. Their target dry matter intake of 4 percent of live weight within 14 days of calving is aided by in-shed feeding of DDG and the ad hoc offering of PKE in feed trailers in the paddock.
- The compact calving spread has improved from 82 percent calved in six weeks in 2012 to 90 percent calved in six weeks in 2015. The well grown heifers' calving is even more compact contributing to this high level. This ensures a high proportion of the herd are at their peak at the same time as pasture quality is at its best. This maximises milk solid production prior to the end of December and is an important consideration in this location where land can dry out over the summer period. During the dry 2012/13 year, production reached 131,988kgMS and the herd was dried off in mid-April. In 2014, in-shed feeders were installed in the milking shed to support the level of feeding and help prevent condition loss in the spring with a view to improving pregnancy rates and reducing empty rates.

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.

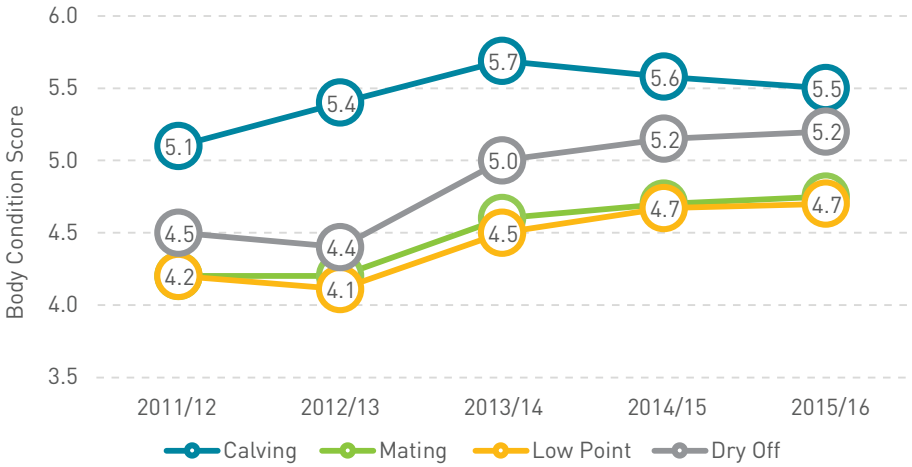
Herd Survivability Metrics

3 year-olds Retention Rate	84%
Replacement Rate at calving	21%
Heifer Mating LWT % Mature Cow LWT	60%
Herd Empty Rate	12%

The herd survivability metrics influence the costs associated with maintaining herd numbers and the good live weights of heifers entering the herd contribute to a high 3 year olds Retention Rate. The cows have a low incidence of lameness as the races have well maintained surfaces leading into a centrally located milking shed. Mastitis is managed through a dry cow therapy programme and shed management including teat spraying. However, wet weather can significantly influence the level of mastitis. As a result livestock are carefully managed during wet weather and are moved to dryer pastures.

Animal health performance over time

Animal Health



	Season Ended				
	2012	**2013**	**2014**	**2015**	**2016**
Cow Health Index (Max 100)	60	53	76	81	81
Annual Cow Losses	2.2%	4.0%	2.1%	0.3%	2.2%
Lame Cow Interventions	No data	3.1%	12.7%	7.4%	7.1%
Six Week Herd Pregnancy	No data	No data	69%	68%	70%
Mastitis	No data	11%	15%	16%	15%
BMSCC (000s)	204	172	178	157	177
Heifer LWT 60d pre-calving % of Mature Cow Genetic LWT	82%	84%	86%	86%	91%

What does this show?

The Cow Health Index has lifted from 60 in 2012 to 81 in 2016. This increase primarily reflects the data availability. In the first two seasons there was no data for lame cow interventions, six week herd pregnancy and mastitis.

The herd body condition score which can be seen in the graph above has improved across all measurement points. The cow condition is on target at calving and throughout the year. In the final months of lactation, cows are fed to protect the body condition leading into dry off. This is achieved by ensuring there is consistent feed for the cows during this period.

Throughout the dry period the cows are fed a low energy ration of 2.5 percent of live weight which is then increased to 3 percent prior to calving.

The formal transition programme focusing on feed mix and quantity is used to minimise animal health issues during calving. This process minimises the risks of ketosis and milk fever which can be an issue when it is wet during calving.

Animal losses are extremely low, which is an indicator of quality stockmanship particularly during calving. Optimum feeding means the young herd members do not have to compete as hard for feed access as there is sufficient feed for all. This leads to low levels of calving slippage. The colostrum cows are milked twice a day after calving for a minimum of five days and during that period are fed ad hoc using a feed trailer containing PKE with added lime flour to provide calcium in order to avoid milk fever.

Although the winters are wet, the incidence of lameness is managed effectively by reducing pressure points in getting to and from the centrally located shed. Over the wet winters the cows are taken off farm to the dairy support land, which is naturally dryer land.

While a dry cow therapy program is in place, it may be possible to consider other preventative actions to reduce the mastitis levels and in so doing achieve a reduction in the average bulk milk somatic cell count of 157,000 cells/mL for the 2014/2015 season.

The six week in-calf rate of 68 percent for the 2014/15 year is lower than the industry target of 75 percent. However, in the 2015/2016 season it lifted to 70 percent which is closer to the 75 percent target.

Environmental performance

This Bay of Plenty dairy farm is located in the Rangitaiki River Catchment area. The land contour is flat with soil types predominantly silt loams (Opouriao and Paroa). The rainfall is 1,260mm and the low lying property has a high water table. The 199.6 hectare farm includes a milking platform area of 105.0 hectares with a 94.6 hectare dairy support block.

The farm owners are only too aware of the climatic impacts on their farm. They are focused on investing in areas to gain greater control of their farming operation and managing a farm that goes from being very wet in spring to very dry in summer.

