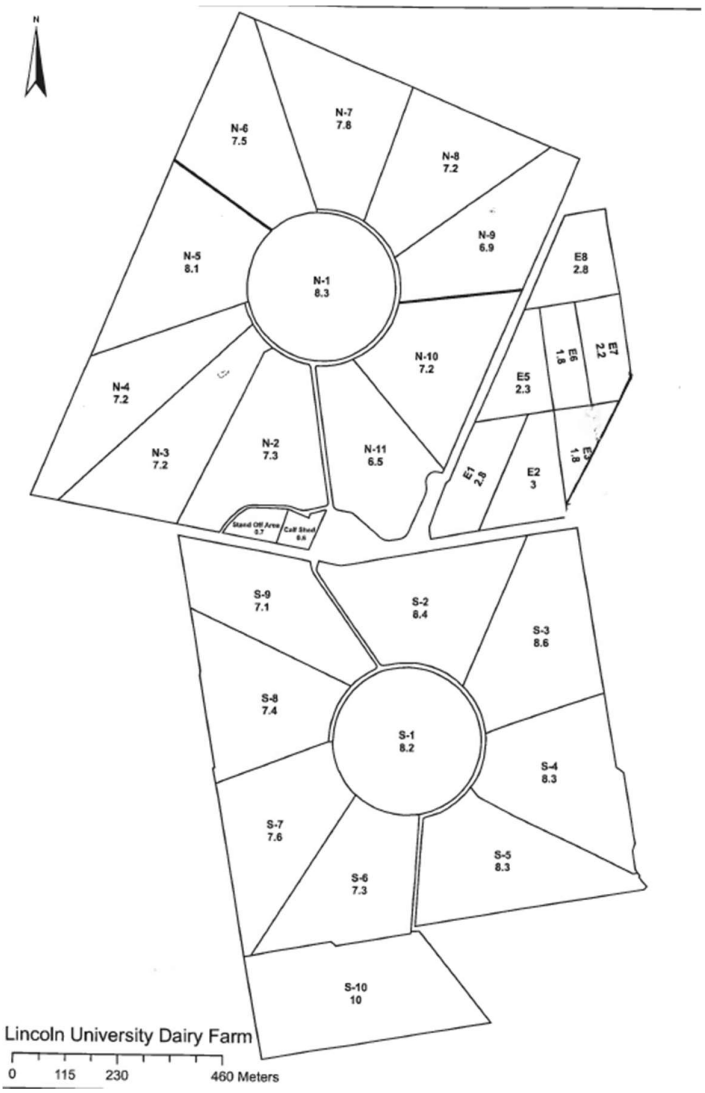
LINCOLN UNIVERSITY DAIRY FARM

Focus Day Oct 2019

Staff:
Peter Hancox – Farm Manager
William Sommerville – 2IC
Katherine Townley – Farm Assistant
Harry Johnson – Farm Assistant

LUDF Hazards Notification

1. Children are the responsibility of their parent or guardian
2. Normal hazards associated with a dairy farm
3. Other vehicle traffic on farm roads and races
4. Crossing public roads
5. Underpass may be slippery



SIDDC
South Island Dairying Development Centre

INTRODUCTION

The LUDF is a progressive farming development facility that is committed to advancing dairy farming practice across the South Island, with particular consideration to productivity and environmental sustainability. Formerly the University sheep farm, the converted 186 hectare Dairy Farm is an excellent cross section of the various soil types evident across the Canterbury Plains. The property, of which 160 ha is the milking platform, is irrigated using a spray system that includes two centre pivots, small portable lateral sprinkler and k-lines.

STAGE 1: 2001/2 AND 2002/3

The farm initially wintered approximately 630 cows, peak milking just over 600 and producing about 1400kgMS/ha from 200 kgN/ha and up to 550 kg DM/cow of imported feed. The milk pay out in 2002/3 was $4.10/kgMS.

STAGE 2: 2003/4 THROUGH TO 2010/11

During this period the primary development was the increase of the stocking rate to between 4 and 4.3 cows per ha. 654-683 cows peak milked as a result production average 1700kgMS/ha and 411 kgMS/cow. LUDF ran a single herd during stage two, to allow us to focus primarily on simple systems, and low and consistent grazing residuals.

STAGE 3: 2011/12 TO 2013/14

The further development of LUDF during stage 3 was a move into "precision dairying', resulting from the implementation of the strategic objective (below). This stage focused on minimum standards, two herds were run to increase productivity and profitability, from a similar environmental impact. Production lifted to 1878kgMS/ha or 477kgMS/cow (630 cows). A change in farm practice was initiated in 2013/14, with the temporary suspension of Eco-n (DCD), in an attempt to hold nitrogen losses without the mitigation effect of Eco-N.

Stage 4: Current

LUDF is adopting a 'Nil-Infrastructure, low input' farm system emerging from the P21 (Pastoral 21) research programme, in partial response to the tightening environmental requirements of some catchments across NZ.

LUDF STRATEGIC OBJECTIVE:

To maximise sustainable profit embracing the whole farm system through increasing productivity;

- Without increasing the farm's total environmental footprint;
- While operating within definable and acceptable animal welfare targets; and
- Remaining relevant to Canterbury (and South Island) dairy farmers by demonstrating practices achievable by leading the progressive farmers.
- LUDF is to accept a higher level of risk (than may be acceptable to many farmers) in the initial or transition phase of this project.

ADDITIONAL OBJECTIVES

1. To develop and demonstrate world-best practice pasture based dairy farming systems and to transfer them to dairy farms throughout the South Island
2. To ensure optimal use of all nutrients on farm, including effluent, fertiliser, nutrients imported from supplements and atmospheric nitrogen; through storage where necessary, distribution according to plant needs and retention in the root zone.
3. To mange pastures and grazing's so per hectare energy production is optimised and milkers consume as much metabolizable energy (ME) as practicable (within the constraints of the current system and the associated nutrient losses).
4. To optimize the use of the farm automation systems and demonstrate/document improved efficiencies and subsequent effect on the business.
5. To achieve industry targets for mating performance within a 10 week mating period, including a 6 week in-calf rate of 78% and 10 week calf rate greater than 89% i.e. empty rate of less than 11%.
6. To actively seek labour productivity gains through adoption of technologies and practices that reduce labour requirements or makes the work environment more satisfying
7. To assist Lincoln University to attract top quality domestic and international students into the New Zealand dairy industry

ONGOING RESEARCH

- The effect of farm management on groundwater and nutrient losses. Includes 10 groundwater monitoring wells and 60 lysimeters to monitor and manage the effect of fertiliser, grazing, irrigation and effluent inputs over a variety of contrasting soil types
- Pasture growth rates, pests and weeds monitoring
- Real time, on-line monitoring for animal health and environmental impact
- Yield mapping of pastures across the season
- Resource inventory and Greenhouse Gas Footprint
- Cleartech effluent treatment system to recycle water and reduce environmental impact
- Pasture measurement method testing – SPACE, CDAX Robot

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South Island Dairying Development Centre

Climate

Mean Annual Maximum Temperature **32° C**

Mean Annual Minimum Temperature **4° C**

Average Days of Screen Frost
36 days per annum

Mean Average Bright Sunshine
2040 Hours per annum

Average annual Rainfall **66mm**
36 days per annum

Soil Types

Free-draining shallow stony soils (Eyre) **5**
Deep sandy soils (Paparua and Templeton) **45**
Imperfectly drained soils (Wakanui) **30%**
Heavy, poorly-drained soils (Temuka) **20%**

Farm Area

Milking Platform **160 ha**
Runoff (East Block) **15 ha**

Unproductive land on platform **6.7 ha**

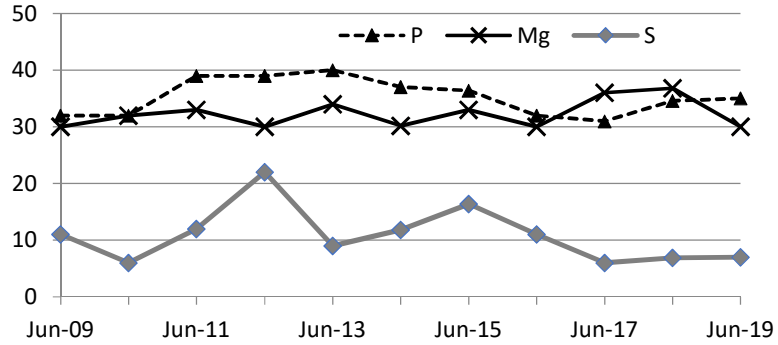
SOIL TEST RESULTS AND FERTILISER APPLICATIONS

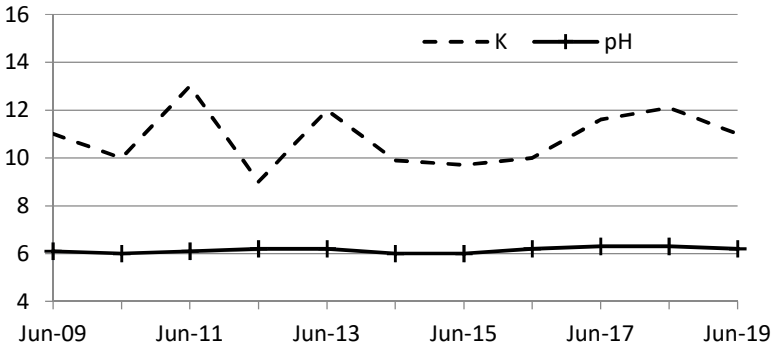
Target Soil Test Ranges:

pH: **5.8-6.2** P: **30-40** K: **5-8**

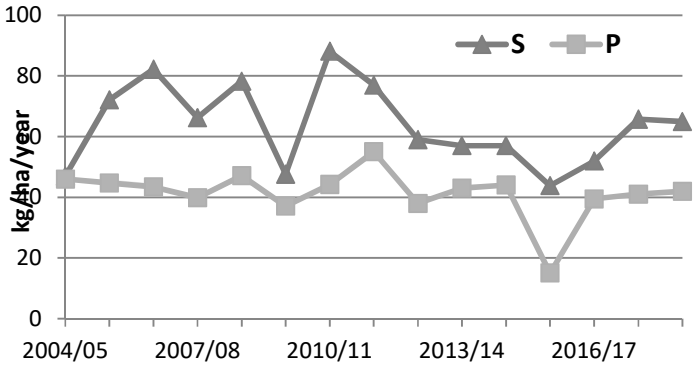
S: **10-12** Mg: **20+**

Whole Farm Average Soil Test Results





Whole Farm Average P and S Application 2003/4 - 2018-19



Paddock	Period Regrassed	Grass Cultivar
N1	Dec-17	Plantain, Shogun
N2	Feb-11	Trojan
N3	Nov-12/Sept-13	Shogun/Chicory/Plantain/Troj
N4	Feb-19	Viscount/Troj/Chicory/Plantain
N5	Dec-11/Aug-13	Shogun
N6	Apr-14/Sept-16	Shogun (spray/drill)
N7	Jan-14	Bealey/Troj/Chicory/Plantain
N8	Jan-13	Bealey/Troj/Chicory/Plantain
N9	Oct-13	Bealey/Troj/Chicory/Plantain
N10	Jan-12	Tetraploids (FVI trial)
N11	Nov-07	Bealey

Paddock	Period Regrassed	Grass Cultivar
S1	Dec-05	Bealey
S2	Dec-10	Troj. Bealey
S3	Feb-10	Bealey/Arrow
S4	Dec-13	Bealey/Troj/Chicory/Platain
S5	Dec-16	Shogun/Trojan
S6	Dec-14	Shogun/Chi/Plant (spray/drill)
S7	Nov-15	Base/Troj/Plantain
S8	Oct-11	Troj. Bealey
S9	Dec-09	Bealey/Arrow
S10	Nov-14	Shogan/Chicory/Plaintain

all paddocks also sown with clover

Staffing and Management

Roster System – 8 days on 2 day off, 8 days on 3 off

Milking Times – cups on 5.00 am/ 2.30 pm

Irrigation and Effluent System

Centre-pivots	127 ha
Long Laterals	24 ha
K-Lines	10 ha
Irrigation System capacity	5.5 mm/day
Length of basic pivot	402
Well depth	90 m

A full rotation competed in 20.8 hours for 5.5 mm (at 100% of maximum speed)

Effluent

- Sump capable of holding 33,000 litres and a 300,000 litre enviro saucer
- 100 mm PVC pipe to base of North Block centre pivot, distribution through pot spay applicators
- Cleartech Effluent Treatment System to recycle water and reduce environmental impact

Herd details – Oct 2019

Breeding worth (rel%) 98/45

Production worth (rel%) 130/60

Average weight/cow – herd monitored walk over weighing: 490 kgLW

Calving start date 2019: Heifers 14 July, Herd 24 July

Est Median calving date: 9th August 2018

Mating start date: 18 October 2018

Empty rate (nil induction policy) after 10 weeks mating – 16% (2018-19 mating). 6 week in-calf rate 71%

	2002/13	Average 03/04-06/07	Average 07/08-10/11	Average 11/12-12/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Total kg/MS supplied	228,420	277,204	269,512	299,112	276,019	278,654	289,906	286,189	251,424	277,293
Average kg/MS/cow	381	425	401	474	440	498	522	516	451	504
Average kg/MS/ha	1414	1720	1685	1870	1725	1742	1812	1789	1571	1733
Farm Working Expenses /kgMS	$2.98	$2.68	$3.62	$3.88	$4.28	$3.87	$3.47	$3.76	$4.15	$3.80
Dairy Operating Profit/ha	$1,164	$2,534	$5,426	$4,609	$7,578	$1,200	$1,182	$4,728	$4,070	$5.296
Payout [excl. levy $/kg] [Milk Price + Div]	$4.10	$4.33	$6.85	$6.28	$8.50	$4.65	$4.30	$6.52	$6.85	$6.23
1 July cow numbers	631	675	697	658	650	580	578	580	579	567
Max cows milked	604	654	673	631	628	560	555	554	558	550
Herd Average Days in milk			264	273	259	263	257	270	264	275
Stock rate cow equiv./ha	3.75	4.05	4.2	3.9	3.92	3.5	3.47	3.46	3.49	3.4
Purch. Suppl – fed (kgDM/cow)	550	317	370	397	507	300	126	397	445	22.3
Supp Made on dairy platform (kgDM/cow)	0	194	116	124	0	40	277	104	88	73
Applied N/160 eff. Ha			202	345	250	143	179	173	178	202

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LUDF FARM SYSTEM OVERVIEW:

STRATEGIC OBJECTIVE

To maximise sustainable profit embracing the whole farm system through:

- increasing productivity;
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- while operating within definable and acceptable animal welfare targets; and
- remaining relevant to Canterbury (and South Island) dairy farmers by demonstrating practices achievable by leading and progressive farmers.
- LUDF is to accept a higher level of risk (than may be acceptable to many farmers) in the initial or transition phase of this project.

To achieve the above objectives, and considering the changing environmental regulations to reduce nutrient losses, LUDF has since the beginning of the 2014/15 season adopted and scaled up research emerging from the P21 Phase 2 programme. This research (jointly funded by the Ministry of Business, Innovation and Employment, DairyNZ, Fonterra, Beef + Lamb New Zealand and the Dairy Companies Association of New Zealand) identified a "low input, highly productive farming system" that reduced nutrient losses while maintaining profitability when estimated against the LUDF data at the time. This Low Input, High Production, High Profitable, Low Nutrient Loss Farm System has been run at LUDF for 5 seasons already.

500 KGMS/COW ON PASTURE WITH MINIMAL SUPPLEMENT

Spring:

- Starts 1st June 1900 kgDM
- Calving date early. Heifers 14th July, Cows 23rd July.
- Make sure cows come back in the right condition.
- Aiming for days in milk!
- Round Length – know your targets. Work towards them but be prepared to change your plan depending on how the season is going.
- Cows milk better on 2nd round. Get there fast enough – but not too fast. Cows peak at 45 days after quality. Get them on good quality.
- Monitoring is key – do the weekly farm walk even though are busy. React on the data you monitor.
- Per cow production – happens as a consequence of getting it right.
- Fat to protein ratio check daily. Indication of how cows are fed.
- Allow for a higher cover, and no supplement for the 1st round. Works well for LUDF.

This Season:

Round length 21st September. Deliberately pushed it out with a bit of silage to hold it out.

Have used more silage 76 kgDM/cow. Cows peaked 2.27 kgMS/cow.

Summer Grazing

- Maintain 23-25 day round.
- Typical production 2.1 kgMS/cow
- Demand 19.7 kgDM/cow
- Demand 68 kgDM/HA
- Residual target 1,550 – 1,600 kgDM
- 23 day round = 1,560 kgDM/HA Pregrazing 3,200 kgDM/Ha
- 25 day round = 1,700 kgDM/HA Pregrazing 3,300 kgDM/Ha
- Visit the cows twice a day – what time will get residual.
- Can drive appetites by offering more with less cows at a lower stocking rate.
- Make sure 1,600 kgDM/HA residual. Not shifted until the residual is achieved.

Mower Use Decisions:

- When cows struggling to get residual in a timely manner. Eg, round length getting long.
- Milk production drops.
- Observe cows struggling with residuals.

Silage Making:

- When round length getting to sustained 27 – 28 days.
- What are growth rates – where are they going, eg, soil temps.

Nitrogen:

- Limited to 170 kgN/Ha.
- Using when getting best bang for the $ spent.
- Longer round – have used less.

- Start when temperatures are 8 degrees+.
- Finished by late March.
- Use a bit more in seed head and heat phases to get better quality pasture.

Autumn

- Condition scoring and priorities start in January.
- All culls gone by 15th April.
- No guarantees soil conditions – play it conservatively.
- Feed the balance of cows better.
- Manage the feeding of supplement by observing average cover.
- Need to keep quality – don't go with extending the round too early.
- 30 – 35 round April.
- Minimal feed of supplement – utilisation of silage a real challenge on the wet soils.
- Finish the season 1,900 kgDM/HA

Unique Aspects of the Farm To Make this work:

- Tetraploids – a big part of the quality story. Allow pregrazings to be longer and holds quality to higher cows.
- Longer rounds, longer covers means higher growth. – 3 leaf growth rate poster.
- Cow quality very high – they can bounce back. But not the be all and end all.
- Farm scale and layout – makes it doable and easy.
- Reliable irrigation, and good soils. Only one variable impact growth rate in summer – temperature. Soil moisture rarely an issue.
- Having good staff – doing 500 kgMS/cow on pasture is bigger than one person.
- In a gold fish bowl – absolute focus.

Challenges in Replicating this farm system:

- Need to have the demand matching the farms potential summer growth rate for your farm. LUDF = 68 kgDM/Ha for summer growth.

Demand kgDM/Ha	Stocking Rate (cows/Ha)				
Milking production kgMS/cow	2.9	3.1	3.3	3.5	3.7
1.6	49	53	56	59	63
1.8	53	56	60	63	67
2	56	60	64	68	71
2.2	59	63	68	72	76

Risk of not harvesting 100 % of pasture on irrigated Canterbury

Risk of having to feed supplement for demand = growth

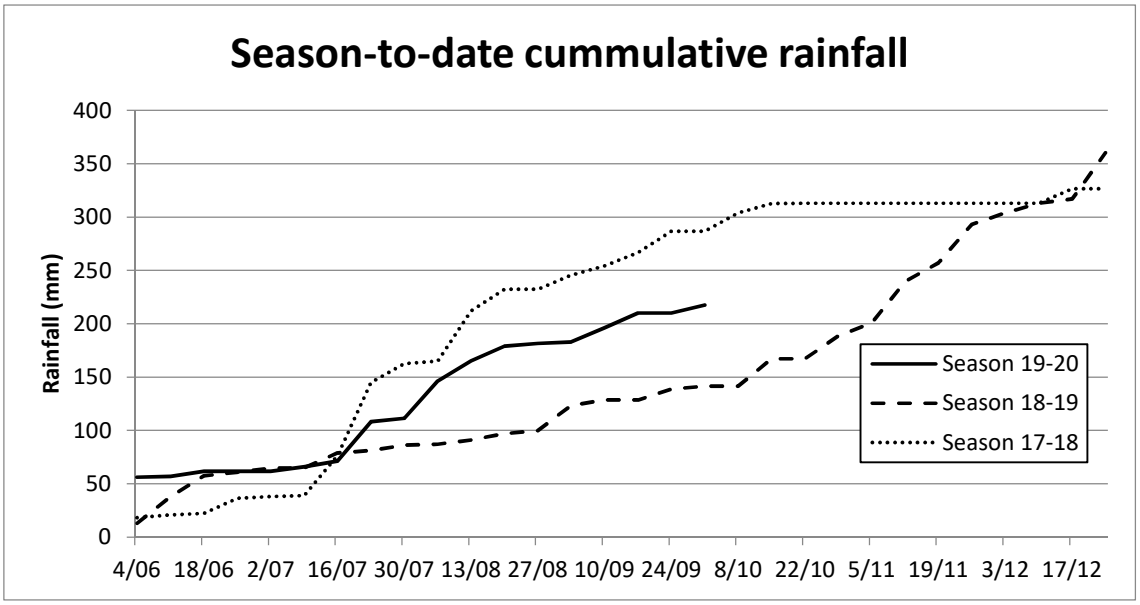
- Holding quality at high covers.
  - 3,500 kgDM/HA max at LUDF
  - 3,000 kgDM/HA
  - Leaf stage and time of year has a bearing.
- More variables driving growth, soil moisture, wind run. Expect to feed more supplement mid season else where when dealing with this?

LUDF – OVERVIEW OF SEASON TO DATE

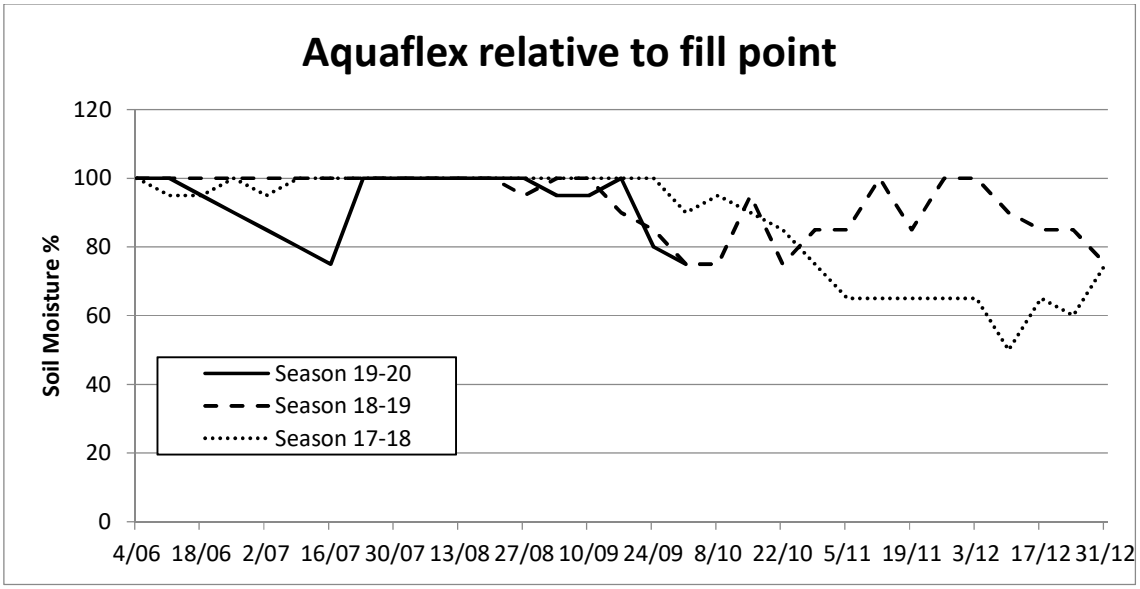
Weather and Environment

The graphs below show the weather conditions from the start of the 2019-20 season till now. June started with 50 ml of rain for LUDF. There were no further rain events until mid-July. Since then, however, the farm has received a total of about 150 ml of rain, making conditions sometimes challenging to manage (avoiding pugging), mostly in the south block of the farm.

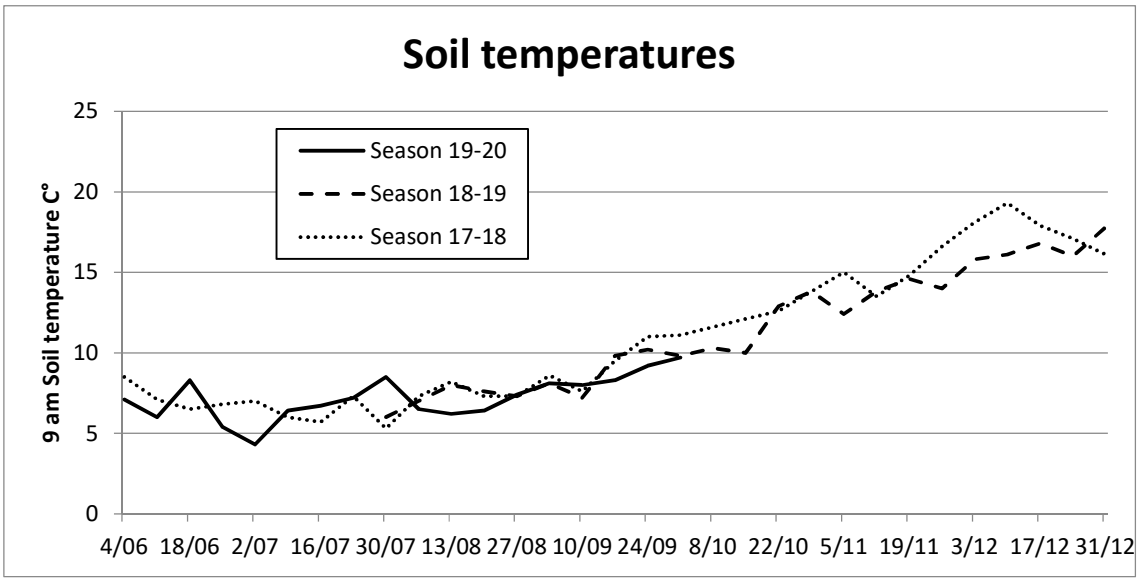
This has made strictly following the Spring Rotation Planner a challenge sometimes.



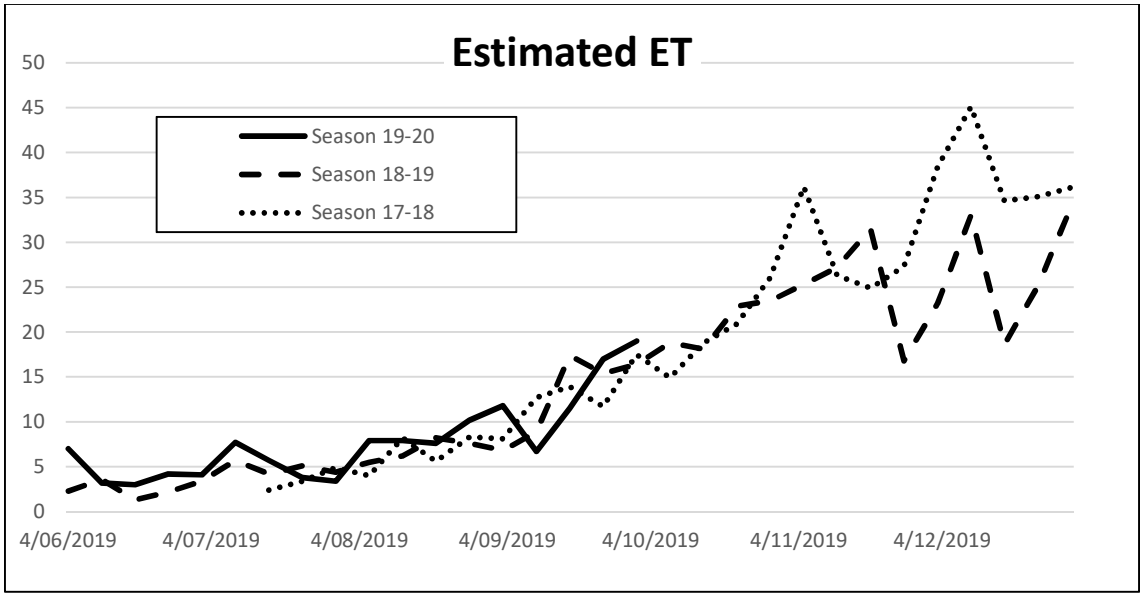
The resulting water logging on the platform has meant the farm remained over 100% for about a month in August and not far off it during September.



The graph below shows that in terms of soil temperature, these have hovered around the same levels as previous season. However, with the continuous flow of southerly storms over the last few weeks, the snow has remained on the hills. This has made the air temperature "feel" cold. Soil temperatures have remained under that of previous season for the last couple of weeks.



ET has remained at roughly the same levels as previous season's levels with an increase in the last couple of weeks of sunshine. This together with the water logging resulting from the rainfall events, has meant irrigation for the season is yet to start.

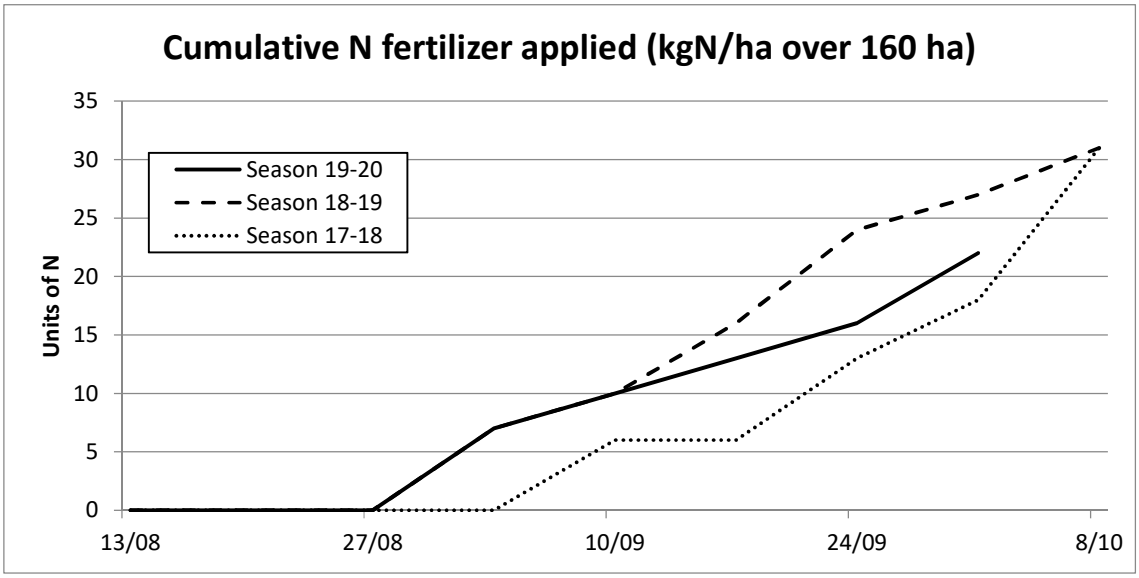


Irrigation has not yet been started

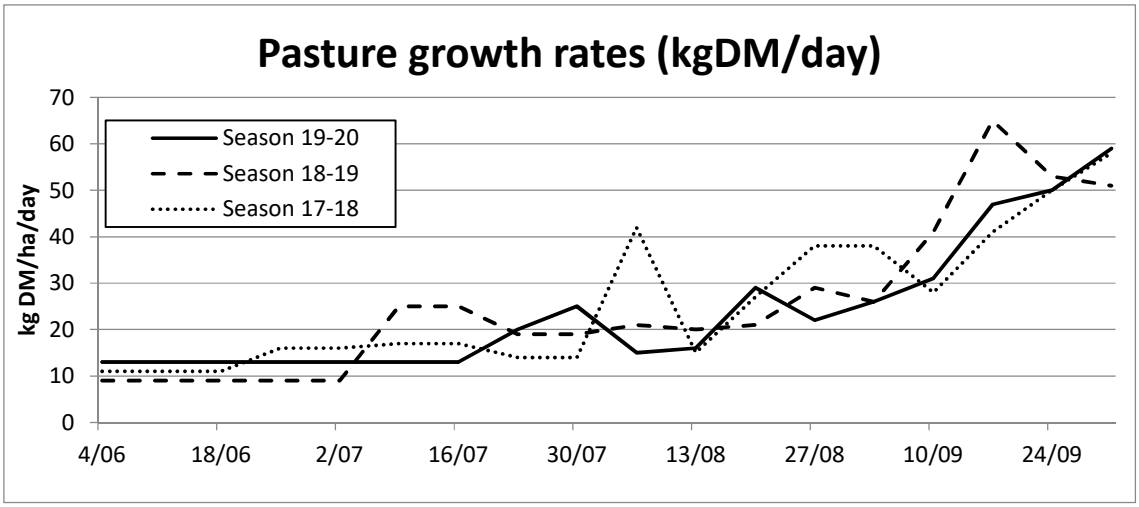
Fertiliser and growth

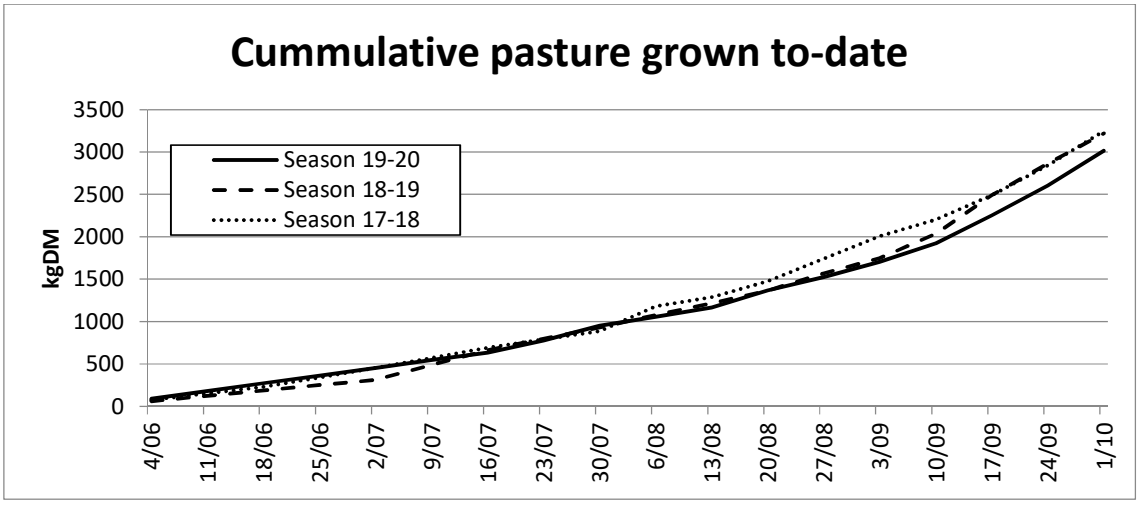
LUDF starts the fertilizer application season when soil temperatures and ground conditions allow for good responses. The first round of fertilizer is always in the form of AMMO to ensure good sulphur level in the ground for the rest of the season.

The start of the fertilizing season has started already, in a similar fashion to previous seasons



The cold snaps and wet weather have meat that pasture growth has remained, in general, on par or below that of last season until the last couple of weeks. As a result, the total pasture grown season-to-date is the lowest it has been for the last 3 seasons.





Feed Management

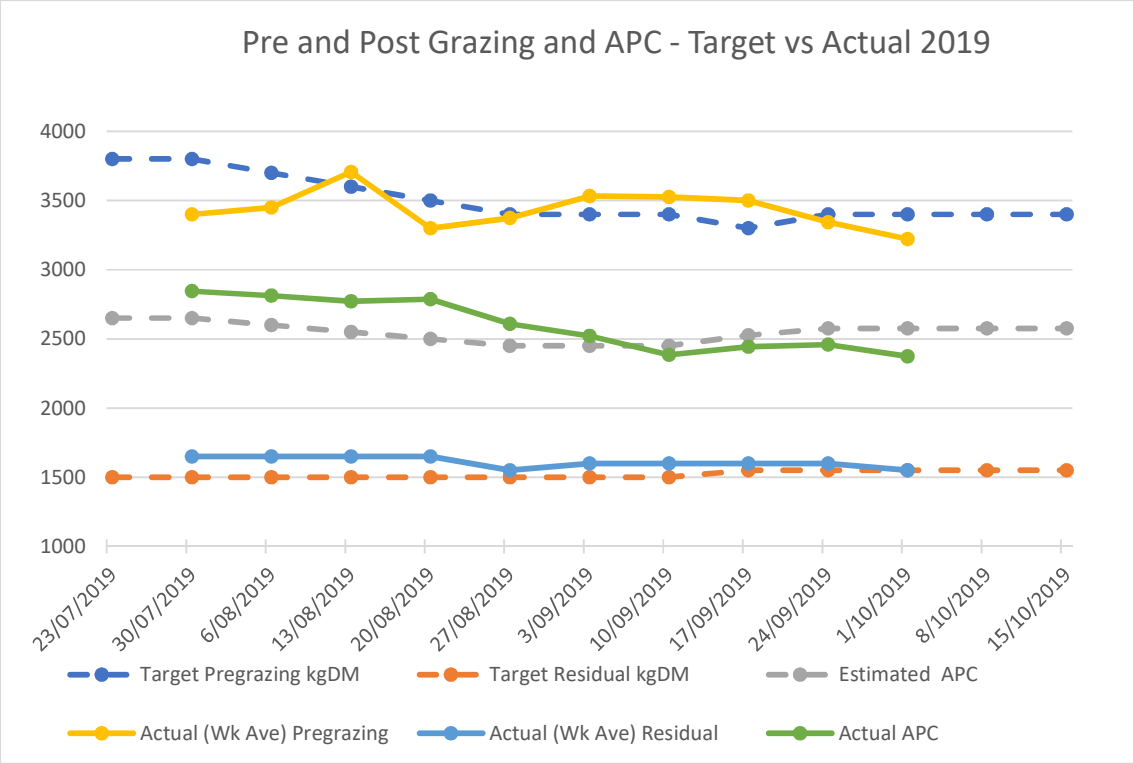
LUDF uses the Spring Rotation Planner (SRP) tool quite successfully through spring every year, following the area to be grazed quite closely to the plan.

With the cold but dry winter, good growth conditions of winter and the wet conditions of the start of the season, LUDF started the SRP at planned start of calving with an Average Pasture Cover (APC) around 200 kgDM above target (2800 vs 2600 kgDM/ha). This allowed the farm to:

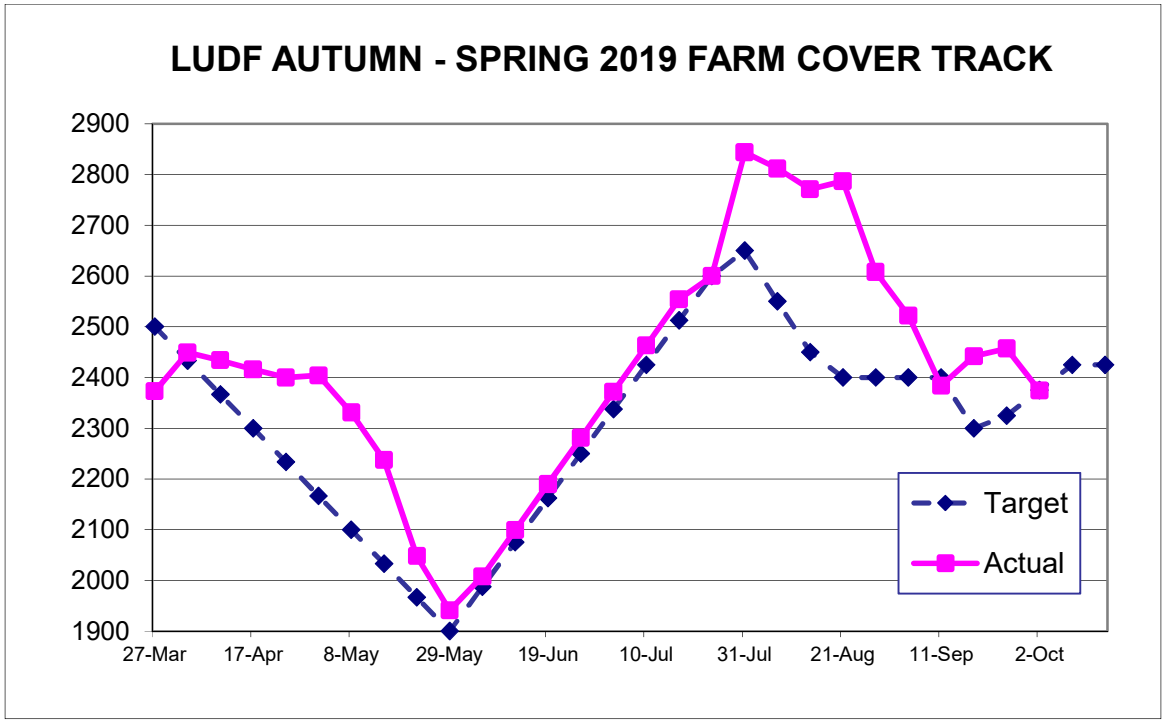
- accumulate good Average Pasture Cover (APC) during this time,
- Have the ability to have area saved for when the wet weather made it necessary to open area up to avoid pugging, with the confidence to not run into a feed deficit
- avoid having to feed supplements until early-September.
- Use dry late calving cows to graze down to residuals in paddocks previously grazed by milking cows ensuring cows were eating as much as they could.

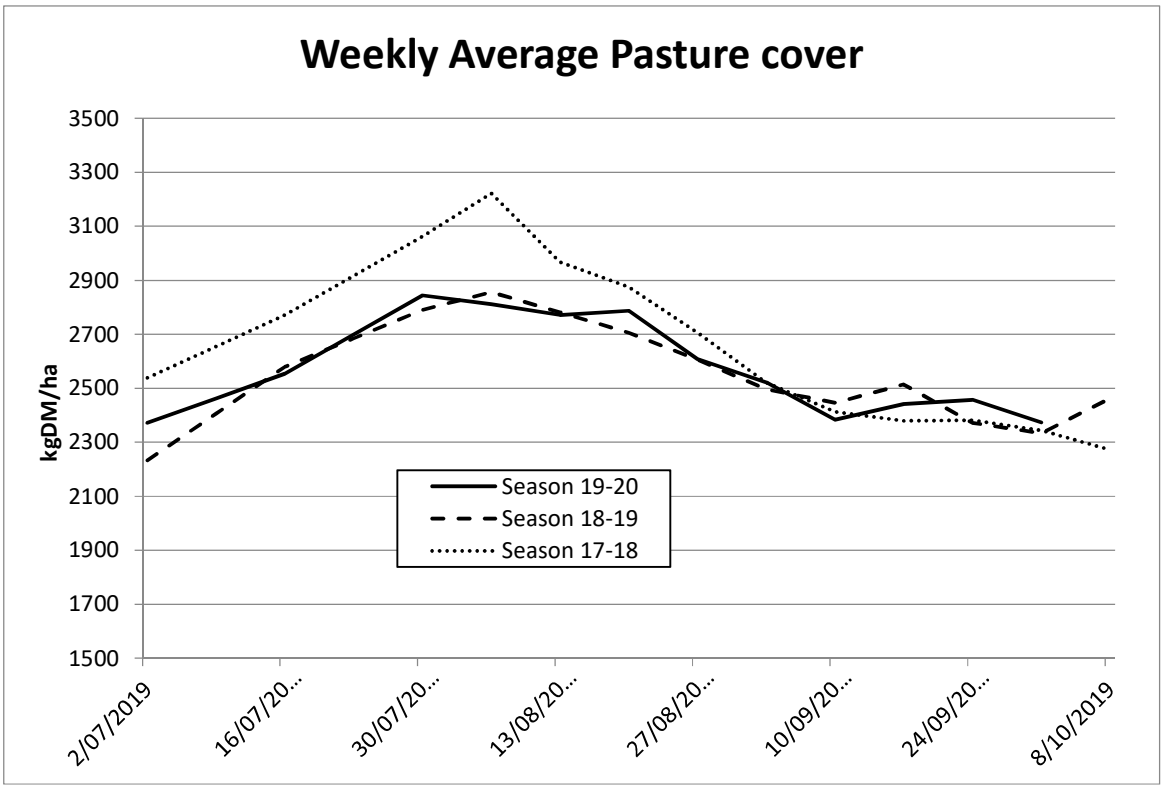
The Spring Rotation Planner was started by 24th July (LUDF pushed mating forward by 1 weeks in season 17-18, which has meant the PSC is not 24th July) and was finished on September 25th.

The graph and table below show how the SRP worked through the period



Week Ending	Average Number Milking and colostrum Cows	Planned area grazed per week	Planned Cumulative area grazed	Planned Cumulative Supplements fed (kgDM/wk)	Actual area grazed per week	Actual Cumulative area grazed per week	Actual Supplements fed (kgDM/week)	Actual Cum. Suppl fed (tot kgDM)
17/07/2019								
23/07/2019	84	2.3	2.3	578	2	2	0	0
30/07/2019	153	5.6	7.9	2691	4.5	6.5	0	0
6/08/2019	235	8.9	16.9	9384	9	15.5	0	0
13/08/2019	357	14.9	31.8	22929	14.6	30.1	0	0
20/08/2019	437	19.5	51.3	39169	15.8	45.9	0	0
27/08/2019	483	20.4	71.7	60432	26.8	72.7	0	0
3/09/2019	513	24.5	96.2	77932	28.7	101.4	2.05	2.05
10/09/2019	534	29.7	125.8	89526	25.6	127	9.6	11.65
17/09/2019	546	34.3	160.2	89548	23	150	13.5	25.15
24/09/2019	551	35.0	195.1	89548	29.2	179.2	15	40.15
1/10/2019	555	42.6	432.9	89548	44.8	224	0	40.15
8/10/2019		43.4	432.9	89548		224	0	40.15
15/10/2019		43.7	476.2	89548		224	0	40.15

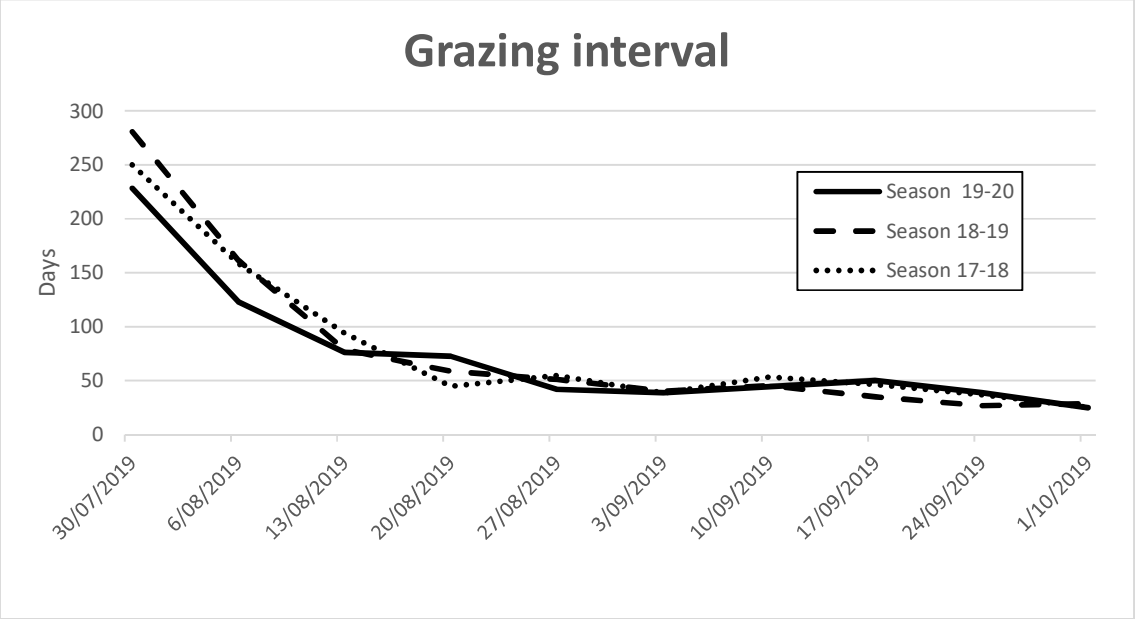


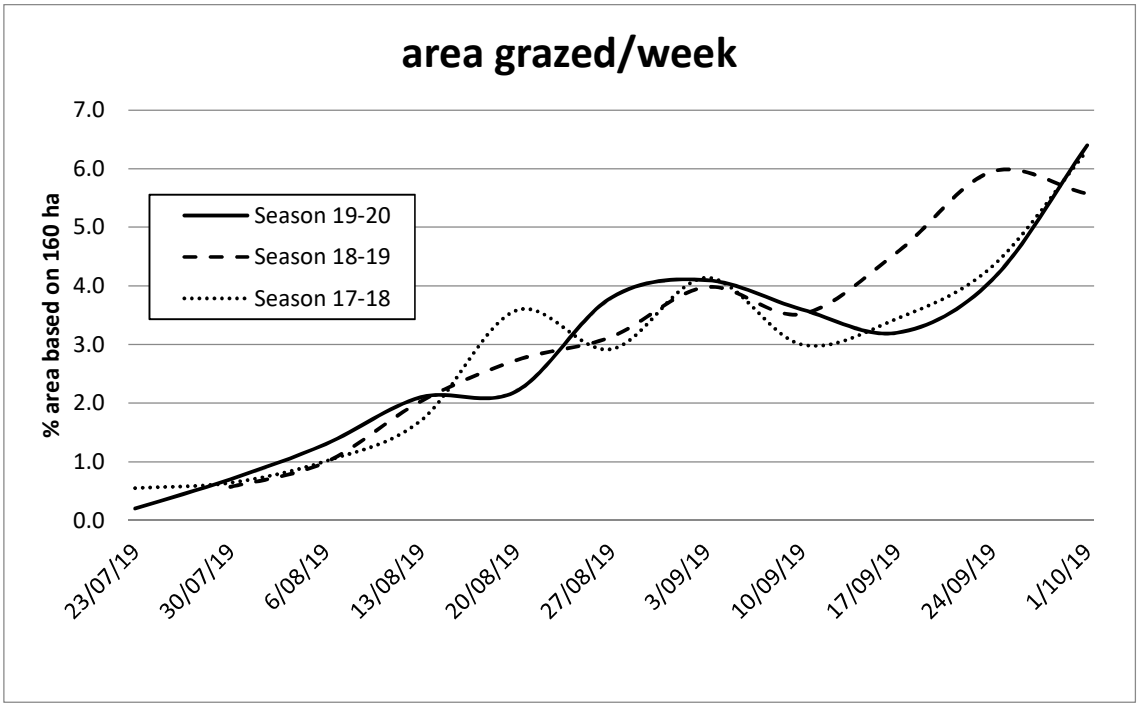


As per the SRP table and graphs, the round length had to be sped up mid-august with the wet weather conditions. When ground conditions improved by end-August, fertilizer was started at the same time as last season.