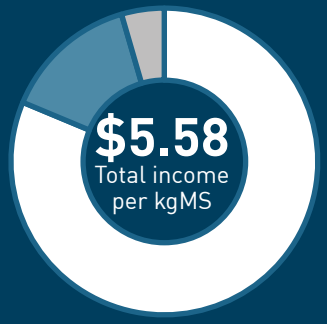
Drainage systems across the farm and the local water pumping scheme are critical to managing this property given the high water table. In addition to the open drains, investment has been made in subsurface drainage with the installation of Novaflow drainage coil over the past 20 years.

To minimise the impact of the herd on the pasture during the winter period, all of their cows are grazed (including young stock) on the free draining sandy soil of the dairy support block. During the lactation period, supplementary in-shed feeding supports pasture availability throughout the season.

Investment in an above-ground effluent storage tank enables effective use of nutrients by deferring effluent to storage during wet conditions. Urea is used strategically following the "little and often" principle to maximise nutrient uptake.

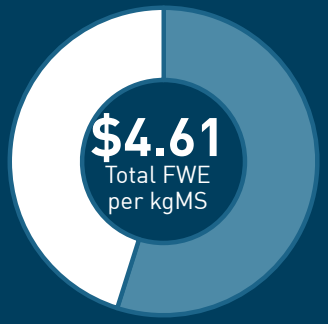
Financial performance 2014/15 season

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	841	$2,644	$4.54
Livestock Trading & Other Income	194	$609	$1.04
Total Income	1,035	$3,253	$5.58
Feed Costs	468	$1,471	$2.53
Other FWE	385	$1,211	$2.08
Total FWE	853	$2,682	$4.61
EBITDA	182	$571	$0.97

What does this show

During the past five years the total farm working expenses have been as low as $4.11/kgMS and as high as $6.22/kgMS in the drought year. The total feed costs have progressively increased from 46 percent to 55 percent of total expenses. In the 2014/15 year, feed costs were $2.53/kgMS. The combination of feed and their relative costs are an area of focus for these farmers although they believe first and foremost in fully feeding their cows.

The breakeven milk price for the 2014/2015 season has been calculated at $3.57kgMS before debt servicing and depreciation. This lowered in the 2015/2016 season to $3.43kgMS.

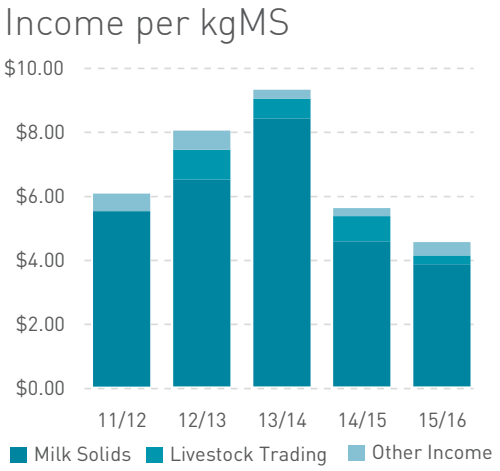
The effect of the drought in 2012/2013 was a drop in total production of 20,408kgMS which was offset somewhat by the milk price increase of $1.00 kgMS. The variability in production attributable to climatic conditions was a key driver for the investment in the in-shed feed system.

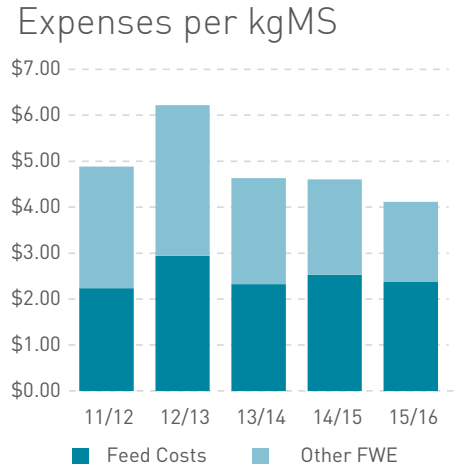
There are costs that can be reduced for a time and others that have a significant impact on revenue which should not be reduced. For example, preventative treatments such as dry cow and teat seal to minimise risk of mastitis. However, core to financial success is lifting revenue as long as it can be done profitably.

Breakeven Milk Price
(per kgMS)

Financial performance over time

	Season Ended				
Financial Efficiency	**2012**	**2013**	**2014**	**2015**	**2016**
Feed cost per kgMS	$2.24	$2.94	$2.33	$2.53	$2.37
Other FWE per kgMS	$2.65	$3.28	$2.30	$2.08	$1.74
Breakeven Milk Price	$4.33	$4.70	$3.73	$3.57	$3.43
Return On Assets %	3%	3%	11%	2%	0%
Capital employed per kgMS	$44	$51	$41	$35	$35
Milk Price	$5.48	$6.48	$8.38	$4.54	$3.83





	Season Ended				
Profit and Loss to EBITDA (per kgMS)	**2012**	**2013**	**2014**	**2015**	**2016**
Milk income	$5.48	$6.48	$8.38	$4.54	$3.83
Dividends	$0.34	$0.44	$0.22	$0.15	$0.33
Livestock trading	($0.01)	$0.93	$0.60	$0.79	$0.27
Other operating income	$0.22	$0.15	$0.07	$0.10	$0.09
Total income	**$6.03**	**$8.00**	**$9.27**	**$5.58**	**$4.52**
Feed costs	$2.24	$2.94	$2.33	$2.53	$2.37
Other FWE	$2.65	$3.28	$2.30	$2.08	$1.74
Total FWE	**$4.89**	**$6.22**	**$4.63**	**$4.61**	**$4.11**
EBITDA	**$1.14**	**$1.78**	**$4.64**	**$0.97**	**$0.41**

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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, 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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