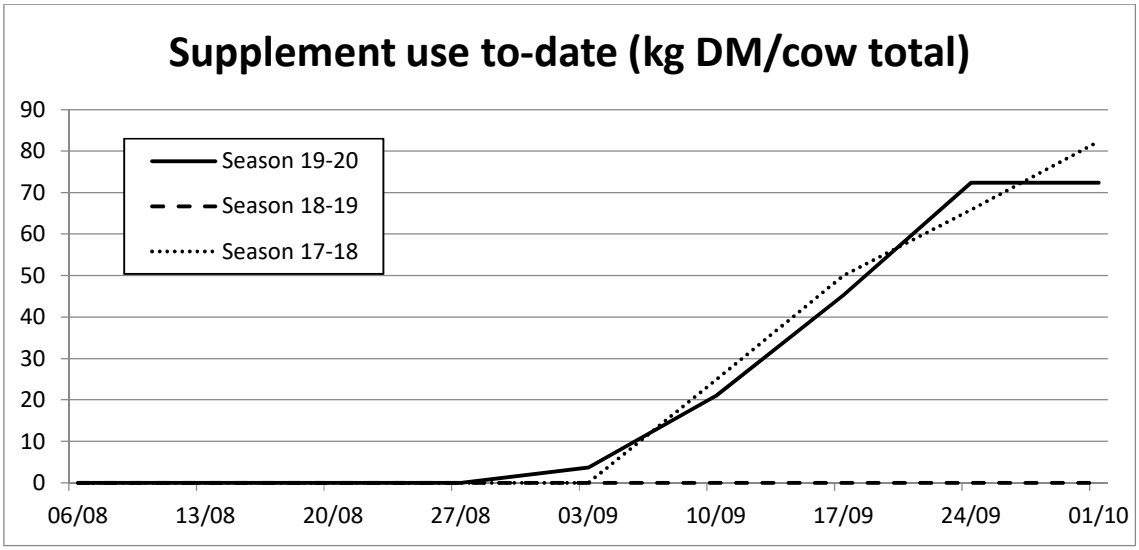
The combination of opening areas under wet conditions, slower growth rates than in 18-19 meant that supplements had to be started by end August to support increasing demand as cows continued to calve as well as increased demand by the milking herd.

by the 23rd September (2 days earlier than planned) while using less supplements than in the 2015-16 season.

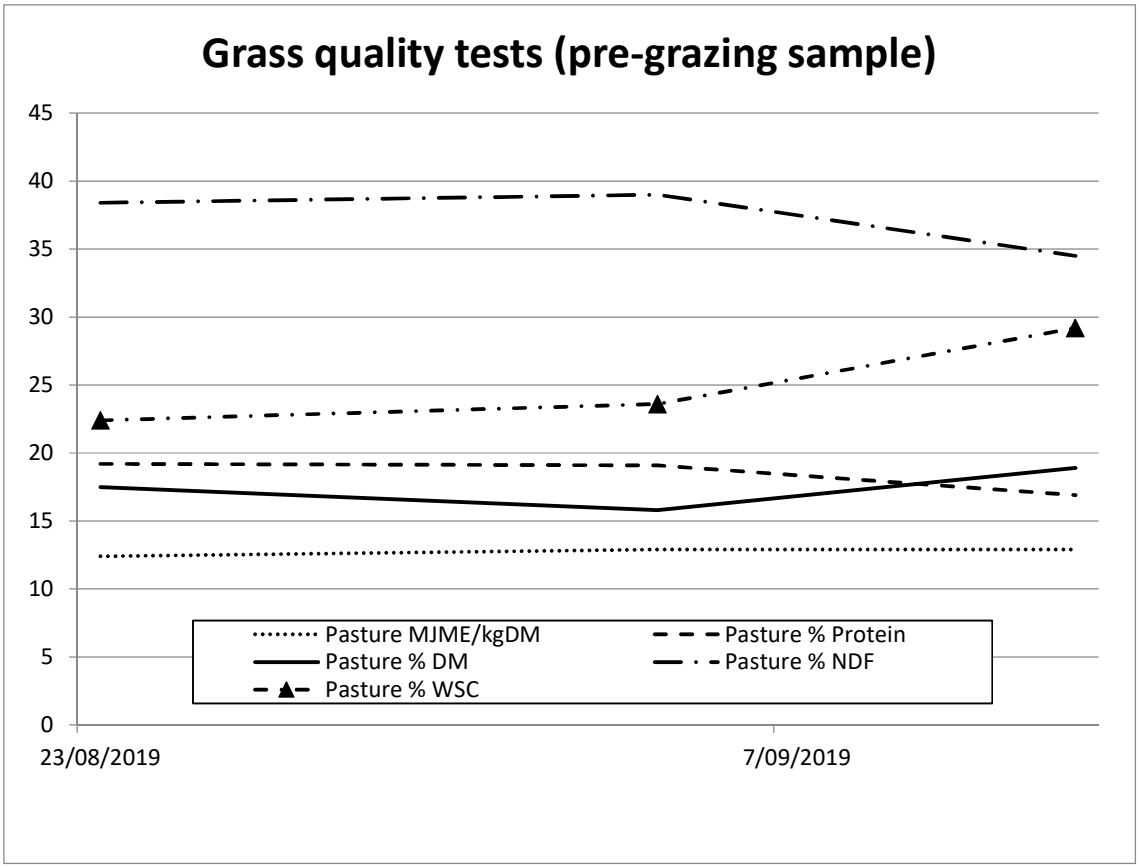




With all of the above, the farm has been unable to go through the SRP without the support of supplements

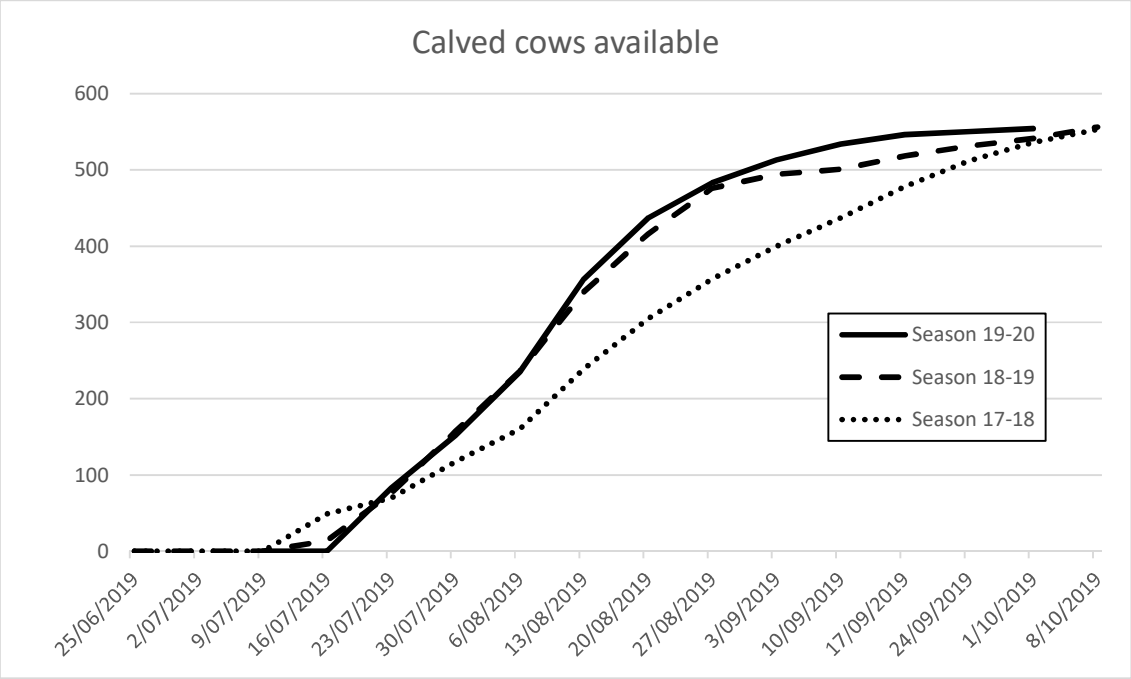


Below are the Pasture Quality graphs showing the trends of DM%, ME, Protein%, NDF % and Water Soluble Carbohydrates (%) of pasture samples taken since the start of the season.

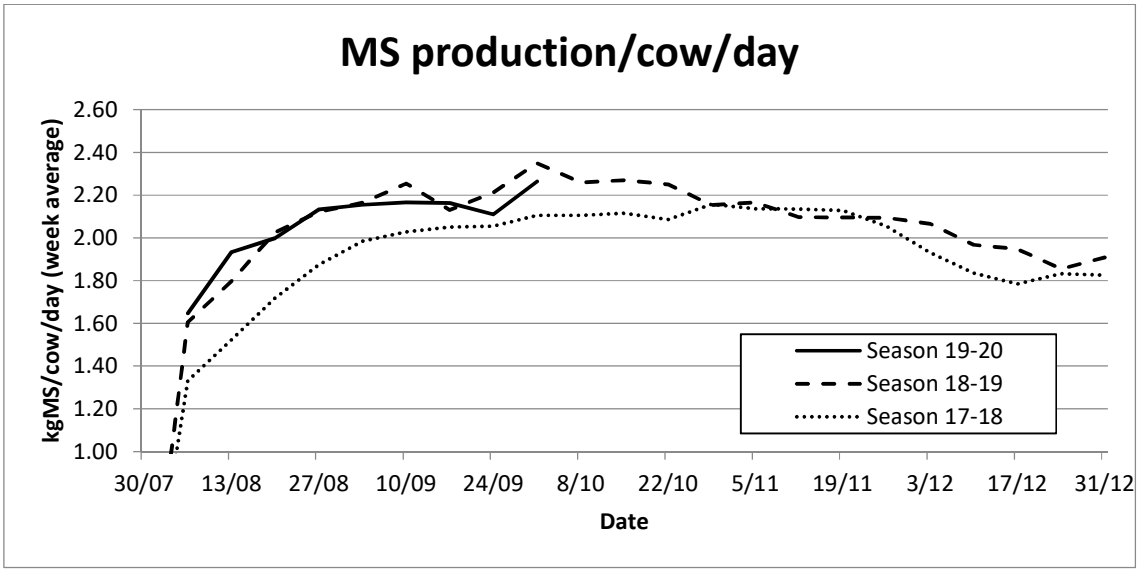


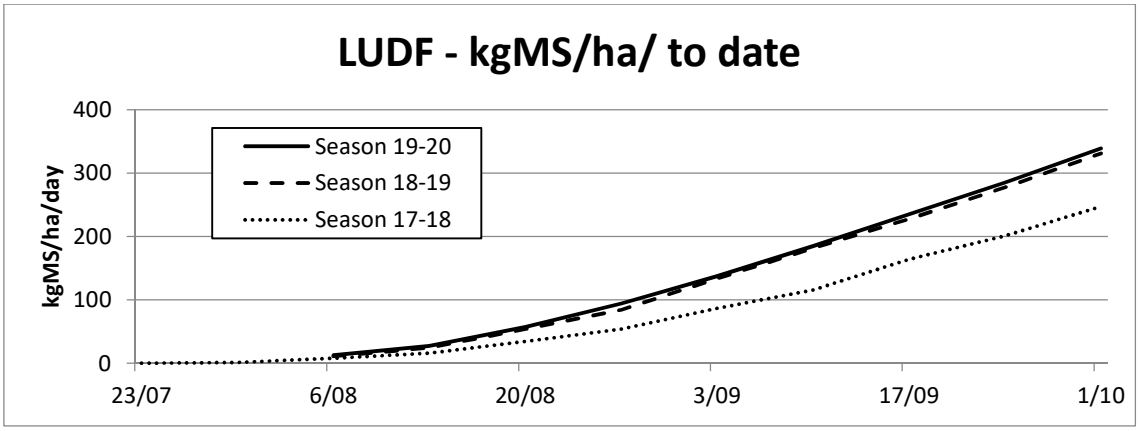
Production

As calving occurred roughly at the same time & speed as last season, the lactation curve remains similar to that of 18-19 season. The calving pattern during the second 3 weeks of calving improved from last season. This is seem below by the higher numbers of cows calved from mid-August onwards when compared with last season.



The graphs below show the performance on a per cow and per hectare basis. Having more cows calving early has meant a slightly higher production/ha if not a higher production per cow when compared with 18-19 season.

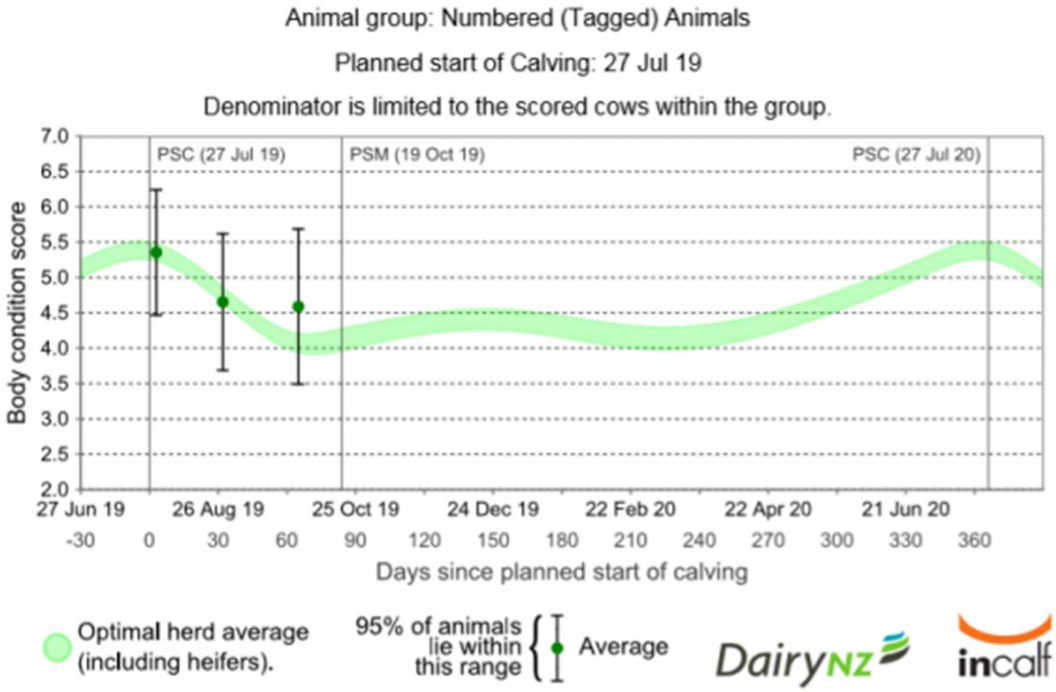


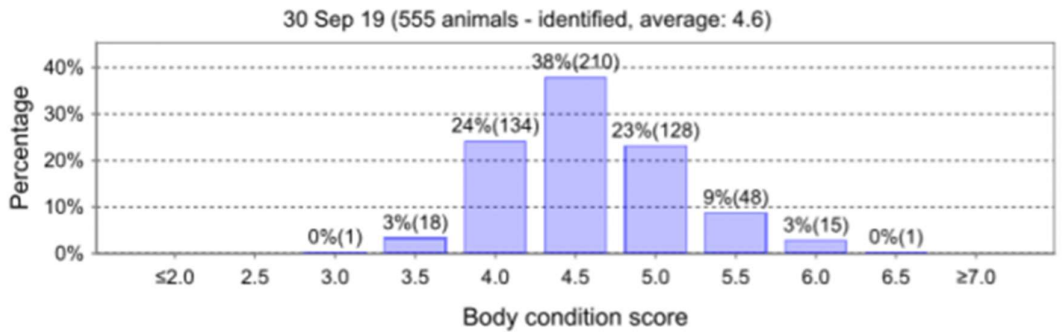


Animal Health

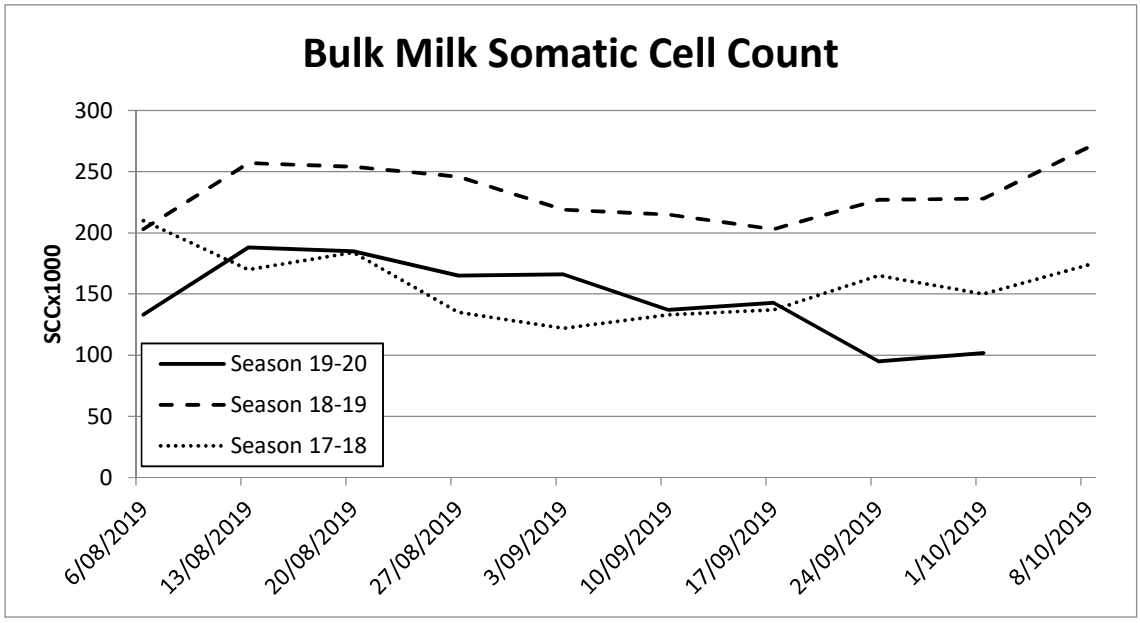
The graphs below show the relevant information regarding BCS and herd health.

BCS of cows in milk was done on Monday 30th September, 4.6 average BCS below are the graphs.

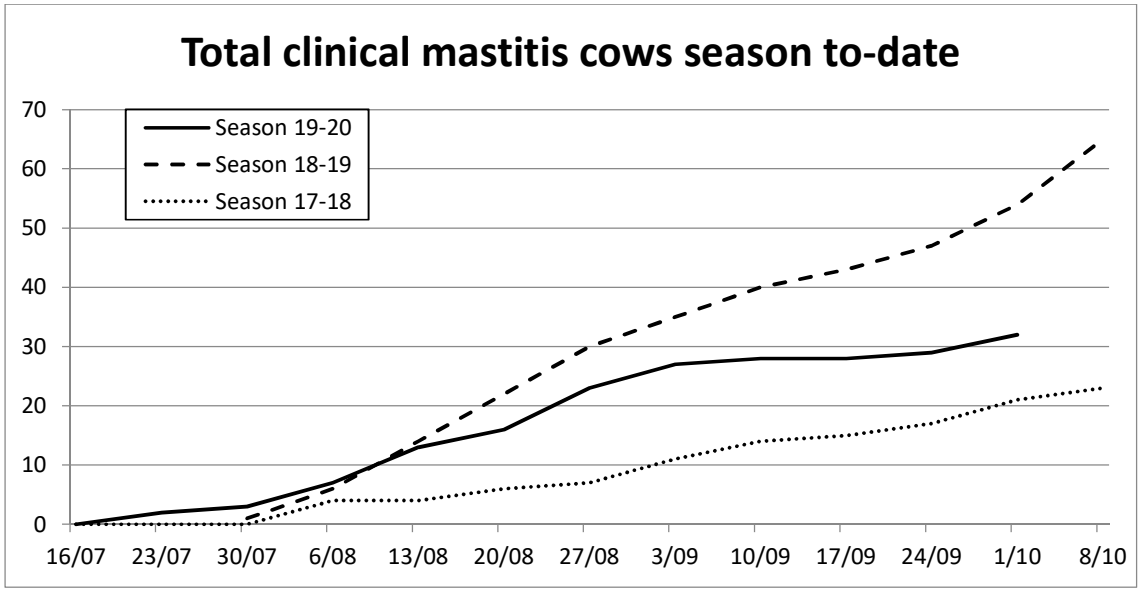




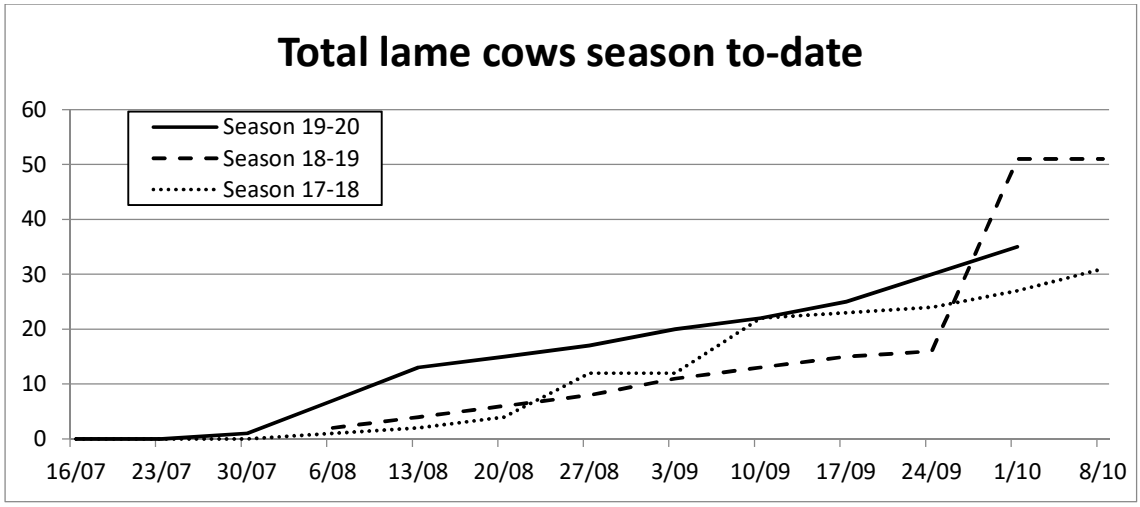
The following graphs show the levels of udder and feet health achieved in the herd season to-date, compared to previous seasons.



Bulk milk SCC has remained under 18-19 season's levels all the way through calving, dropping to the lowest it has been in the last 3 years from mid-September.



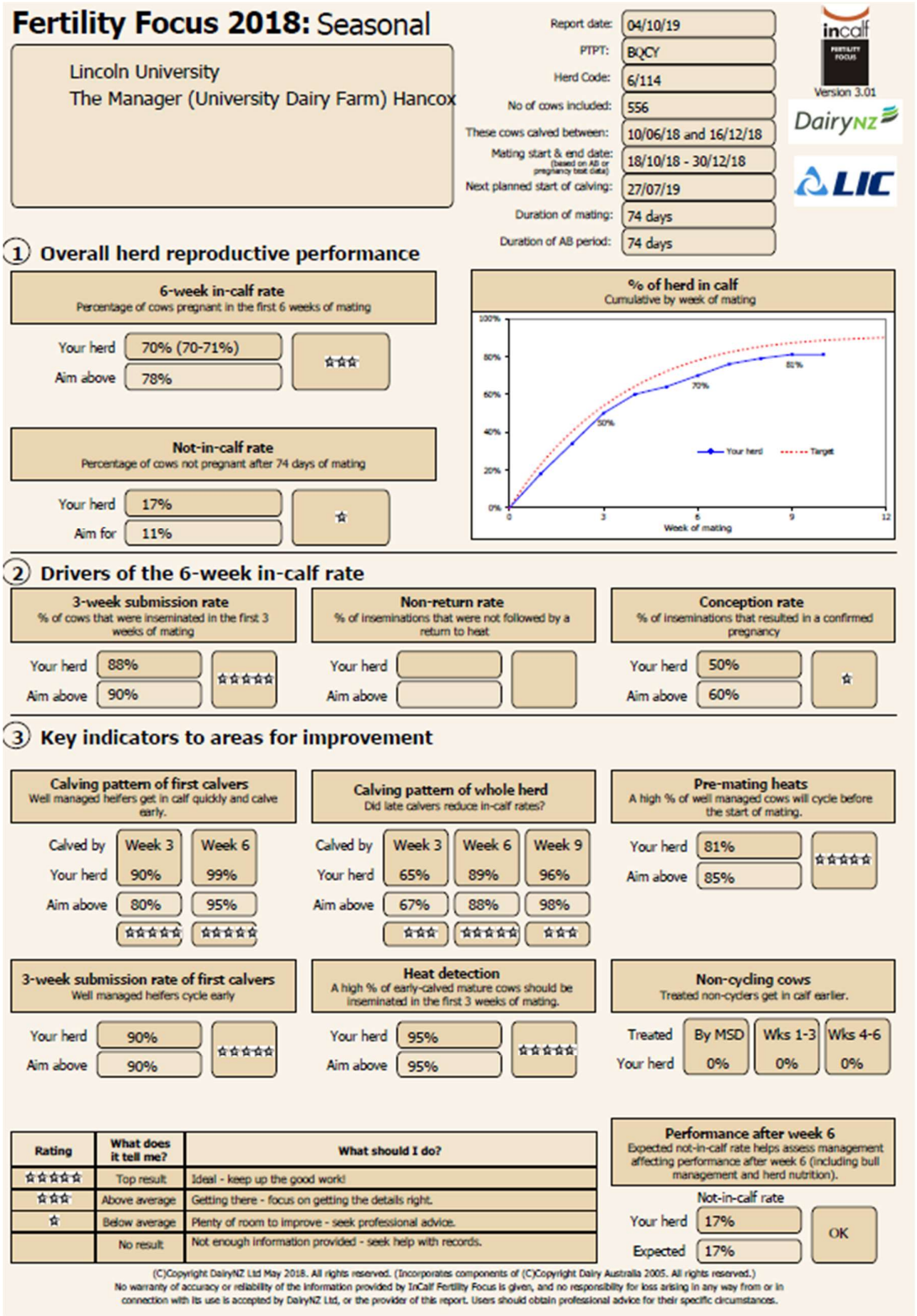
The number of clinical mastitis confirms the previous comments regarding udder health.



The cumulative lame days-to-date have been at their highest levels when compared to the previous 2 seasons. This is helped by the wet condition

BREEDING

LUDF FERTILITY FOCUS REPORT



Fertility Focus 2018: Seasonal

Lincoln University
The Manager (University Dairy Farm) Hancox

Report date:	04/10/19
PTPT:	BQCY
Herd Code:	6/114
No of cows included:	556
These cows calved between:	10/06/18 and 16/12/18
Mating start & end date: (based on AB or pregnancy test data)	18/10/18 - 30/12/18
Next planned start of calving:	27/07/19
Duration of mating:	74 days
Duration of AB period:	74 days

incalf FERTILITY FOCUS Version 3.01 · DairyNZ · LIC

1 Overall herd reproductive performance

6-week in-calf rate
Percentage of cows pregnant in the first 6 weeks of mating

Your herd	70% (70-71%)
Aim above	78%

☆☆☆

Not-in-calf rate
Percentage of cows not pregnant after 74 days of mating

Your herd	17%
Aim for	11%

☆

% of herd in calf
Cumulative by week of mating

2 Drivers of the 6-week in-calf rate

3-week submission rate
% of cows that were inseminated in the first 3 weeks of mating

Your herd	88%
Aim above	90%

☆☆☆☆☆

Non-return rate
% of inseminations that were not followed by a return to heat

Your herd	
Aim above	

Conception rate
% of inseminations that resulted in a confirmed pregnancy

Your herd	50%
Aim above	60%

☆

3 Key indicators to areas for improvement

Calving pattern of first calvers
Well managed heifers get in calf quickly and calve early.

Calved by	Week 3	Week 6
Your herd	90%	99%
Aim above	80%	95%
	☆☆☆☆☆	☆☆☆☆☆

Calving pattern of whole herd
Did late calvers reduce in-calf rates?

Calved by	Week 3	Week 6	Week 9
Your herd	65%	89%	96%
Aim above	67%	88%	98%
	☆☆☆	☆☆☆☆☆	☆☆☆

Pre-mating heats
A high % of well managed cows will cycle before the start of mating.

Your herd	81%
Aim above	85%

☆☆☆☆☆

3-week submission rate of first calvers
Well managed heifers cycle early

Your herd	90%
Aim above	90%

☆☆☆☆☆

Heat detection
A high % of early-calved mature cows should be inseminated in the first 3 weeks of mating.

Your herd	95%
Aim above	95%

☆☆☆☆☆

Non-cycling cows
Treated non-cyclers get in calf earlier.

Treated	By MSD	Wks 1-3	Wks 4-6
Your herd	0%	0%	0%

Rating	What does it tell me?	What should I do?
☆☆☆☆☆	Top result	Ideal - keep up the good work!
☆☆☆	Above average	Getting there - focus on getting the details right.
☆	Below average	Plenty of room to improve - seek professional advice.
	No result	Not enough information provided - seek help with records.

Performance after week 6
Expected not-in-calf rate helps assess management affecting performance after week 6 (including bull management and herd nutrition).

Not-in-calf rate

Your herd	17%
Expected	17%

OK

Behind Your Detailed Fertility Focus Report

incalf FERTILITY FOCUS Version 3.01

DairyNZ

LIC

Report period: Cows calved between 10/06/18 and 16/12/18.
This was the most recent period with sufficient herd records that enabled an analysis to be completed.

Calving system: Seasonal
Your herd has been classified as seasonal calving because most calvings occurred in a single batch lasting less than 21 weeks.

Level of analysis: Detailed.
Your good record keeping means a detailed analysis was possible for your herd.

Report date:	04/10/19
PTPT:	BQCY
Herd Code:	6/114
Calvings up to this date requested for analysis:	30/03/19
No of cows included:	556
These cows calved between:	10/06/18 and 16/12/18
Mating start & end date: (based on AB or pregnancy test data)	18/10/18 - 30/12/18

Part A) Herd records cross check

Check that the herd records in the table are complete and correct.

2018/19	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total
No. of calvings		161	330	49	16								556
No. of AB matings					395	416	168						979
No. of preg tests								585	141				726
No. of non-aged/late aged positive preg tests													0
No. of cows culled or died					2		4	21	9		104	24	164

Part B) Notes on the calculations

Use the following notes to see how your results were calculated.

1) Overall herd reproductive performance

6-week in-calf rate

Your report has been based on the mating and pregnancy test results you supplied. The ACTUAL 6 week in-calf rate is shown for your herd.

Records available for not-in-calf rate

Recorded pregnant	458
Recorded empty	92
Doubtful/recheck*	0
Culled without pregnancy test	6
No record of cull or pregnancy test	0
Cows analysed	556

*Includes cows whose most recent empty diagnosis was less than 35 days after mating end date.

2) Drivers of the 6-week in-calf rate

3-week submission rate

554 cows had calving dates in the required range and were not culled before day 21 of mating and 88% of these were submitted during the first 21 days of mating.

Non-return rate

Non-return rate is not calculated when pregnancy test results provide an accurate estimate of conception rate.

Conception rate

The conception rate was calculated for 906 AB inseminations on and between 18.10.18 and 30.12.18.

3) Key indicators to areas for improvement

Calving pattern of first calvers

135 cows with eligible calving dates were recorded as calving at less than 34 months of age. The calving pattern of first calvers was calculated from their records.

Calving pattern of whole herd

556 cows had calving dates that were eligible for this report.

3-week submission rate of first calvers

135 first calvers had calving dates in the required range and were not culled before day 21 of mating and 90% of these were submitted during the first 21 days of mating.

Heat detection

225 cows at least 4 years old at calving had calved at least 8 weeks before mating start date and were not culled before day 21 of mating and 95% of these were submitted during the first 21 days of mating.

Pre-mating heats

554 cows had calving dates in the required range and were not culled before day 21 of mating and 448 of these had a pre-mating heat recorded.

Non-cycling cows

No cows were identified as being treated for non-cycling. If you did treat non-cycling cows, please supply records to ensure those cows are identified.

Performance after week 6

Your herd's not-in-calf rate and 6-week in-calf rate were used to determine the success of your herd's mating program after the first six weeks. If bulls were used after week 6 of mating, this gives an assessment of how well they got cows in calf.

Induced cows

No cows were identified as having induced calvings. If cows were induced, ensure all inductions are recorded.

LUDF Mating Plan

PSM: 18th October 560 numbered animals

Week 1	Sexed A2 Kiwi X 315 cows on plan 15 straws/day 18th Oct – 7th Nov	Late Calvers – 56 cows Nominated Kiwi X - A2A2, High BW 50 straws 18th Oct – 7th Nov	SGL Angus Low BW Cows 350 straws 18th Oct – 6th Dec
Week 2			
Week 3			
Week 4	A2 Liquid Kiwi X High BW cows returning from sexed 155 cows on plan 8th Nov – 28th Nov		
Week 5			
Week 6			
Week 7			
Week 8	Nominated - SGL Dairy 6th Dec – 12th Dec Semen from private storage (Frozen) 84 straws. Use this up before starting liquid SGL		
Week 9	SGL Dairy – Liquid 13th Dec – 2nd Jan 200 cows on plan		
Week 10			
Week 11			

8th Oct Synchro	160 Yearlings - A2 Yearling Friendly Kiwi X 10 days AB, PG shot to late heifers then 4 days AB. Follow up with NM Bulls Corner of Boltons Road and Tramway Road, Kirwee

Frozen semen:

- 350 x SGL Angus
- 50 x Classic Pack 5 – Kiwi X, A2A2, High BW
- 84 x SGL Dairy (From private storage)

AHIPENE FARMING MATING PHILOSOPHY – 100% AB

Liam and Lauren Kelly's company Ahipene Farming is in its 3rd season 50/50 HOSM 660 cows and contract milk a 2nd farm of 510 cows, Lauren's parents Marv and Jane Pangborn own both farms.

Both Liam and Lauren were raised on dairy farms and Liam has been in the Dairy Industry for 17 years, during this time Liam has graduated from Primary ITO with Diploma in Farm Management.

Ahipene Farming employs 6.5 full time team members, this includes a manager on each farm. We are extremely proud of our team with the work they do, the results they achieve and also the study they have managed to complete while working full time.

AHIPENE FARMING LTD		
PRODUCTION	**2017/18**	**2018/19**
Total MS	314,400	330,860
Peak Cows	665	670
Hectares	180	180
MS/Cow	473	494
MS/Ha	1747	1838
REPRODUCTION		
6 Week in-calf rate	72%	74%
Empties	15%	10%
SUPPLEMENTS		
Balage	133,120	163,840
Straw	5,000	0
PK	259,000	183,060
Proliq	0	37,785
Molasses	0	44,000
Grain	103,000	140,822
Total	500,120	569,507
Supplement/cow	752	850
***fodderbeet not included**		

Key Disciplines/Rules During AB

- Attention to detail is big on our farm and a must!!
- Pre mating heats (Has to be a strong heat)
- Keep tail paint up to speed
- Senior staff members do all AB heat detection (Current Managers have wanted to do the first 6 weeks which is encouraged)
- Paddock checks are a must and all staff are well trained. (This also helps us not having to do a dry off scan)
- We are 1st on our AB technician run, so we opt to milk very early to get a good AB time (Thankfully farm size allows this)
- February all lactating cows are Body Condition Scored, from the results all heifers and light pregnant cows (Depending on calving date) go on OAD milking
- Well Grown heifers
- Cows wintered in Three mobs:
    - One: Lights and heifers
    - Two: 4.5 BCS and early calving 5 BCS
    - Three: Fats and September calvers
- Early metro-checking
- Body Condition Score all lactating cows 10th September and put light cows on OAD (This year 30 cows)

What Works/What Has Failed

- PG works well
- Strategic CIDR programme works well (Exceptional results with carryover cows)
- I love Protrack and the Camera is great
- OAD light cows
- Making the system too complicated - Last season we had 3 CIDR programmes which was logistically challenging for farm team and AI tech
- Having no bulls - You need to be very careful on silent heats, too many farms AI a pregnant cow as they are unsure, this can cause an abortion to an already pregnant cow

Pro's and Con's doing all AI

Pro's

- No bulls (Safety and the hassle)
- Self-contained (MBovis)
- LIC short gestation
- Reduced Bobbies
- More culling options

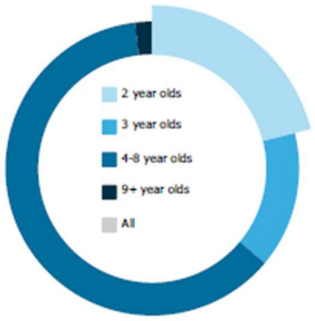
Con's

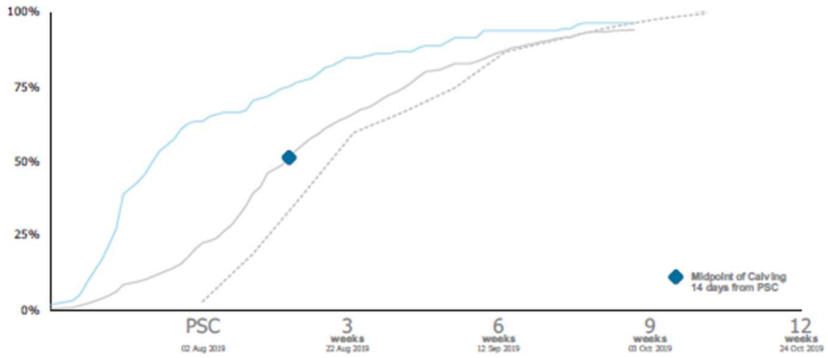
- AB period is long
- Staying focused
- Reliant on Technology and the human factor

Calving Reports for Spring 2019 (PHFB)

All Cows

Calving Rate by Age





Number of Cows Calved by Week

Age	Count		< PSC	3	6	9	12	Total	
2 year olds	146	21%	64%	85%	94%	-	-	141	97%
2 Year Old Target				75%	92%	100%			
3 year olds	104	15%	7%	62%	81%	-	-	97	93%
4-8 year olds	429	62%	10%	59%	86%	-	-	402	94%
9+ year olds	13	2%	0%	62%	92%	-	-	12	92%
All	**692**	**100%**	**21%**	**65%**	**87%**	**-**	**-**	**652**	**94%**
Whole Herd Target				60%	87%	98%			

AHIPENE FERTILITY FOCUS REPORT

Fertility Focus 2018: Seasonal

Ahipene Farming Limited
Liam Kelly

Report date:	01/10/19
PTPT:	PHFB
Herd Code:	6/11325
No of cows included:	669
These cows calved between:	16/06/18 and 22/12/18
Mating start & end date: (based on AB or pregnancy test data)	24/10/18 - 13/01/19
Next planned start of calving:	02/08/19
Duration of mating:	82 days
Duration of AB period:	81 days

incalf FERTILITY FOCUS Version 3.01

DairyNZ

LIC

1 Overall herd reproductive performance

6-week in-calf rate
Percentage of cows pregnant in the first 6 weeks of mating

Your herd	74% (74-76%)
Aim above	78%

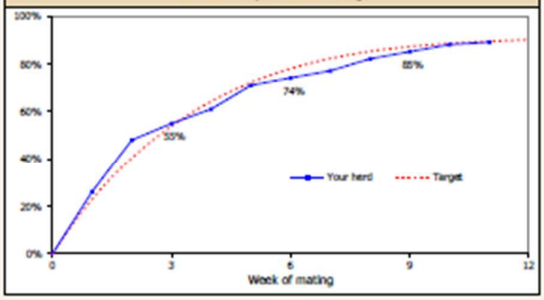
☆☆☆☆☆

Not-in-calf rate
Percentage of cows not pregnant after 82 days of mating

Your herd	10% (9-10%)
Aim for	10%

☆☆☆☆☆

% of herd in calf
Cumulative by week of mating



2 Drivers of the 6-week in-calf rate

3-week submission rate
% of cows that were inseminated in the first 3 weeks of mating

Your herd	93%
Aim above	90%

☆☆☆☆☆

Non-return rate
% of inseminations that were not followed by a return to heat

Your herd	
Aim above	

Conception rate
% of inseminations that resulted in a confirmed pregnancy

Your herd	55%
Aim above	60%

☆☆☆

3 Key indicators to areas for improvement

Calving pattern of first calvers
Well managed heifers get in calf quickly and calve early.

Calved by	Week 3	Week 6
Your herd	81%	95%
Aim above	80%	95%
	☆☆☆☆☆	☆☆☆☆☆

Calving pattern of whole herd
Did late calvers reduce in-calf rates?

Calved by	Week 3	Week 6	Week 9
Your herd	68%	91%	99%
Aim above	67%	88%	98%
	☆☆☆☆☆	☆☆☆☆☆	☆☆☆☆☆

Pre-mating heats
A high % of well managed cows will cycle before the start of mating.

Your herd	77%
Aim above	85%

☆☆☆☆☆

3-week submission rate of first calvers
Well managed heifers cycle early

Your herd	95%
Aim above	90%

☆☆☆☆☆

Heat detection
A high % of early-calved mature cows should be inseminated in the first 3 weeks of mating.

Your herd	96%
Aim above	95%

☆☆☆☆☆

Non-cycling cows
Treated non-cyclers get in calf earlier.

Treated	By MSD	Wks 1-3	Wks 4-6
Your herd	12%	0%	4%

Rating	What does it tell me?	What should I do?
☆☆☆☆☆	Top result	Ideal - keep up the good work!
☆☆☆	Above average	Getting there - focus on getting the details right.
☆	Below average	Plenty of room to improve - seek professional advice.
	No result	Not enough information provided - seek help with records.

Performance after week 6
Expected not-in-calf rate helps assess management affecting performance after week 6 (including bull management and herd nutrition).

Not-in-calf rate

Your herd	10%
Expected	13%

OK

Behind Your Detailed Fertility Focus Report

incalf FERTILITY FOCUS Version 3.01

DairyNZ

LIC

Report period: Cows calved between 16/06/18 and 22/12/18.
This was the most recent period with sufficient herd records that enabled an analysis to be completed.

Calving system: Seasonal
Your herd has been classified as seasonal calving because most calvings occurred in a single batch lasting less than 21 weeks.

Level of analysis: Detailed.
Your good record keeping means a detailed analysis was possible for your herd.

Report date:	01/10/19
PTPT:	PHFB
Herd Code:	6/11325
Calvings up to this date requested for analysis:	30/03/19
No of cows included:	669
These cows calved between:	16/06/18 and 22/12/18
Mating start & end date: (based on AB or pregnancy test data)	24/10/18 - 13/01/19

Part A) Herd records cross check

Check that the herd records in the table are complete and correct.

2018/19	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total
No. of calvings		107	417	132	13								669
No. of AB matings					373	544	161	42					1120
No. of preg tests							317		657			5	979
No. of non-aged/late aged positive preg tests												2	2
No. of cows culled or died						8	4		30	18	60	35	155

Part B) Notes on the calculations

Use the following notes to see how your results were calculated.

1 Overall herd reproductive performance

6-week in-calf rate

Your report has been based on the mating and pregnancy test results you supplied. The ACTUAL 6 week in-calf rate is shown for your herd.

Records available for not-in-calf rate

Recorded pregnant	595
Recorded empty	60
Doubtful/recheck*	2
Culled without pregnancy test	12
No record of cull or pregnancy test	0
Cows analysed	669

*Includes cows whose most recent empty diagnosis was less than 35 days after mating end date.

2 Drivers of the 6-week in-calf rate

3-week submission rate

666 cows had calving dates in the required range and were not culled before day 21 of mating and 93% of these were submitted during the first 21 days of mating.

Non-return rate

Non-return rate is not calculated when pregnancy test results provide an accurate estimate of conception rate.

Conception rate

The conception rate was calculated for 1054 AB inseminations on and between 24.10.18 and 13.01.19.

3 Key indicators to areas for improvement

Calving pattern of first calvers

111 cows with eligible calving dates were recorded as calving at less than 34 months of age. The calving pattern of first calvers was calculated from their records.

Calving pattern of whole herd

669 cows had calving dates that were eligible for this report.

3-week submission rate of first calvers

111 first calvers had calving dates in the required range and were not culled before day 21 of mating and 95% of these were submitted during the first 21 days of mating.

Heat detection

307 cows at least 4 years old at calving had calved at least 8 weeks before mating start date and were not culled before day 21 of mating and 96% of these were submitted during the first 21 days of mating.

Pre-mating heats

666 cows had calving dates in the required range and were not culled before day 21 of mating and 514 of these had a pre-mating heat recorded.

Non-cycling cows

666 cows had calving dates in the required range and were not culled before day 21 of mating and 106 of these were identified as being treated for non-cycling.

Performance after week 6

Your herd's not-in-calf rate and 6-week in-calf rate were used to determine the success of your herd's mating program after the first six weeks. If bulls were used after week 6 of mating, this gives an assessment of how well they got cows in calf.

Induced cows

No cows were identified as having induced calvings. If cows were induced, ensure all inductions are recorded.

PASTURES

PASTURE ASSESSMENT PROGRAM

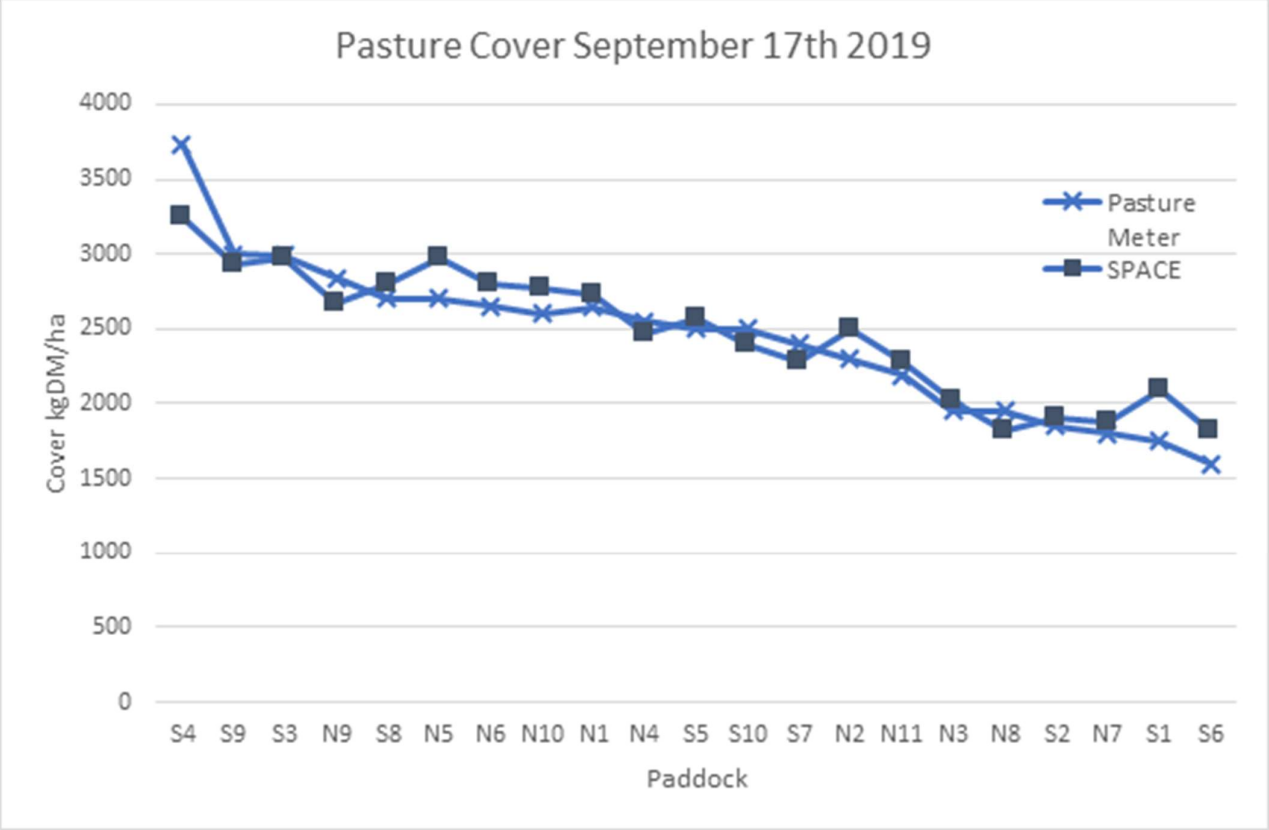
Lincoln University Dairy Farm (LUDF) is going to trial 3 different pasture assessment tools to demonstrate to farmers options available to them to monitor and manage pasture.

Key Contributors:

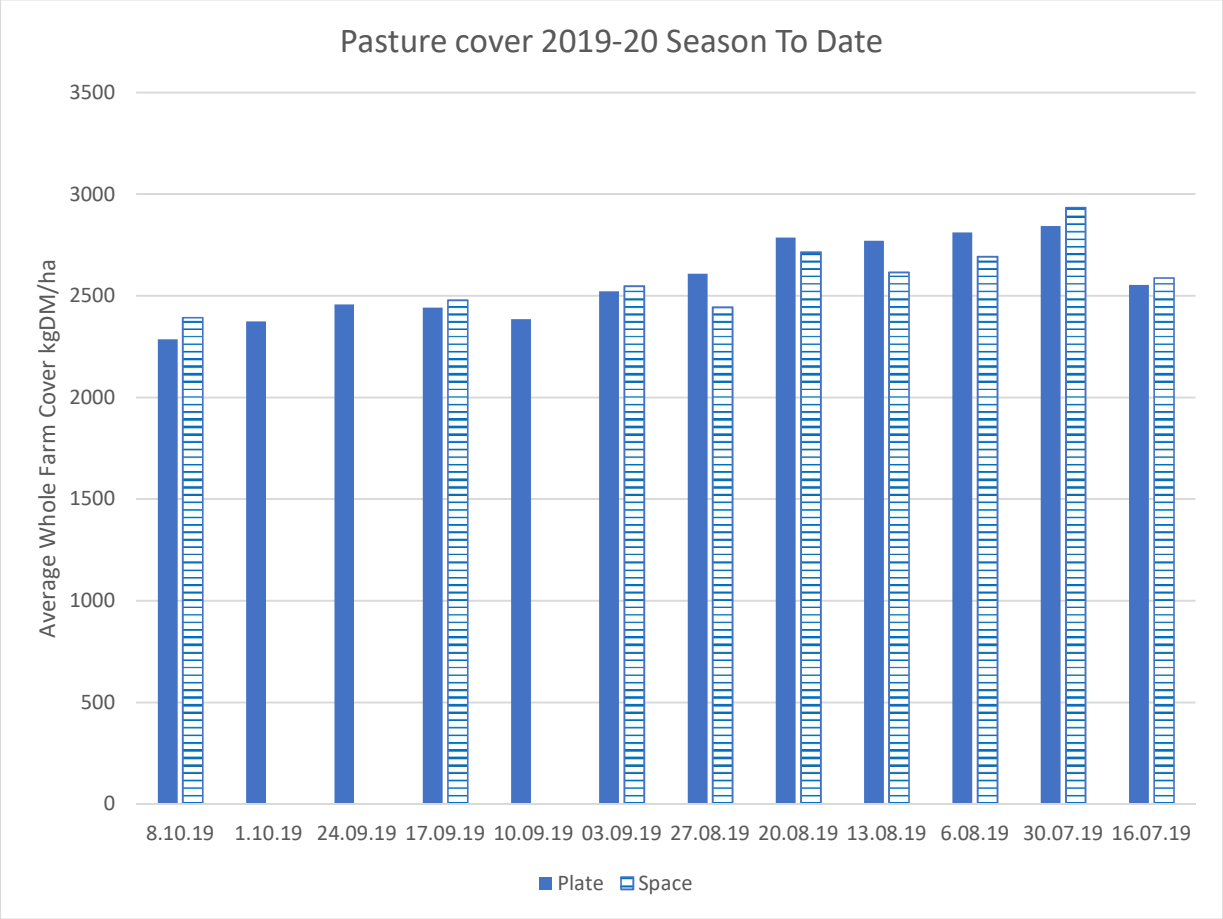
- **LUDF**, Platemeter assessments + Pasture Coach
- **C-DAX,** Robotic assessment
- **LIC SPACE,** Satellite assessment
- **SIDDC,** collate and present the data

SIDDC will present the data on our website in two graphs that are updated regularly, as shown below.

The first graph will have the most recent estimated pasture cover from all three tools, on an individual paddock basis.



The second graph will depict the average weekly pasture cover of the season to date, for all three tools:



Electronic Plate Meter + Pasture Coach

The Electronic Plate Meter works by measuring the compressed height of pasture. The plate rises up and down the shaft, taking measurements. A formula is used to convert the average compressed pasture height into kg DM/ha after the paddock has been walked.

The benefits of the Electronic Plate Meter are:

- Able to quantify pasture on farm (Average Pasture Cover)
- Correctly and consistently target a consistent pasture height
- A tool that almost anybody can use

When used in conjunction with regular farm walks the Plate Meter can be a vital tool in pasture management decisions. The data collected can also generate valuable information for future farm management decisions.

Things to note when collecting data:

- Avoid gateways, troughs and fence lines
- Ensure the walk gives a fair representation of the paddock. To do this either walk diagonally across the paddock or walk a 'w' within the paddock

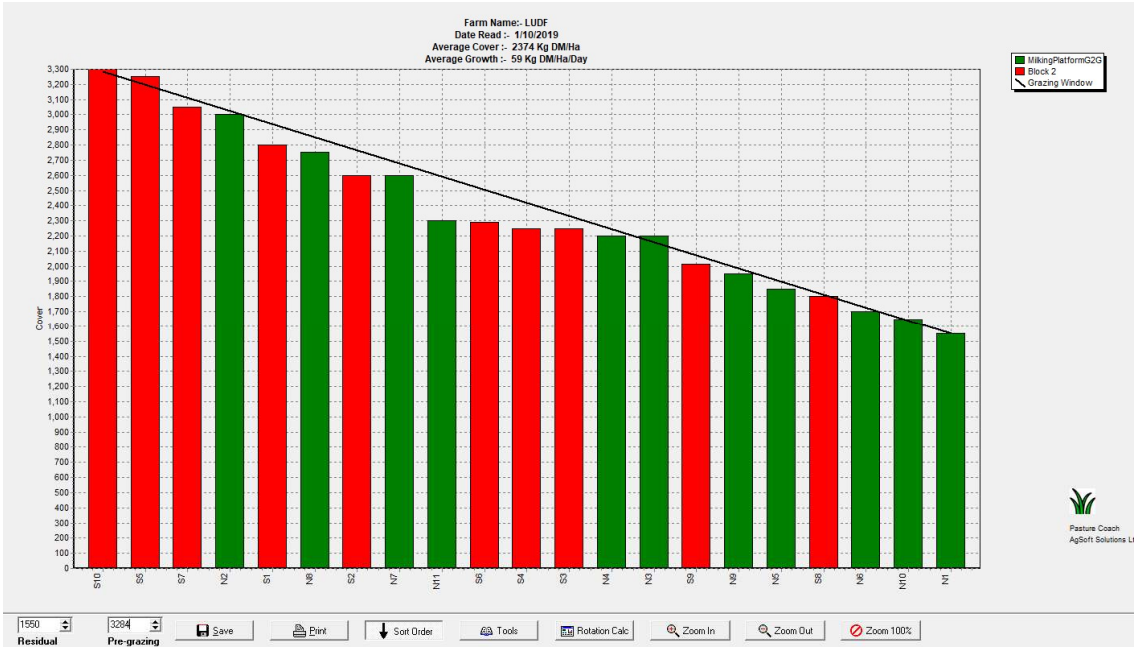
- The readings should be random and not biased by the operator looking where to place the meter. Aim to take a reading every 2-3 steps.
- Maintenance is critical to ensure accuracy and reliability of reading
- Operators technique needs to be consistent
- Adverse environmental conditions will impact on accuracy (frost, wind, wet conditions)

The data collected from the plate meter is used as a guide by Peter, farm manager, to inform pasture management. He visually verifies all the readings during the weekly farm walk and estimates that he corrects 1 in 5 readings based on his experience and judgement. It should also be mentioned that Peter's technique may differ from that of others, as he rolls the meter as he walks, rather than placing it straight down. Rolling the meter may be more accurate as it avoids the extra force that can come with placing it straight down, which would affect the measurements.

While results may vary person to person when utilising a plate meter, there is value in walking the farm on a regular basis and visually inspecting pasture growth and health.

Due to this variation in results, plate meter readings should not be used as the only method to allocate pasture to stock. Stock and pasture length should be observed to ensure they are grazing for sufficient time and that post grazing residuals are hitting the desired targets

LUDF is using Pasture Coach pasture management software to store the pasture walk data and to produce weekly feed wedges which are posted with our weekly farm walk notes.



SPACE®

LIC's SPACE™ pasture management service provides farmers with detailed pasture data, from images taken by satellites. Once a farmer is signed up to the SPACE™ service, LIC will start receiving satellite images of their farm. When the weather and satellite positioning allows a clear image of the farm to be taken, it is analysed, and a detailed pasture data report is sent out the next day.

It's a game-changer for pasture management, utilising an algorithm developed by LIC scientists to estimate pasture cover for New Zealand farmers.

The SPACE™ report includes:

- an image of your farm which presents pasture cover variation by colour, showing differences across the farm and within each paddock;
- an image of your farm showing any areas covered by shadow and cloud;
- a detailed feed wedge; and
- the latest paddock ranking and estimated dry matter per hectare (kgDM/ha) for each.

USING PASTURE SMARTER – 3 LESSONS FROM LUDF

Graham Kerr, Barenbrug Agriseeds

Lesson #1 Consistent residuals day-in day-out (except when wet)

Achieving consistent post-grazing residuals is worth maybe $145,000/year extra income on a 200ha farm with pastures producing 15,000 kgDM/ha/year, as shown in Table 1. This is based on eating just 3% more feed, which in turn gives a small increase in feed quality measured in metabolisable energy or ME (+0.3 MJ ME).

Table 1 The value of improved grazing residuals on a 200ha dairy farm.

Benefit	Amount	Pasture grown	Extra	Extra MS*	Value
Increase eaten	Extra 3% eaten	3,000,000 kgDM	90,000 kgDM (3,000,000 kgDM x 3%)	12,938 kgMS	$77,628 @$6/kgMS
Increase in ME	Extra 0.3MJ ME/kgDM	3,000,000 kgDM (=200ha x 15,000kgDM/ha)	900,000 MJME (3,000,000 kgDM x 0.3 MJ ME)	11,250 kgMS	$67,500 @$6/kgMS
				Total income for extra ME + eaten =	**$145,128**

* ME converted to milksolids at 80 MJME/kg MS. Assumed ME of extra pasture eaten of 11.5 MJ ME/kgDM.

Is this level of increase of an extra 120kgMS/ha possible? Yes, the Lincoln University Dairy Farm (LUDF) increased production by 273 kgMS/ha from 2002/03 to 2003/04, over two seasons with similar conditions BY A FOCUS ON RESIDUALS. ***But to achieve this takes a strong focus.***

Pasture management is simple, in theory. There are only three rules:

1. Graze a pasture at the right time with the right stocking rate.
2. Take animals off the pasture when the desired residual is attained.
3. Repeat steps 1 and 2.

(In wet weather the aim should shift to protecting the soil and pasture from damage.)

Practical tips:

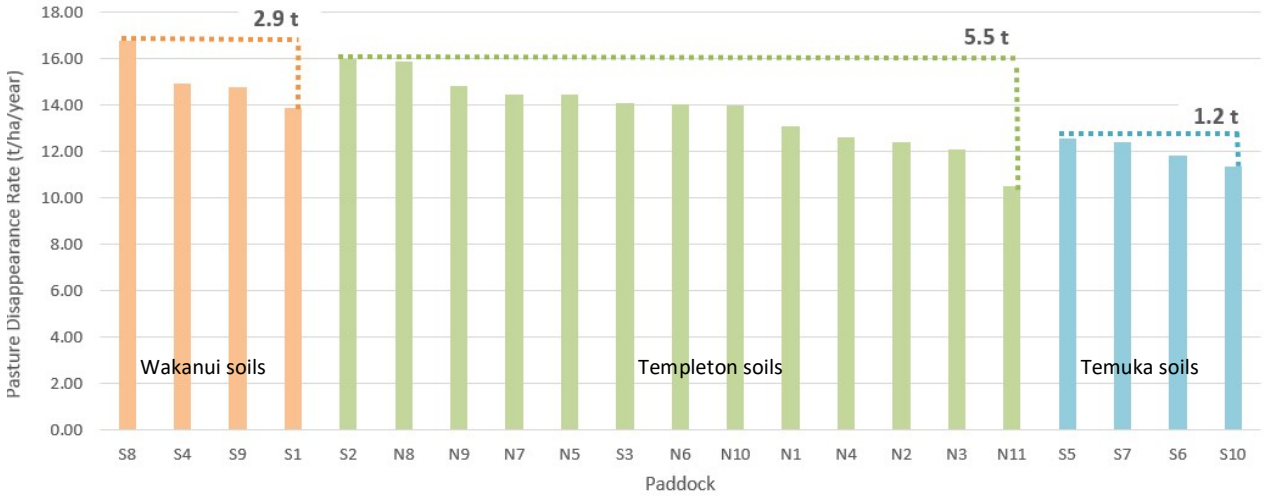
1. *Define target residual* – Does your whole farm team know what the target residual is? Have a photo of right residual in the lunchroom, but also on everyone's phones to use in the paddock.
2. *Use a plate meter* **–** These are a great way for your team to objectively discuss a residual, (avoiding the "*I think it's 1500. No, I think it's 1700*" discussions.)
3. *Use 24-hour grazings* **–** Only half as many residuals to get right as 12-hour grazings, reducing the number of decisions and potential for error by half. The science shows milksolid production is equal for 12 versus 24 hour grazings.
4. *Have residual as a KPI for those shifting cows* – having it as a key performance indicator in a job description/contract means it's non-negotiable to achieve.
5. *"What if" options* – residuals aren't always achieved (e.g. old pastures of cocksfoot make it difficult). Have your options to reset residual when required.
6. *Act quickly* – If residuals aren't achieved act quickly to reset them. This might include putting cows back into the paddock, or pre-graze mowing next round.

Lesson #2 Smarter pasture renewal

Many paddocks on New Zealand dairy farms aren't producing to their potential. But there is limited analysis of pasture performance occurring on-farm to look at what the right amount of investment in renewal should be, such as Figure 2.

Divide the farm by areas with different productive. For LUDF there are different soils (e.g. the poorly drained Temuka soils provide less feed). On LUDF Paddock N11 has the greatest potential, with 5.5tDM/ha less eaten, compared to S2 with the same soil.

Figure 2: LUDF Pasture disapperance 2018/19 (t DM/ha)



This paddock data comes automatically from farm walk pasture assessments through software such as 'Pasture Coach', 'AgriNet' or 'Minda Land and Feed'. Input your grazing dates to get the best analysis.

The second step is looking at the reasons for the differences in paddock performance, which may be driven by plant species, but may equally be other factors that need to be addressed such as soil fertility, compaction, drainage or insect damage.

New pasture at 7c/kgDM is very attractive when imported feed such as PKE cost maybe 30c/kg DM (based on $240/t, 90% DM plus handling costs of 3c/kg DM).

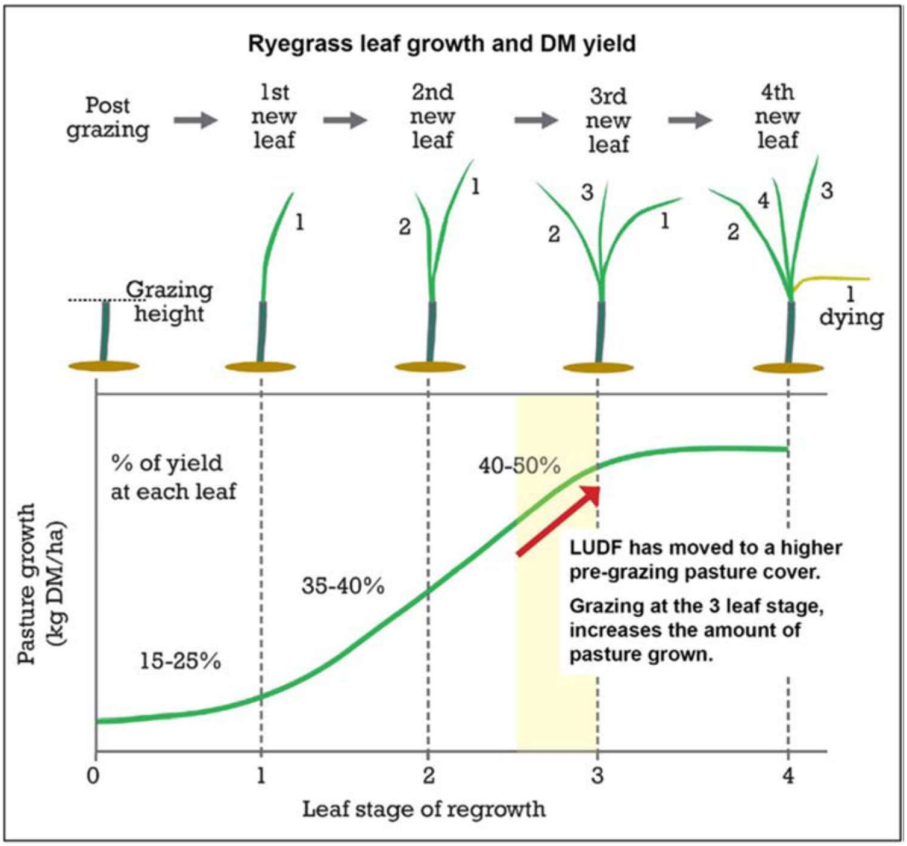
Practical tips - pasture renewal

1. *Assess the performance of individual paddocks* – this varies greatly. In analyses we have undertaken, there is typically a 100% yield difference between poorest performing and highest performing paddocks (e.g. 9 t DM/ha to 18 t DM/ha).
2. *Look at similar parts of farm* – some parts of the farm may be better than others (e.g. soil or irrigation type). Compare paddocks within these parts.
3. *Look for low hanging fruit* – spend money on the paddocks that are cheap to improve, and potential gains are large.
4. *Keep assessing paddock performance* – to assess results from renewal. *R*epeat what gives good returns on investment (*don't* repeat things that don't work well).

Lesson #3 Tetraploid/diploid ryegrass mixes

The LUDF has significantly reduced cow number, N fertiliser applications, and its N loss through Overseer, but produced a similar amount of milk. A neat trick!

One part in achieving this is that LUDF has increased its pre-grazing pasture cover by 200-300 kgDM/ha. The science behind this is shown in the diagram below.



The LUDF has moved from grazing ryegrass at around *2.5 leaves/tiller* to around *3 leaves/tiller* which is producing about 1 t DM/ha/year more pasture. This is as 40-50% of the ryegrass DM yield in a regrowth cycle is produced with the third leaf. Simply put "grass grows grass", more leaves capture more light = greater photosynthesis.

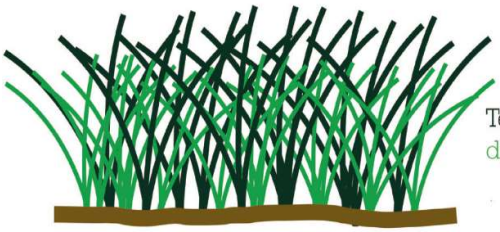
A consistent, even post-grazing residual remains a key requirement for LUDF (see Lesson #1). Running higher pregrazing covers means the grazing round is longer (by an average of 6 days) and each paddock will be grazed 1 time less over the season.

Practical tips - pasture mix & monitoring

1. Tetraploid/diploid perennial ryegrass mixes, have a significant advantage for this system, as they maintain high cow intakes at higher covers. Whereas cows may struggle to graze a straight diploid ryegrass >3100 well, a tetraploid/diploid mix will typically still be well grazed at 3400 kgDM/ha.

2. Tetraploid/diploid pasture mixes are persisting well at LUDF. In fact in the 2018/19 season, the top 7 paddocks were all tetraploid/diploid perennial ryegrass mixes (that ranged from 5 to 10 years old).

   Whereas LUDF had difficulty stopping overgrazing (and getting persistence) on straight tetraploid ryegrass pastures10-15 years ago, when tetraploids and diploids are mixed (as in the diagram below), the tougher diploid tillers protect the tetraploids.



Pre-grazing
Tetraploid plants (dark green) & diploid (light green) are mixed up.

Post-grazing
Tougher diploid stems help protect tetraploid plants from over-grazing.

3. Having higher covers across the farm means your farm is growing more, and you can move past 3 leaves/tiller into surplus and feed quality issues more quickly. With the LUDF system monitoring and acting quickly to control pasture quality when necessary (e.g. pre-graze mowing, making silage) are important.

MANAGING MILK PRICES

LUDF MILK PRICE RISK MANAGEMENT PROJECT

The following information illustrates three example milk price risk management strategies that will be tracked by the Lincoln University Dairy Farm over the next 5 years. The potential outcomes of these strategies have been tested using historical prices based on a range of predefined assumptions. It is important to recognise that this modelling is reflective of hypothetical outcomes rather than actual outcomes.

1. Monthly Milk Pricing

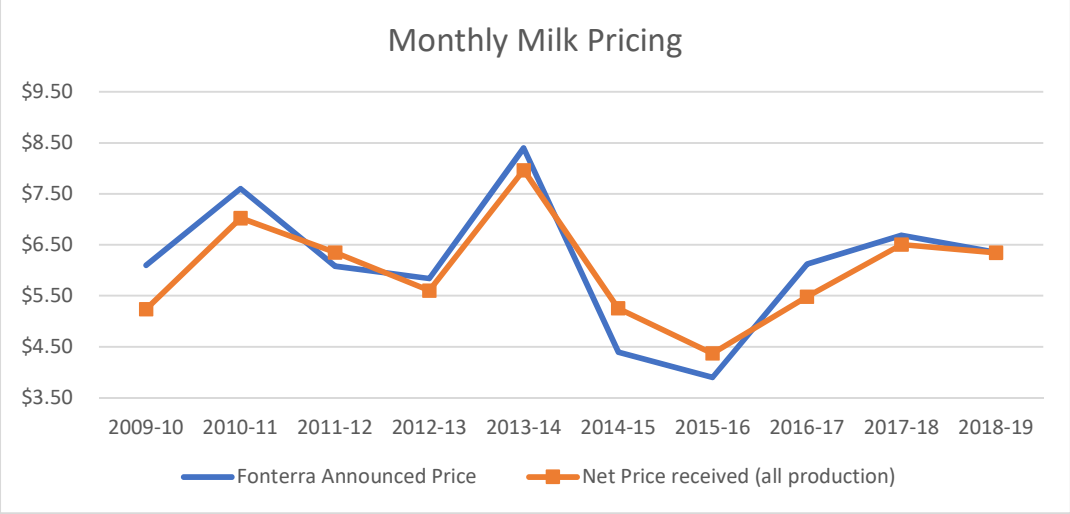
Strategy Definition

- Enter positions March to December for the season beginning May that year @ 5% per month up to 50% of production
- Only trading the week after the 1st GDT event of the month
    - During the week following the 1st GDT event of each month, NZ Milk Price futures are sold representing 5% of total production
- Positions can be held for both the current season and one season in advance
- Eligible tools NZ Milk Price futures or Fonterra's Fixed Milk Price Product

Back Testing Assumptions

- A farm producing 100,000kgMS per annum
- A ring fenced margin facility was provided under existing banking relationship
    - Interest rates: 6% debit and 0.1% credit
- Broker initial margin requirement: 120% of NZX requirement
- To back test during the period before Milk Price Futures launched, Fonterra's forecast prices have been used as a proxy for futures prices. For this period, it is assumed that hedging can only start 16 months out.
- Transaction cost using futures 1 cent per kgMS hedged ($60 total per contract)
- Transaction cost using FMP 10 cents per kgMS hedged

Back Testing Outcomes



- This strategy would have achieved a flattening of price and certainty of outcome with 50% hedged each year
- Using futures with this strategy would have resulted in a reduction in revenue of 13 cents / kgMS over the back testing period vs an unhedged position. This reduction in revenue was the result of a combination of opportunity cost from missing out on the highest prices as well as financing and transaction costs.
- Using FMP with this strategy would have resulted in a reduction in revenue of 21 cents / kgMS over the back testing period vs an unhedged position. This reduction in revenue was the result of a combination of opportunity cost from missing out on the highest prices as well as transaction costs.

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
% hedged	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Hedged rate	$ 4.47	$ 6.50	$ 6.64	$ 5.40	$ 7.60	$ 6.12	$ 4.85	$ 4.94	$ 6.36	$ 6.37
Fonterra Announced Price	$ 6.10	$ 7.60	$ 6.08	$ 5.84	$ 8.40	$ 4.40	$ 3.90	$ 6.12	$ 6.69	$ 6.35
Net Price incl Hedges	$ 5.28	$ 7.05	$ 6.36	$ 5.62	$ 8.00	$ 5.26	$ 4.38	$ 5.53	$ 6.52	$ 6.36
Finance and Transaction Cost (spread across all production)	-$ 0.05	-$ 0.03	-$ 0.01	-$ 0.02	-$ 0.04	-$ 0.01	-$ 0.01	-$ 0.04	-$ 0.02	-$ 0.01
Net Price received (all production)	$ 5.24	$ 7.02	$ 6.35	$ 5.60	$ 7.96	$ 5.25	$ 4.37	$ 5.48	$ 6.50	$ 6.35
Margin Facility Drawdown (multi season)	-$ 94,380	-$ 61,872	-$ 5,196	-$ 50,700	-$ 60,696	$ 0	$ 0	-$ 87,806	-$ 37,013	-$ 18,418

2. Surplus above Cost of Production (Goods)

Strategy Definition

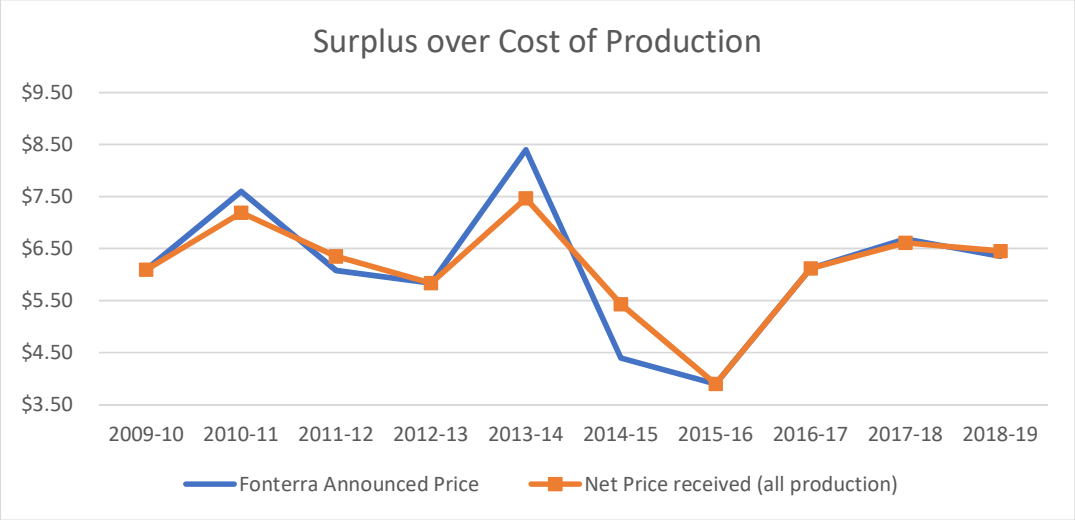
Margin over Cost of Production ($4.50 / KGMS)		
Margin above Cost of Production	Hedge Price	Production Hedged
+30%	$5.35	10%
+40%	$6.30	20%
+50%	$6.75	40%
+60%	$7.20	60%
+70%	$7.65	80%

- Able to hedge using Milk Price Futures up to 22 months prior to settlement up to max of 80% of production
- For simplicity only able to trade the week after the 1st GDT event of the month
- If during the week following the 1st GDT event of the month the NZ Milk Price futures price pass through a hedging trigger/price level, futures contracts are sold to lift Production Hedged up to the level outlined in the strategy definition.
- Positions can be held for both the current season and one season in advance
- Eligible tools NZ Milk Price futures

Back Testing Assumptions

- Farm producing 100,000kgMS per annum
- A ring fenced margin facility was provided under existing banking relationship
    - Interest rates: 6% debit and 0.1% credit
- Broker initial margin requirement: 120% of NZX requirement
- To back test during the period before Milk Price Futures launched, Fonterra's forecast prices have been used as a proxy for futures prices. For this period it is assumed that hedging can only start 16 months out.
- Transaction cost using futures 1 cent per kgMS hedged ($60 total per contract)

Back Testing Outcomes



- Would have achieved a flattening of price and improved certainty of outcome but in 30% of season there were no hedges in place
- Using futures with this strategy would have resulted in no change to total revenue over the back testing period vs an unhedged position. It had the effect of moving revenue out of high priced season into low priced season, with enough price improvement to cover any transaction/financing and opportunity costs.

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
% hedged	0%	40%	40%	0%	80%	40%	0%	20%	40%	40%
Hedged rate	$ -	$ 6.63	$ 6.78	$ -	$ 7.33	$ 7.00	$ -	$ 6.15	$ 6.53	$ 6.64
Fonterra Announced Price	$ 6.10	$ 7.60	$ 6.08	$ 5.84	$ 8.40	$ 4.40	$ 3.90	$ 6.12	$ 6.69	$ 6.35
Net Price incl Hedges	$ 6.10	$ 7.21	$ 6.36	$ 5.84	$ 7.54	$ 5.44	$ 3.90	$ 6.13	$ 6.63	$ 6.47
Finance and Transaction Cost (spread across all production)	$ -	-$ 0.02	-$ 0.01	$ -	-$ 0.07	-$ 0.00	$ -	-$ 0.00	-$ 0.02	-$ 0.01
Net Price received (all production)	$ 6.10	$ 7.19	$ 6.35	$ 5.84	$ 7.47	$ 5.44	$ 3.90	$ 6.12	$ 6.61	$ 6.46
Max Facility Drawdown (multi season)	-$ 6,528	-$ 50,400	$ 0	-$ 60,672	-$ 123,456	$ 0	$ -	-$ 24,384	-$ 30,144	-$ 30,336

3. Breakeven Protection using Put Options

Strategy Definition

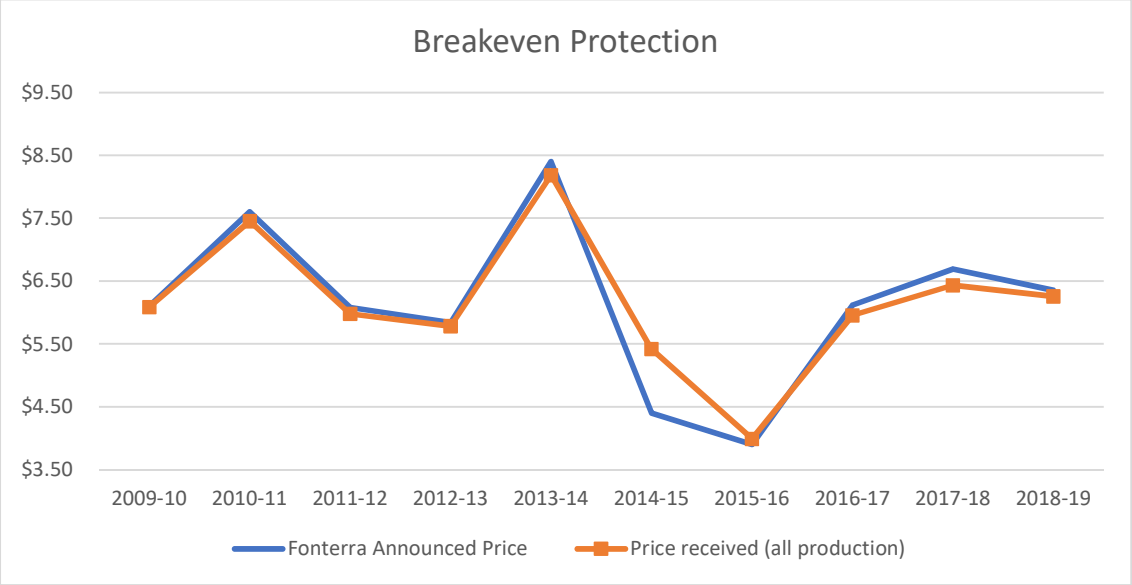
Breakeven Protection (Cost of Production $4.50 per KGMS)		
Hedge Trigger Price	Put Strike	Production Hedged
$5.20	$4.60	20%
$5.60	$5.00	30%
$6.00	$5.40	40%
$6.40	$5.80	50%
$6.80	$6.20	60%
$7.20	$6.60	80%

- This strategy is aiming to pay off in only the very worst pricing outcomes similar to insurance
- Once NZ Milk Price futures prices pass through a hedging trigger, or price level, put options at strikes $0.60 under the market price are bought
- Able to hedge up to 16 months out from settlement up to max of 80% of production
    - A significant proportion of option premium is driven by the time remaining until the option settles. For this reason this strategy aims to reduce the effect time has on premium cost by only starting hedging at 16 months prior to settlement.
- For simplicity trading the week after the 1st GDT event of the month
- There is no margin payable when buying option, but transaction costs will still apply
- Premium is paid when a contract is entered into and is non refundable
    - Premium was funded out of working capital
- Positions can be held for both the current season and one season in advance
- Eligible tools NZ Milk Price Put Options

Back Testing Assumptions

- A farm producing 100,000kgMS per annum
- To back test during the period before Milk Price Options launched (May 2016), Fonterra's forecast prices have been used as a proxy for futures prices (futures prices are used to provide the hedging trigger).
    - During the period prior to May 2016 it is assumed that premium determined would be similar to that witnessed post launch.
    - Trade in these contracts is sporadic, for modelling purposes, the daily settlement price for each option has been used.
- Transaction cost using futures 1 cent per kgMS hedged ($60 total per contract)

Back Testing Outcomes



- Would have achieved flattening of price and provided protection from the worst pricing outcomes
- Using put options under this strategy would have delivered an increase in revenue on all production over this period of 1 cent/kgMS, net of transaction costs. This delivered by achieving lower net prices in 80% of years but higher net prices during the 2015 and 2016 season.

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
% hedged	20%	50%	50%	20%	80%	60%	20%	40%	50%	60%
Floor Rate	$ 4.95	$ 5.85	$ 6.18	$ 4.92	$ 6.53	$ 6.40	$ 4.65	$ 5.28	$ 5.69	$ 6.06
Fonterra Announced Price	$ 6.10	$ 7.60	$ 6.08	$ 5.84	$ 8.40	$ 4.40	$ 3.90	$ 6.12	$ 6.69	$ 6.35
Net Price incl Hedge	$ 6.10	$ 7.60	$ 6.13	$ 5.84	$ 8.40	$ 5.60	$ 4.05	$ 6.12	$ 6.69	$ 6.35
Premium + Transaction Cost (across all production)	-$ 0.02	-$ 0.15	-$ 0.15	-$ 0.06	-$ 0.21	-$ 0.18	-$ 0.06	-$ 0.17	-$ 0.26	-$ 0.09
Net Price received (all production)	$ 6.08	$ 7.45	$ 5.98	$ 5.78	$ 8.19	$ 5.42	$ 3.99	$ 5.95	$ 6.43	$ 6.26
Premium Paid	$ 1,459	$ 14,432	$ 14,432	$ 5,773	$ 20,582	$ 17,318	$ 5,773	$ 16,243	$ 25,114	$ 8,832

Summary For Dairy Farmers:

- A well-constructed and executed policy has the potential to flatten out milk prices by, at times, reducing prices received during highs milk prices seasons and, at times, lifting prices received during low prices season. This can gives hedgers time to deal with down turns.
- Using futures / fixed milk price tools to manage milk price risk is reasonably complicated. The strategies outlined above are purposefully simplified for practicality and presentation purposes. It is recommended that if you are going to use these tools, you need to understand the implications. You should get professional advice to confirm your policy is robust and workable.
- Using some of these tools will require significant up front margin (capital) which will need to be cash flowed. You need to confirm the potential demands on cash and have the facilities available.
- Developing and sticking to a sound policy is essential for this to work. You need to take the emotions of fear and greed out of managing milk price.

Milk Price Risk Management

Jun 2019

Source: NZX dairy derivatives customers globally, not exhaustive

NZX
NEW ZEALAND'S EXCHANGE

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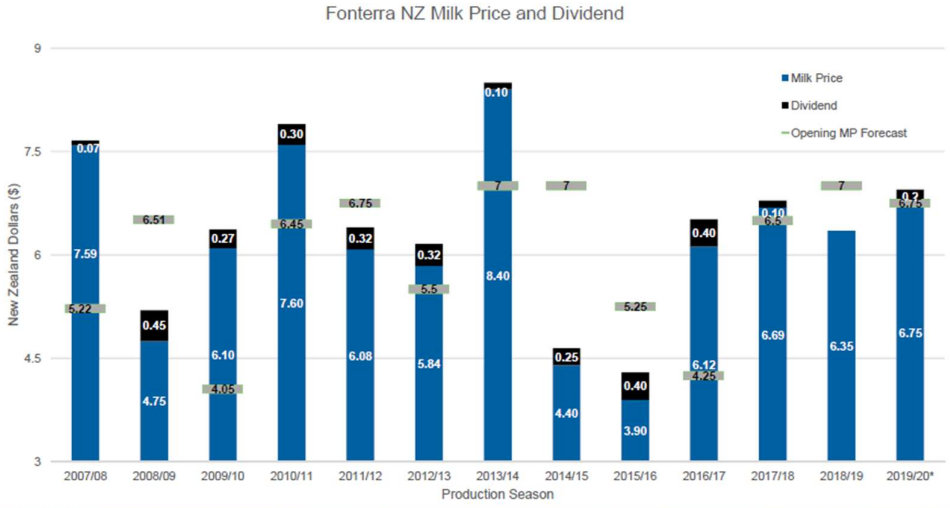
Fonterra FGMP reflects commodity market volatility



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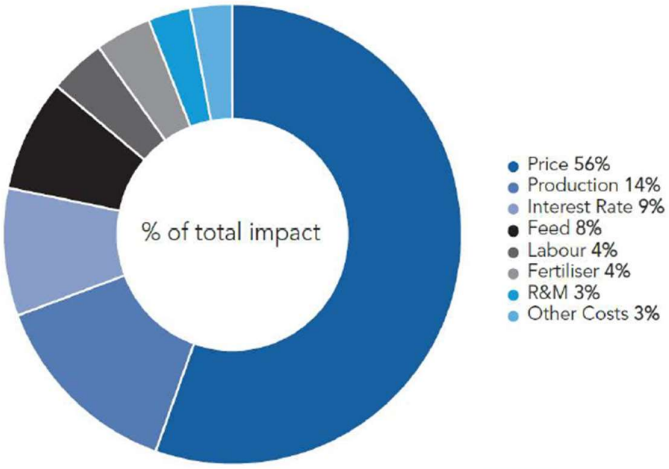
Understand, classify and prioritise risk

Average dairy farm risk profile



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Does milk price risk management matter to my business?

- **What are the business objectives?**
  - Reduce debt, maximise production, stability in margin, succession?
- **What risks influence objective success?**
  - Milk price falling, restricted access to capital, cost inflation, farms sale liquidity?
- **What is the business's capacity to bear those risks?**
  - Cost structures, low pay-out, when capital is constrained?
- **What is the risk-reward trade off?**
  - Opportunity cost and transaction cost vs. certainty of outcomes
- **What is the business' risk appetite?**
  - Does uncertainty keep me up sleep, what are the expectation of all stakeholders

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Identify tools and strategies to manage priority risks

- Identify risk management tools and strategies to manage and prioritise risks

Production Risk: Diversification, split calving, use of nitrogen, investment in genetics etc

Milk Price Risk: Low cost production system, fixed prices contracts, Milk Price Futures and Options, swaps, decrease debt

Feed Cost: run low cost milking system, use forward contracting

Interest Rate: pay down debt, fix interest rates

Disruption Risk: Build brand value, diversify, manage cost structures

Environmental: Low input system, run-off management, fence waterways, tree planting

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What tools are available and how do they compare?

	Documention Required	Capital Intensity[1]	Time Intensity	Flexibility[2]	Cost	Accessibility[3]	Basis Risk[4]	Hedge Multiple Seasons	Limits to Hedged Percentage[5]
Milk Price Futures and Options								✓	N
Processor Fixed Milk Price Contracts								×	Y
Intermediary Swap Products								✓	N

Relativity Key	
	Best
	Moderate
	Worst

1. Futures and options have a cash flow implication with initial and variation margin requirements. Some intermediary swap products require security deposits or terms requiring margin after certain price moves.
2. Flexibility reflects the ability to transact at any time, exit at any time, choose transaction size as well as the ability to trade option contracts.
3. Processor products are only available to suppliers. Access to intermediary products can be restricted depending on processor supplied.
4. Futures, Options and Intermediary products settle to Fonterra's final farm gate milk price, therefore for a farmer that does not supply Fonterra these products can introduce basis risk; where the price a farmer receives for physical milk sales to their processor differs from the settlement price of the product used to hedge milk price
5. Some processors place limits the percentage of production which can be hedged using fixed price contracts.

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What are NZ Milk Price Futures?

A mechanism to fix the price you receive for your milk

An agreement between a buyer and a seller to exchange a commodity for delivery or cash settlement at a future date at a particular price.

- Standardised and exchangeable forward contracts
  - Contract Size – 6,000 kg/ms
  - Annual Contracts – Current season + two seasons ahead (3 total)
  - Cash settled vs the final Fonterra Farmgate Milk Price
- Cash Collateralised
  - Initial Margin
  - Variation Margin

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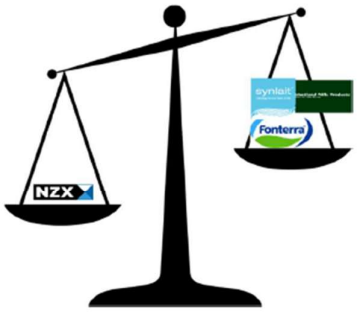
What is a Futures Contract? - Cash Settlement

Physical Market Losses (Gains)

=

Hedging Gains (Losses)



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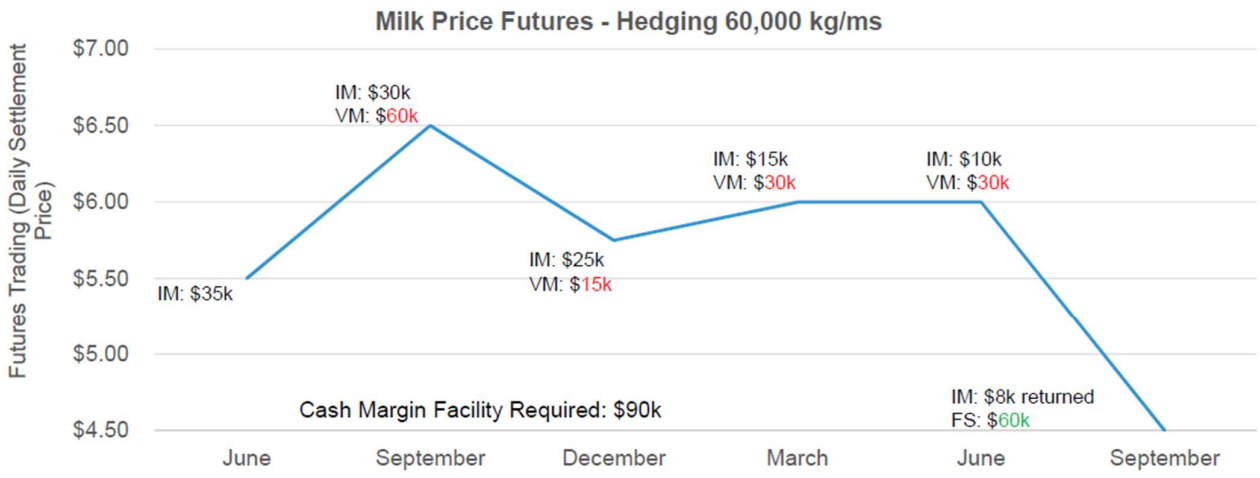
Cash Margin example



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Hedging policy

GOVERNANCE

- Purpose/Objectives
  - Consider: business philosophy, requirements of financier, shareholders objectives
  - Clear objectives: e.g. reduce cash flow volatility, maintain high input feeding systems, repay debt, expand etc
- Responsibilities
  - Who should be involved in decision making and changes in policy

STRATEGY

- Risk Measurement and Limits
  - What are the rules that help determine when to trade
  - When should positions be reviewed
  - Limits to be considered:
    - % of production to be hedged,
    - Price levels,
    - Time frames for Entry & Exit,
    - Eligible Instruments,
    - Duration of hedging,
    - Size of margin facility

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How to access the futures market

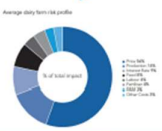
Understand Risk

Independent Advisers

Brokers

Banks

NZX



Create a Plan/Policy

Independent Advisers

Brokers

Discuss with Bank

- Margin finance facility required

bnz Westpac ASB Rabobank ANZ

Setup Brokerage Account

- Access NZX market through accredited brokers

JARDEN OMF
RICE DAIRY
INTL FCStone

NZX

PROFITABILITY OF CANTERBURY DAIRY FARMING

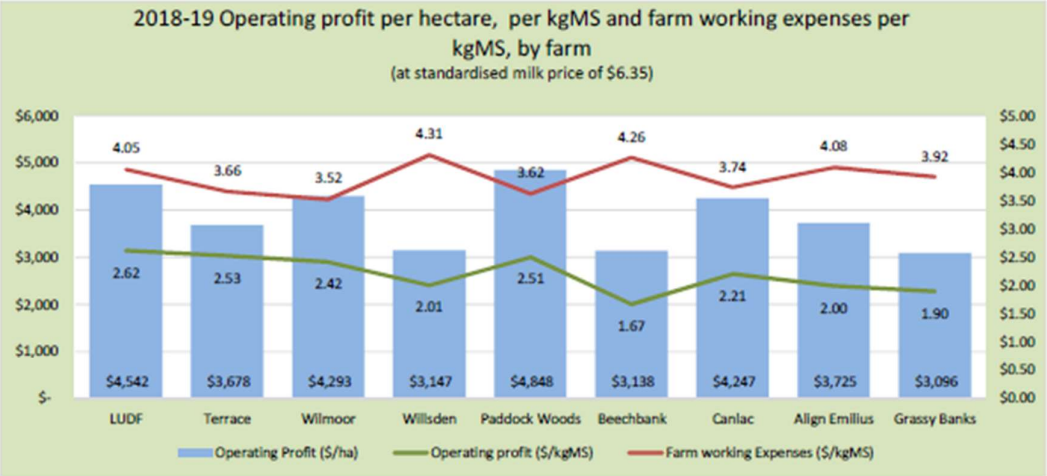
LUDF VS BEST PRACTICE VS CANTERBURY AVERAGE

DairyNZ profitability comparison summary

- The DairyNZ profitability comparison (DNZPC) shows data from the Lincoln University Dairy Farm alongside eight high-performing Canterbury dairy farms for the 2018-19 season
- Milk income has been standardised to the Fonterra milk price for that season. (incl. dividend) For 2018-19 $6.35 has been used
- Further information using wider Canterbury Benchmark data for the 2017-18 season is also shown for comparative purposes in some slides

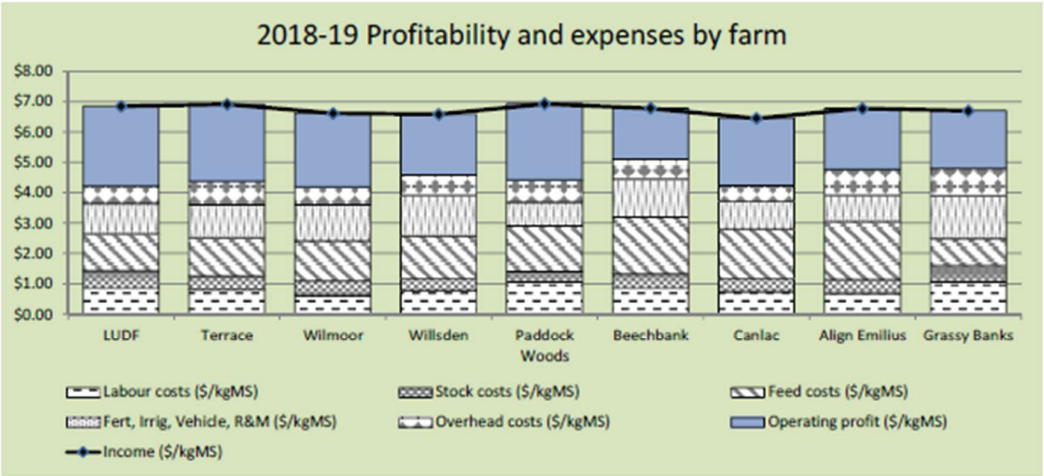
DairyNZ

DNZPC 2018-19 Profitability by farm



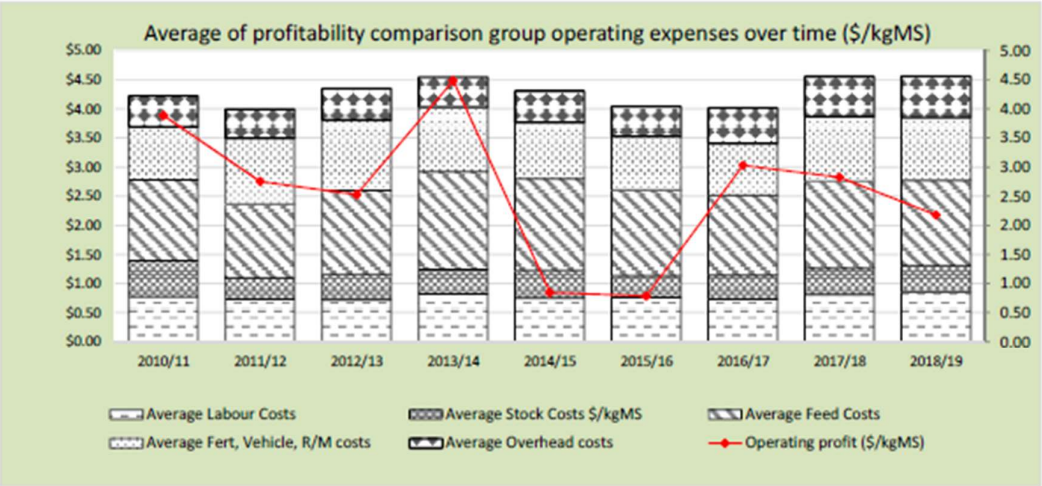
DairyNZ

DNZPC Breakdown of 2018-19 costs by farm



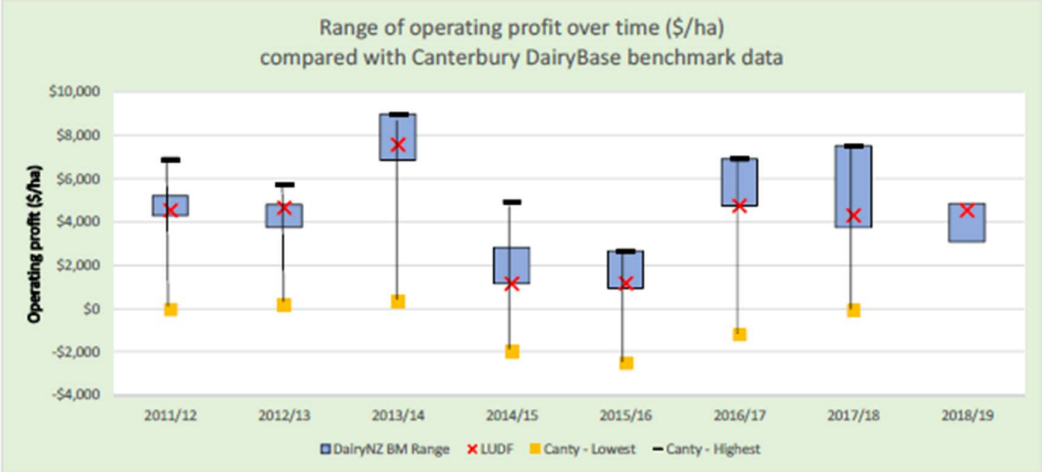
DairyNZ

DNZPC - Operating profit and expenses over time



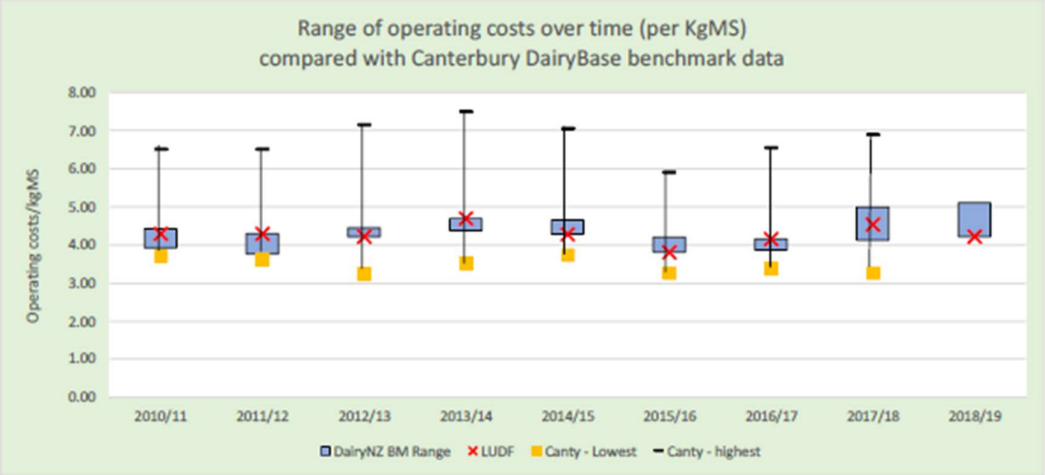
DairyNZ

DNZPC – Range of operating profit over time



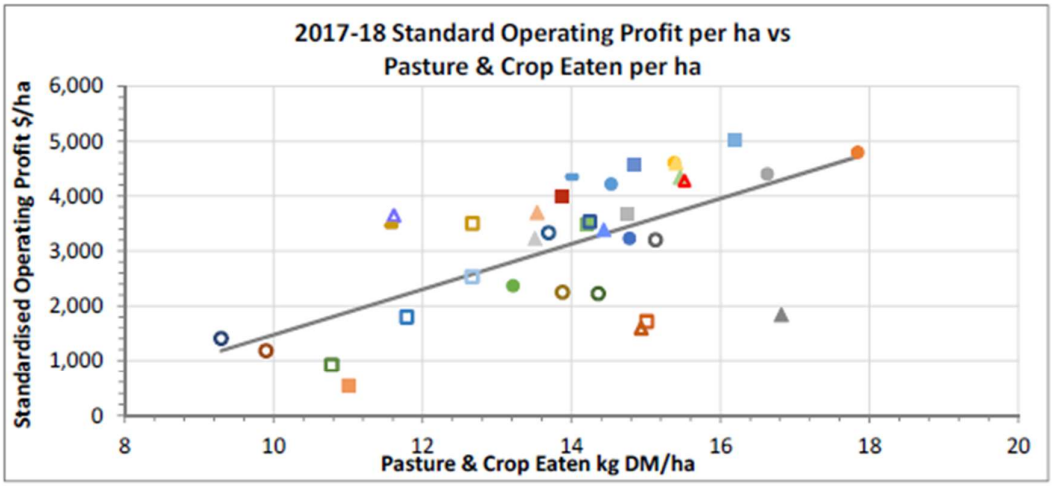
DairyNZ

DNZPC - Range of operating costs over time



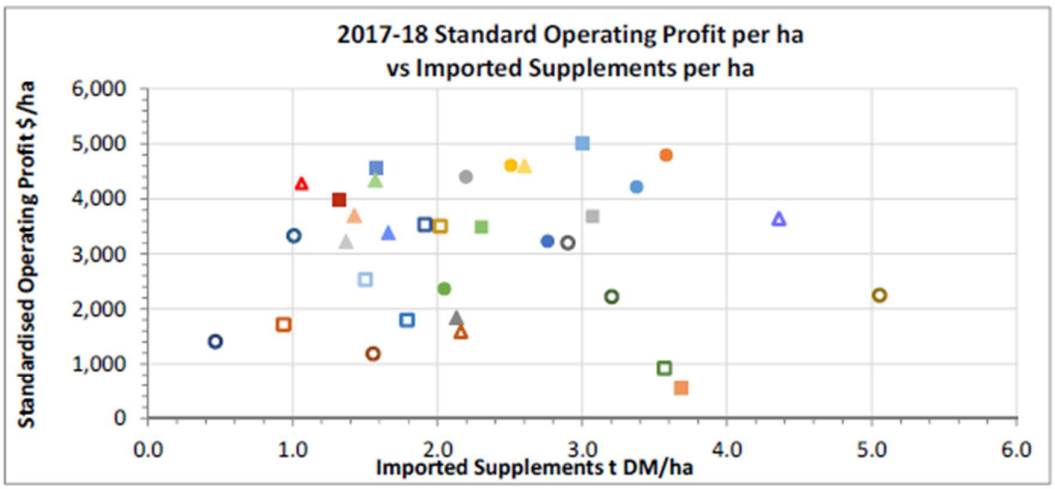
DairyNZ

Canterbury benchmark – 2017-18



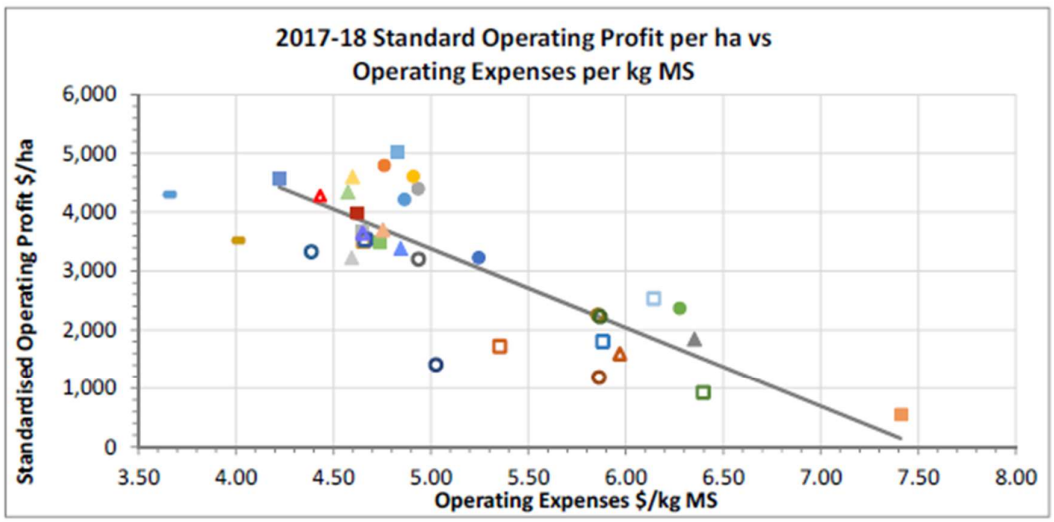
DairyNZ

Canterbury benchmark – 2017-18



DairyNZ

Canterbury benchmark 2017-18



DairyNZ

Key Points

- Operating profit and particularly cost structures have been relatively stable over the last 2 seasons
- Wage and salary costs show a moderate increase between 2017-18 and 2018-19
- This is offset by a moderate decrease in feed expenses over the same period. Other cost centres are generally stable
- Profitability comparison farms generally run lower, tighter cost structures
- There is a strong correlation between pasture and crop eaten and operating profit (Canty BM Data)
- There is a strong to very strong correlation between operating expenses and operating profit (both DNZPC and Canty BM data)
- There is no correlation between imported supplements and operating profit (Canty BM Data)

DairyNZ

Acknowledgments

- DairyNZ would like to thank the following organisations and individuals for their time, assistance and for freely sharing their financial data;
  - LUDF and SIDDC – Peter Hancox, Clare Buchanan and Jeremy Savage,
  - Terrace Farms – Dairy Holdings Ltd and O'Connor Dairies ltd
  - Wilmoor Dairy Farm Ltd – Kate and Stephen Moorhead,
  - Willsden Dairy Farm – Leo Donkers,
  - Paddock Wood – Hannah and Craig Fulton,
  - Beechbank Dairies Ltd – Sharron and Alan Davie-Martin,
  - Canlac Holdings Ltd. – Tony Coltman,
  - Align Group, Emilius – Rhys Roberts,
  - Grassy Banks – Brendan Caird,
  - The DairyNZ Canterbury/North Otago consulting officer team
  - Jenny McPherson of DairyNZ for data collection and collation

DairyNZ

LUDF 2017-18 FINANCIAL REPORT BENCHMARKED AGAINST CANTERBURY AVERAGE

DairyBase
Platform for growth

Physical Data Summary

Lincoln University Dairy Farm IFB- Production Year (Farm ID: 725852)
Dairy Season ended: 2018 Printed: 4 October 2019

This information was collected in the level-1 questionnaire. It is used to generate adjustments and KPI's in both Financial and Physical Detail reports. Please check that it is correct.

Dairy Co Supplied:	Fonterra		
Production System:	4 Feed imported to extend lactation 21-30%		
Business Type:	Diverse	**Balance Month:**	May
Calving Season:	Spring only	**Milking Interval:**	Twice a day
Winter Milk:	No	**Organic:**	No
Region:	Marlborough-Canterbury	**District**	Selwyn
% Milking Area Irrigated:	More than 30%	**Season's rainfall (mm):**	
Farm Dairy Type:	R50	**NIWA 10 Yr Av Rainfall (mm):**	680

Stock

Predominant dairy breed:	Crossbred
Peak Cows Milked:	558
Stocking rate (Cows/ha):	3.5
Replacement Calves Reared:	140

Land Area (ha)

Total Dairying area:	167.5
less Ungrazeable area:	7.5
Effective Dairying area:	160.0
Support block effective area:	0.0
Defined Young Stock area:	0
Non-dairy effective area:	0.0

Labour

Full time paid labour equivalents:	3.7
Full time unpaid labour equivalents:	0.0
FTE unpaid management:	0.0
Total FTEs:	3.7
Milking Cups per FTE	13.6

Production	Total	Per ha	Per cow	Composition
Milk Litres:	2,725,438	17,034	4,884	
Fat kg:	139,450	872	250	5.1%
Protein kg:	111,974	700	201	4.1%
Financial year - Milksolids kg:	251,424	1,571	451	9.2%
Production year - Milksolids kg:	251,424	1,571	451	

Number in Benchmark Group:	135	
Benchmark Group Selected by:	Profitability analysis District groups : Canterbury	Farm business type : 1- Owner operator
Benchmark Group Ranked by:		

Data entered by:	**Financial: Canterbury Benchmarking**	**Extended Physical: Canterbury Benchmarking**

Disclaimer:
This report and the data and information in it ("Information") is intended as general information only and is not intended as general or specific advice. All implied warranties in respect of the Information are expressly excluded. DairyNZ does not warrant that the Information is complete or accurate. DairyNZ will not be liable (whether in contract, tort (including negligence), breach of statutory duty, or otherwise) to any person who has received or relied on this report or the Information.

Validation Messages: None

DairyBase

Profitability KPI's

Lincoln University Dairy Farm IFB- Production Year (Farm ID: 725852)
Dairy Season ended: 2018 Printed: 4 October 2019

Number in Benchmark Group:	135	
Benchmark Group Selected by:	Profitability analysis District groups : Canterbury	Farm business type : 1- Owner operator
Benchmark Group Ranked by:		

FARM PHYSICAL KPI's	2017-18		2016-17		2015-16	
	Farm	Benchmark	Farm	Benchmark	Farm	Benchmark
Cows/ha	3.5	3.5	3.5	3.5	3.5	3.6
Kg Milksolids/ha	1,571	1,518	1,789	1,541	1,812	1,613
Kg Milksolids/cow	451	434	516	445	522	447
Cows/FTE	151	158	142	165	150	164
Kg MS/FTE	67,952	68,493	73,382	73,526	78,353	73,138

PROFITABILITY Dairy	2017-18		2016-17		2015-16	
	Farm	Benchmark	Farm	Benchmark	Farm	Benchmark
Gross Farm Revenue/ha	11,384	10,759	12,214	9,552	8,098	7,124
Operating Expenses/ha	7,267	7,692	7,453	7,088	7,016	7,260
Operating Profit (EFS)/ha	4,117	3,067	4,760	2,464	1,082	-136
Gross Farm Revenue/kg MS	7.24	7.09	6.83	6.20	4.47	4.42
Operating Expenses/kg MS	4.62	5.07	4.17	4.60	3.87	4.50
Operating Profit (EFS)/kg MS	2.62	2.02	2.66	1.60	0.60	-0.08
FWE/kg MS	4.16	4.29	3.76	3.87	3.47	3.77
Operating Profit Margin %	36.2%	28.5%	39.0%	25.8%	13.4%	-1.9%

LIQUIDITY	2017-18	2016-17	2015-16
Net Cash Income	1,790,259	1,957,625	1,280,443
Farm Working Expenses	1,046,767	1,076,527	1,006,609
Cash Operating Surplus	743,492	881,098	273,834

Profitability Cash Flow

CASH	$/KG MS	$	NON CASH ADJUSTMENTS	$	CASH + NON CASH	$
DAIRY SALES					DAIRY GFR	
Net Milk	6.75	1,697,112			Net Milk	1,697,112
Net Livestock	0.37	93,147	+ Value of Change in	31,151	Net Livestock	124,298
Other Dairy	0.00	0	Dairy Livestock		Other Dairy	0
NET CASH INCOME	7.12	1,790,259			DAIRY GFR	1,821,410

CASH FWE	$/KG MS	$	NON CASH ADJUSTMENTS	$	OPERATING EXPENSES	$
Wages	0.99	249,217	+ Labour Adj	0	Labour Expenses	249,217
Stock Expenses	0.62	155,445			Stock Expenses	155,445
Supplementary Feed	0.49	122,601	- Feed Inventory Adj	0	Total Supplement Expenses	122,601
Grazing and Support block	1.14	287,318	+Ownd Supp block Adj	0	Total Grazing and Support block	287,318
Other Working Expenses	0.75	189,393			Other Working Expenses	189,393
Overheads	0.17	42,793	+Depreciation	116,000	Total Overheads	158,793
FARM WORKING EXPENSES	4.16	1,046,767			OPERATING EXPENSES	1,162,767

CASH OPERATING SURPLUS	2.96	743,492	NET ADJUSTMENTS	-84,849	DAIRY OPERATING PROFIT (EFS)	658,643

DairyBase

Financial Detail

Lincoln University Dairy Farm IFB- Production Year (Farm ID: 725852)
Dairy Season ended: 2018 Printed: 4 October 2019

Number in Benchmark Group:	135	
Benchmark Group Selected by:	Profitability analysis District groups : Canterbury	Farm business type : 1- Owner operator
Benchmark Group Ranked by:		

	Total $		$ Per kg MS		$ Per Ha		$ Per Cow	
GROSS FARM REVENUE (GFR)	**Farm**	**% of GFR**	**Farm**	**Benchmark**	**Farm**	**Benchmark**	**Farm**	**Benchmark**
Net Milk Sales	1,697,112	93.2%	6.75	6.56	10,607	9,957	3,041	2,845
Net Dairy Livestock Sales	93,147	5.1%	0.37	0.35	582	533	167	152
Value of Change in Dairy Livestock	31,151	1.7%	0.12	0.16	195	237	56	68
Other Dairy Revenue	0	0.0%	0.00	0.02	0	31	0	9
DAIRY GROSS FARM REVENUE	1,821,410	100.0%	7.24	7.09	11,384	10,759	3,264	3,074
Non-Dairy Cash Income								
Value of Change in Non-dairy livestock								
Total Gross Farm Revenue								
OPERATING EXPENSES								
Labour Expenses								
Wages	249,217	13.7%	0.99	0.75	1,558	1,137	447	325
Labour Adjustment - Unpaid	0	0.0%	0.00	0.03	0	39	0	11
Labour Adjustment - Management	0	0.0%	0.00	0.14	0	220	0	63
Total Labour Expenses	249,217	13.7%	0.99	0.92	1,558	1,396	447	399
Stock Expenses								
Animal Health	65,793	3.6%	0.26	0.22	411	339	118	97
Breeding & Herd Improvement	52,279	2.9%	0.21	0.14	327	218	94	62
Farm Dairy	9,110	0.5%	0.04	0.05	57	83	16	24
Electricity (Farm Dairy, Water Supply)	28,263	1.6%	0.11	0.10	177	154	51	44
Total Stock Expenses	155,445	8.5%	0.62	0.52	972	794	279	227
Feed Expenses								
Supplement Expenses								
Net Made,Purchased,Cropped	92,491	5.1%	0.37	0.84	578	1,278	166	365
Less Feed Inventory Adjustment	0	0.0%	0.00	-0.01	0	-10	0	-3
Calf Feed	30,110	1.7%	0.12	0.06	188	94	54	27
Total Supplement Expenses	122,601	6.7%	0.49	0.91	766	1,382	220	395
Grazing & Run Off Expenses								
Young & Dry Stock Grazing	124,079	6.8%	0.49	0.45	775	679	222	194
Winter Cow Grazing	163,239	9.0%	0.65	0.05	1,020	79	293	23
Support block Lease	0	0.0%	0.00	0.05	0	76	0	22
Owned Support block Adjustment	0	0.0%	0.00	0.11	0	170	0	49
Total Grazing & Support block expenses	287,318	15.8%	1.14	0.66	1,796	1,004	515	287
Total Feed Expenses	409,919	22.5%	1.63	1.57	2,562	2,386	735	682
Other Working Expenses								
Fertiliser	29,873	1.6%	0.12	0.37	187	569	54	162
Nitrogen	42,179	2.3%	0.17	0.07	264	113	76	32
Irrigation	36,539	2.0%	0.15	0.26	228	402	65	115
Regrassing	10,540	0.6%	0.04	0.07	66	109	19	31
Weed & Pest	278	0.0%	0.00	0.04	2	64	0	18
Vehicles	7,851	0.4%	0.03	0.08	49	115	14	33
Fuel	9,740	0.5%	0.04	0.06	61	84	17	24
R & M - land & buildings	9,300	0.5%	0.04	0.20	58	305	17	87
R & M - plant and equipment	43,093	2.4%	0.17	0.13	269	202	77	58
Freight and General	0	0.0%	0.00	0.03	0	50	0	14
Total Other Working Expenses	189,393	10.4%	0.75	1.33	1,184	2,013	339	575
Overheads								
Administration	21,773	1.2%	0.09	0.11	136	161	39	46
Insurance	9,500	0.5%	0.04	0.06	59	88	17	25
ACC	0	0.0%	0.00	0.02	0	28	0	8
Rates	11,520	0.6%	0.05	0.05	72	83	21	24
Depreciation	116,000	6.4%	0.46	0.49	725	743	208	212
Total Overheads	158,793	8.7%	0.63	0.73	992	1,103	285	315
TOTAL DAIRY OPERATING EXPENSES	1,162,767	63.8%	4.62	5.07	7,267	7,692	2,084	2,197
Non-Dairy Operating Expenses								
Total Operating Expenses								
OPERATING PROFIT								
DAIRY OPERATING PROFIT	658,643	36.2%	2.62	2.02	4,117	3,067	1,180	876
Non-Dairy Operating Profit								
Total Operating Profit								

DairyBase

Multiyear Financial Detail (total $)

Lincoln University Dairy Farm IFB- Production Year (Farm ID: 725852)
Dairy Season ended: 2018 Printed: 4 October 2019

	2017-18	2016-17	2015-16	2014-15
Business Type : Region	D:Mari-Cant	D:Mari-Cant	D:Mari-Cant	D:Mari-Cant
Milking Area (ha)	160.0	160.0	160.0	160.0
Peak Cows	558	555	555	560
Milksolids Kg	251,424	286,189	289,906	278,654

GROSS FARM REVENUE (GFR)	2017-18 Total $	2017-18 % of GFR	2016-17 Total $	2016-17 % of GFR	2015-16 Total $	2015-16 % of GFR	2014-15 Total $	2014-15 % of GFR
Net Milk Sales	1,697,112	93.2%	1,864,235	95.4%	1,236,159	95.4%	1,271,776	92.1%
Net Dairy Livestock Sales	93,147	5.1%	93,390	4.8%	44,284	3.4%	115,088	8.3%
Value of Change in Dairy Livestock	31,151	1.7%	-3,464	-0.2%	15,253	1.2%	-5,315	-0.4%
Other Dairy Revenue	0	0.0%	0	0.0%	0	0.0%	0	0.0%
DAIRY GROSS FARM REVENUE	1,821,410	100.0%	1,954,161	100.0%	1,295,696	100.0%	1,381,549	100.0%
Non-Dairy Cash Income					0	0.0%	0	0.0%
Value of Change in Non-dairy livestock					0	0.0%	0	0.0%
Total Gross Farm Revenue					1,295,696	100.0%	1,381,549	100.0%
OPERATING EXPENSES								
Labour Expenses								
Wages	249,217	13.7%	235,621	12.1%	219,193	16.9%	222,868	16.1%
Labour Adjustment - Non-paid	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Labour Adjustment - Management	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total Labour Expenses	249,217	13.7%	235,621	12.1%	219,193	16.9%	222,868	16.1%
Stock Expenses								
Animal Health	65,793	3.6%	74,535	3.8%	57,851	4.5%	57,168	4.1%
Breeding & Herd Improvement	52,279	2.9%	43,546	2.2%	42,230	3.3%	51,081	3.7%
Farm Dairy	9,110	0.5%	8,685	0.4%	9,119	0.7%	7,180	0.5%
Electricity (Farm Dairy, Water Supply)	28,263	1.6%	28,011	1.4%	25,379	2.0%	24,722	1.8%
Total Stock Expenses	155,445	8.5%	154,777	7.9%	134,579	10.4%	140,151	10.1%
Feed Expenses								
Supplement Expenses								
Net Made,Purchased, Cropped	92,491	5.1%	81,775	4.2%	44,756	3.5%	67,454	4.9%
Less Feed Inventory Adjustment	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Calf Feed	30,110	1.7%	22,733	1.2%	21,006	1.6%	41,821	3.0%
Total Supplement Expenses	122,601	6.7%	104,508	5.3%	65,762	5.1%	109,275	7.9%
Grazing & Support block Expenses								
Young & Dry Stock Grazing	124,079	6.8%	121,729	6.2%	112,184	8.7%	114,155	8.3%
Winter Cow Grazing	163,239	9.0%	142,336	7.3%	185,907	14.3%	177,192	12.8%
Support block Lease	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Owned Support block Adjustment	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total Grazing & Support block expenses	287,318	15.8%	264,065	13.5%	298,091	23.0%	291,347	21.1%
Total Feed Expenses	409,919	22.5%	368,573	18.9%	363,853	28.1%	400,622	29.0%
Other Working Expenses								
Fertiliser	29,873	1.6%	32,343	1.7%	15,087	1.2%	36,273	2.6%
Nitrogen	42,179	2.3%	38,597	2.0%	45,093	3.5%	37,922	2.7%
Irrigation	36,539	2.0%	45,536	2.3%	52,427	4.0%	50,374	3.6%
Regrassing	10,540	0.6%	11,762	0.6%	8,654	0.7%	24,083	1.7%
Weed & Pest	278	0.0%	1,223	0.1%	1,174	0.1%	1,350	0.1%
Vehicles	7,851	0.4%	10,573	0.5%	12,714	1.0%	17,155	1.2%
Fuel	9,740	0.5%	10,611	0.5%	10,275	0.8%	9,891	0.7%
R & M - land & buildings	9,300	0.5%	14,708	0.8%	19,215	1.5%	34,330	2.5%
R & M - plant and equipment	43,093	2.4%	83,072	4.3%	57,431	4.4%	42,142	3.1%
Freight and General	0	0.0%	12,444	0.6%	14,225	1.1%	7,318	0.5%
Total Other Working Expenses	189,393	10.4%	260,869	13.3%	236,295	18.2%	260,838	18.9%
Overheads								
Administration	21,773	1.2%	28,902	1.5%	24,965	1.9%	23,672	1.7%
Insurance	9,500	0.5%	9,500	0.5%	9,500	0.7%	9,500	0.7%
ACC	0	0.0%	6,765	0.3%	6,704	0.5%	6,704	0.5%
Rates	11,520	0.6%	11,520	0.6%	11,520	0.9%	11,520	0.8%
Depreciation	116,000	6.4%	116,000	5.9%	116,000	9.0%	116,000	8.4%
Total Overheads	158,793	8.7%	172,687	8.8%	168,689	13.0%	167,396	12.1%
DAIRY OPERATING EXPENSES	1,162,767	63.8%	1,192,527	61.0%	1,122,609	86.6%	1,191,875	86.3%
Non-Dairy Operating Expenses					0	0.0%	0	0.0%
Total Operating Expenses					1,122,609	86.6%	1,191,875	86.3%
OPERATING PROFIT								
DAIRY OPERATING PROFIT	658,643	36.2%	761,634	39.0%	173,087	13.4%	189,674	13.7%
Non-Dairy Operating Profit					0	0.0%	0	0.0%
Total Operating Profit					173,087	13.4%	189,674	13.7%

LUDF 2018-19 FINANCIAL REPORT BENCHMARKED AGAINST CANTERBURY AVERAGE

The 2018-19 financial report for LUDF has been included for reference, but not all data from Canterbury's 2018-19 season has been compiled and submitted in DairyBase yet, so the benchmark sample is smaller than in 2017-18 and is not yet complete.

DairyBase

Physical Data Summary

Lincoln University Dairy Farm IFB- Production Year (Farm ID: 725852)
Dairy Season ended: 2019 Printed: 4 October 2019

This information was collected in the level-1 questionnaire. It is used to generate adjustments and KPI's in both Financial and Physical Detail reports. Please check that it is correct.

Dairy Co Supplied:	Fonterra		
Production System:	3 Feed imported to extend lactation 11-20%		
Business Type:	Diverse	**Balance Month:**	May
Calving Season:	Spring only	**Milking Interval:**	Twice a day
Winter Milk:	No	**Organic:**	No
Region:	Marlborough-Canterbury	**District**	Selwyn
% Milking Area Irrigated:	More than 30%	**Season's rainfall (mm):**	
Farm Dairy Type:	R50	**NIWA 10 Yr Av Rainfall (mm):**	640

Stock

Predominant dairy breed:	Crossbred
Peak Cows Milked:	550
Stocking rate (Cows/ha):	3.4
Replacement Calves Reared:	140

Land Area (ha)

Total Dairying area:	167.5
less Ungrazeable area:	7.5
Effective Dairying area:	160.0
Support block effective area:	12.0
Defined Young Stock area:	0
Non-dairy effective area:	0.0

Labour

Full time paid labour equivalents:	3.6
Full time unpaid labour equivalents:	0.0
FTE unpaid management:	0.0
Total FTEs:	3.6
Milking Cups per FTE	13.7

Production

	Total	Per ha	Per cow	Composition
Milk Litres:	2,982,256	18,639	5,422	
Fat kg:	153,440	959	279	5.1%
Protein kg:	123,852	774	225	4.2%
Financial year - Milksolids kg:	277,292	1,733	504	9.3%
Production year - Milksolids kg:	277,292	1,733	504	

Number in Benchmark Group: 27
Benchmark Group Selected by: Profitability analysis — Farm business type : 1- Owner operator
Region : Marlborough-Canterbury
Benchmark Group Ranked by:

Data entered by: **Financial: Canterbury Benchmarking** **Extended Physical: Canterbury Benchmarking**

Validation Messages: None

DairyBase

Profitability KPI's

Lincoln University Dairy Farm IFB- Production Year (Farm ID: 725852)
Dairy Season ended: 2019 Printed: 4 October 2019

Number in Benchmark Group:	27	
Benchmark Group Selected by:	Profitability analysis Region : Marlborough-Canterbury	Farm business type : 1- Owner operator
Benchmark Group Ranked by:		

FARM PHYSICAL KPI's	2018-19		2017-18		2016-17	
	Farm	Benchmark	Farm	Benchmark	Farm	Benchmark
Cows/ha	3.4	3.5	3.5	3.5	3.5	3.4
Kg Milksolids/ha	1,733	1,555	1,571	1,509	1,789	1,527
Kg Milksolids/cow	504	439	451	433	516	443
Cows/FTE	153	179	151	158	142	162
Kg MS/FTE	77,026	78,327	67,952	68,436	73,382	71,841

PROFITABILITY Dairy	2018-19		2017-18		2016-17	
	Farm	Benchmark	Farm	Benchmark	Farm	Benchmark
Gross Farm Revenue/ha	12,028	10,481	11,384	10,695	12,214	9,468
Operating Expenses/ha	7,319	7,913	7,267	7,670	7,453	7,045
Operating Profit (EFS)/ha	4,709	2,568	4,117	3,026	4,760	2,423
Gross Farm Revenue/kg MS	6.94	6.74	7.24	7.09	6.83	6.20
Operating Expenses/kg MS	4.22	5.09	4.62	5.08	4.17	4.61
Operating Profit (EFS)/kg MS	2.72	1.65	2.62	2.01	2.66	1.59
FWE/kg MS	4.05	4.46	4.16	4.30	3.76	3.89
Operating Profit Margin %	39.2%	24.5%	36.2%	28.3%	39.0%	25.6%

LIQUIDITY	2018-19	2017-18	2016-17
Net Cash Income	1,938,900	1,790,259	1,957,625
Farm Working Expenses	1,124,021	1,046,767	1,076,527
Cash Operating Surplus	814,879	743,492	881,098

Profitability Cash Flow

CASH	$/KG MS	$	NON CASH ADJUSTMENTS	$	CASH + NON CASH	$
DAIRY SALES					DAIRY GFR	
Net Milk	6.41	1,777,435			Net Milk	1,777,435
Net Livestock	0.58	161,465	+ Value of Change in	-14,454	Net Livestock	147,011
Other Dairy	0.00	0	Dairy Livestock		Other Dairy	0
NET CASH INCOME	6.99	1,938,900			DAIRY GFR	1,924,446

CASH FWE	$/KG MS	$	NON CASH ADJUSTMENTS	$	OPERATING EXPENSES	$
Wages	0.85	237,056	+ Labour Adj	0	Labour Expenses	237,056
Stock Expenses	0.58	160,459			Stock Expenses	160,459
Supplementary Feed	0.50	138,371	- Feed Inventory Adj	69,000	Total Supplement Expenses	69,371
Grazing and Support block	0.95	264,480	+Ownd Supp block Adj	0	Total Grazing and Support block	264,480
Other Working Expenses	1.00	277,016			Other Working Expenses	277,016
Overheads	0.17	46,639	+Depreciation	116,000	Total Overheads	162,639
FARM WORKING EXPENSES	4.05	1,124,021			OPERATING EXPENSES	1,171,021

CASH OPERATING SURPLUS	2.94	814,879	NET ADJUSTMENTS	-61,454	DAIRY OPERATING PROFIT (EFS)	753,425

DairyBase

Financial Detail

Lincoln University Dairy Farm IFB- Production Year (Farm ID: 725852)
Dairy Season ended: 2019 Printed: 4 October 2019

Number in Benchmark Group: 27
Benchmark Group Selected by: Profitability analysis
Region : Marlborough-Canterbury
Farm business type : 1- Owner operator
Benchmark Group Ranked by:

	Total $		$ Per kg MS		$ Per Ha		$ Per Cow	
GROSS FARM REVENUE (GFR)	**Farm**	**% of GFR**	**Farm**	**Benchmark**	**Farm**	**Benchmark**	**Farm**	**Benchmark**
Net Milk Sales	1,777,435	92.4%	6.41	6.45	11,109	10,037	3,232	2,831
Net Dairy Livestock Sales	161,465	8.4%	0.58	0.18	1,009	277	294	78
Value of Change in Dairy Livestock	-14,454	-0.8%	-0.05	0.05	-90	75	-26	21
Other Dairy Revenue	0	0.0%	0.00	0.06	0	92	0	26
DAIRY GROSS FARM REVENUE	1,924,446	100.0%	6.94	6.74	12,028	10,481	3,499	2,956
Non-Dairy Cash Income								
Value of Change in Non-dairy livestock								
Total Gross Farm Revenue								
OPERATING EXPENSES								
Labour Expenses								
Wages	237,056	12.3%	0.85	0.87	1,482	1,347	431	380
Labour Adjustment - Unpaid	0	0.0%	0.00	0.01	0	8	0	2
Labour Adjustment - Management	0	0.0%	0.00	0.03	0	50	0	14
Total Labour Expenses	237,056	12.3%	0.85	0.90	1,482	1,405	431	396
Stock Expenses								
Animal Health	66,810	3.5%	0.24	0.21	418	322	121	91
Breeding & Herd Improvement	66,015	3.4%	0.24	0.14	413	213	120	60
Farm Dairy	7,634	0.4%	0.03	0.09	48	145	14	41
Electricity (Farm Dairy, Water Supply)	20,000	1.0%	0.07	0.06	125	88	36	25
Total Stock Expenses	160,459	8.3%	0.58	0.49	1,003	768	292	217
Feed Expenses								
Supplement Expenses								
Net Made,Purchased,Cropped	132,371	6.9%	0.48	0.82	827	1,283	241	362
Less Feed Inventory Adjustment	69,000	3.6%	0.25	0.00	431	7	125	2
Calf Feed	6,000	0.3%	0.02	0.05	38	73	11	21
Total Supplement Expenses	69,371	3.6%	0.25	0.87	434	1,350	126	381
Grazing & Run Off Expenses								
Young & Dry Stock Grazing	252,560	13.1%	0.91	0.36	1,578	555	459	157
Winter Cow Grazing	0	0.0%	0.00	0.28	0	443	0	125
Support block Lease	11,920	0.6%	0.04	0.03	74	39	22	11
Owned Support block Adjustment	0	0.0%	0.00	0.05	0	85	0	24
Total Grazing & Support block expenses	264,480	13.7%	0.95	0.72	1,653	1,122	481	316
Total Feed Expenses	333,851	17.3%	1.20	1.59	2,087	2,471	607	697
Other Working Expenses								
Fertiliser	88,364	4.6%	0.32	0.27	552	418	161	118
Nitrogen	0	0.0%	0.00	0.14	0	219	0	62
Irrigation	41,123	2.1%	0.15	0.28	257	438	75	124
Regrassing	3,872	0.2%	0.01	0.06	24	94	7	26
Weed & Pest	109	0.0%	0.00	0.01	1	18	0	5
Vehicles	31,295	1.6%	0.11	0.03	196	48	57	14
Fuel	0	0.0%	0.00	0.04	0	62	0	18
R & M - land & buildings	0	0.0%	0.00	0.19	0	291	0	82
R & M - plant and equipment	98,950	5.1%	0.36	0.12	618	182	180	51
Freight and General	13,303	0.7%	0.05	0.11	83	173	24	49
Total Other Working Expenses	277,016	14.4%	1.00	1.25	1,731	1,944	504	548
Overheads								
Administration	24,139	1.3%	0.09	0.19	151	294	44	83
Insurance	10,500	0.5%	0.04	0.06	66	92	19	26
ACC	0	0.0%	0.00	0.02	0	29	0	8
Rates	12,000	0.6%	0.04	0.05	75	77	22	22
Depreciation	116,000	6.0%	0.42	0.54	725	834	211	235
Total Overheads	162,639	8.5%	0.59	0.85	1,016	1,326	296	374
TOTAL DAIRY OPERATING EXPENSES	1,171,021	60.8%	4.22	5.09	7,319	7,913	2,129	2,232
Non-Dairy Operating Expenses								
Total Operating Expenses								
OPERATING PROFIT								
DAIRY OPERATING PROFIT	753,425	39.2%	2.72	1.65	4,709	2,568	1,370	724
Non-Dairy Operating Profit								
Total Operating Profit								

DairyBase

Multiyear Financial Detail (total $)

Lincoln University Dairy Farm IFB- Production Year (Farm ID: 725852)
Dairy Season ended: 2019 Printed: 4 October 2019

	2018-19	2017-18	2016-17	2015-16
Business Type : Region	D:Mari-Cant	D:Mari-Cant	D:Mari-Cant	D:Mari-Cant
Milking Area (ha)	160.0	160.0	160.0	160.0
Peak Cows	550	558	555	555
Milksolids Kg	277,292	251,424	286,189	289,906

GROSS FARM REVENUE (GFR)	2018-19 Total $	% of GFR	2017-18 Total $	% of GFR	2016-17 Total $	% of GFR	2015-16 Total $	% of GFR
Net Milk Sales	1,777,435	92.4%	1,697,112	93.2%	1,864,235	95.4%	1,236,159	95.4%
Net Dairy Livestock Sales	161,465	8.4%	93,147	5.1%	93,390	4.8%	44,284	3.4%
Value of Change in Dairy Livestock	-14,454	-0.8%	31,151	1.7%	-3,464	-0.2%	15,253	1.2%
Other Dairy Revenue	0	0.0%	0	0.0%	0	0.0%	0	0.0%
DAIRY GROSS FARM REVENUE	1,924,446	100.0%	1,821,410	100.0%	1,954,161	100.0%	1,295,696	100.0%
Non-Dairy Cash Income							0	0.0%
Value of Change in Non-dairy livestock							0	0.0%
Total Gross Farm Revenue							1,295,696	100.0%
OPERATING EXPENSES								
Labour Expenses								
Wages	237,056	12.3%	249,217	13.7%	235,621	12.1%	219,193	16.9%
Labour Adjustment - Non-paid	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Labour Adjustment - Management	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total Labour Expenses	237,056	12.3%	249,217	13.7%	235,621	12.1%	219,193	16.9%
Stock Expenses								
Animal Health	66,810	3.5%	65,793	3.6%	74,535	3.8%	57,851	4.5%
Breeding & Herd Improvement	66,015	3.4%	52,279	2.9%	43,546	2.2%	42,230	3.3%
Farm Dairy	7,634	0.4%	9,110	0.5%	8,685	0.4%	9,119	0.7%
Electricity (Farm Dairy, Water Supply)	20,000	1.0%	28,263	1.6%	28,011	1.4%	25,379	2.0%
Total Stock Expenses	160,459	8.3%	155,445	8.5%	154,777	7.9%	134,579	10.4%
Feed Expenses								
Supplement Expenses								
Net Made,Purchased, Cropped	132,371	6.9%	92,491	5.1%	81,775	4.2%	44,756	3.5%
Less Feed Inventory Adjustment	69,000	3.6%	0	0.0%	0	0.0%	0	0.0%
Calf Feed	6,000	0.3%	30,110	1.7%	22,733	1.2%	21,006	1.6%
Total Supplement Expenses	69,371	3.6%	122,601	6.7%	104,508	5.3%	65,762	5.1%
Grazing & Support block Expenses								
Young & Dry Stock Grazing	252,560	13.1%	124,079	6.8%	121,729	6.2%	112,184	8.7%
Winter Cow Grazing	0	0.0%	163,239	9.0%	142,336	7.3%	185,907	14.3%
Support block Lease	11,920	0.6%	0	0.0%	0	0.0%	0	0.0%
Owned Support block Adjustment	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total Grazing & Support block expenses	264,480	13.7%	287,318	15.8%	264,065	13.5%	298,091	23.0%
Total Feed Expenses	333,851	17.3%	409,919	22.5%	368,573	18.9%	363,853	28.1%
Other Working Expenses								
Fertiliser	88,364	4.6%	29,873	1.6%	32,343	1.7%	15,087	1.2%
Nitrogen	0	0.0%	42,179	2.3%	38,597	2.0%	45,093	3.5%
Irrigation	41,123	2.1%	36,539	2.0%	45,536	2.3%	52,427	4.0%
Regrassing	3,872	0.2%	10,540	0.6%	11,762	0.6%	8,654	0.7%
Weed & Pest	109	0.0%	278	0.0%	1,223	0.1%	1,174	0.1%
Vehicles	31,295	1.6%	7,851	0.4%	10,573	0.5%	12,714	1.0%
Fuel	0	0.0%	9,740	0.5%	10,611	0.5%	10,275	0.8%
R & M - land & buildings	0	0.0%	9,300	0.5%	14,708	0.8%	19,215	1.5%
R & M - plant and equipment	98,950	5.1%	43,093	2.4%	83,072	4.3%	57,431	4.4%
Freight and General	13,303	0.7%	0	0.0%	12,444	0.6%	14,225	1.1%
Total Other Working Expenses	277,016	14.4%	189,393	10.4%	260,869	13.3%	236,295	18.2%
Overheads								
Administration	24,139	1.3%	21,773	1.2%	28,902	1.5%	24,965	1.9%
Insurance	10,500	0.5%	9,500	0.5%	9,500	0.5%	9,500	0.7%
ACC	0	0.0%	0	0.0%	6,765	0.3%	6,704	0.5%
Rates	12,000	0.6%	11,520	0.6%	11,520	0.6%	11,520	0.9%
Depreciation	116,000	6.0%	116,000	6.4%	116,000	5.9%	116,000	9.0%
Total Overheads	162,639	8.5%	158,793	8.7%	172,687	8.8%	168,689	13.0%
DAIRY OPERATING EXPENSES	1,171,021	60.8%	1,162,767	63.8%	1,192,527	61.0%	1,122,609	86.6%
Non-Dairy Operating Expenses							0	0.0%
Total Operating Expenses							1,122,609	86.6%
OPERATING PROFIT								
DAIRY OPERATING PROFIT	753,425	39.2%	658,643	36.2%	761,634	39.0%	173,087	13.4%
Non-Dairy Operating Profit							0	0.0%
Total Operating Profit							173,087	13.4%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