SIDDC
South Island Dairying Development Centre

LINCOLN UNIVERSITY
DEMONSTRATION DAIRY FARM

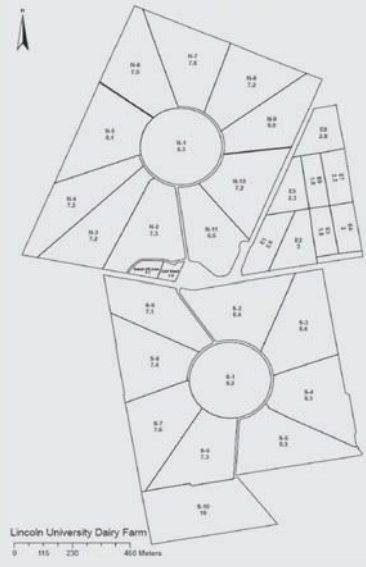
FOCUS DAY - FEBRUARY 2016

STAFF

Peter Hancox	– Farm Manager
Matt Weatherhead	– 2IC
Matthew Costello	– Dairy Assistant
Vacant	– Dairy Assistant

LUDDF 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



Partners Networking To Advance South Island Dairying

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Plant & Food RESEARCH
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INTRODUCTION

The LUDDF 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 hectares is the milking platform, is irrigated using a spray system that includes two centre pivots, small portable lateral sprinklers 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 200kgN/ha and up to 550kg DM/cow of imported feed. The milk payout (income) 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 and as a result production averaged 1700kgMS/ha and 411kgMS/cow. LUDDF 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 LUDDF 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 profitiability, 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: 2014/15

LUDDF 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. Targeted milk production is 1750kgMS/ha or 500kgMS/cow from 3.5 cows/ha with up to 150kgN/ha and 300kgDM/cow imported supplement.

LUDDF STRATEGIC OBJECTIVE 2011-2015:

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 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.

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 manage pastures and grazing so per hectare energy production is optimised and milkers consume as much metabolisable 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 in 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, 60 lysimeters and 6 drainage plots 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, including a Forage Value Index paddock scale cultivar trial.
- Winter cropping effects on subsequent cow and calf performance.
- Yield mapping of pastures across the season
- Native Plantings – biodiversity effects
- Resource Inventory and Greenhouse Gas Footprint

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 **666 mm**

SOIL TYPES

Free-draining shallow stony soils (Eyre soils) **5**

Deep sandy soils (Paparua and Templeton soils) **45**

Imperfectly drained soils (Wakanui soils) **30**

Heavy, poorly-drained soils (Temuka soils) **20**

FARM AREA

Milking Platform **160 ha**
Runoff [East Block] **15 ha**
Unproductive land on platform **6.7ha**

SOIL TEST RESULTS AND FERTILISER APPLICATIONS

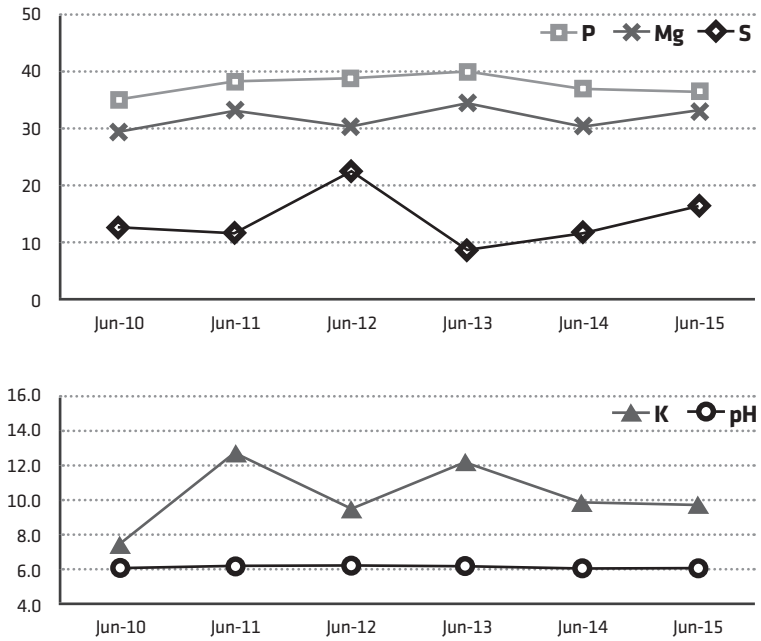
Target Soil Test Ranges:

pH: **5.8 – 6.2** P: **30 – 40** K: **5 – 8**
S: **10 – 12** Mg: **20+**

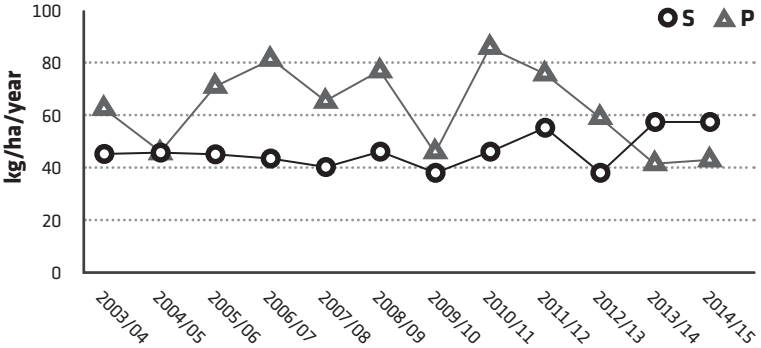
PASTURE

The milking platform was sown at conversion [March 2001] in a mix of 50/50 Bronsyn/ Impact ryegrasses with Aran and Sustain white clovers, and 1kg/ha of Timothy.

WHOLE FARM AVERAGE SOIL TEST RESULTS



WHOLE FARM AVERAGE P AND S APPLICATIONS 2003/04 – 2014/15



Paddock	Period Regrassed	Grass Cultivar
N1	Feb-01	Brons. Imp
N2	Feb-11	Trojan
N3	Nov-12/Sept-13	Shogun/Chicory/Plantain/Troj
N4	Feb-15	Base/Troj/Chicory/Plantain
N5	Dec-11/Aug-13	Shogun
N6	Apr-14	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
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/Plantain
S5	Dec-08	Arrow - Alto
S6	Dec-14	Shogan/Chi/Plant (spray/drill)
S7	Sep-06	Base/Troj/Plantain
S8	Oct-11	Troj. Bealey
S9	Dec-09	Bealey/Arrow
S10	Nov-14	Shogan/Chicory/Plantain
All paddocks also sown with clover		

STAFFING AND MANAGEMENT

Roster System – 8 days on 2 off, 8 days on 3 off
Milking Times – cups on 5.00am / 2.30pm

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	90m

A full rotation completed in 20.8 hours for 5.5 mm [at 100% of maximum speed].

- Average Annual Rainfall = 666 mm. Average irrigation input applies an additional 450 mm.
- Average Evapotranspiration for Lincoln is 870 mm/year.

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 spray applicators.

MATING PROGRAMME – SPRING 2015

KiwiX DNA for 365 cows [F8-F16]; Holstein Friesian Daughter Proven for 280 cows [F0-F7 then follow with Jersey bulls.
Heifers start mating 10 days early, natural mate for 9 weeks.
10 weeks mating for milking herd. Expect to rear 150 heifers.

HERD DETAILS – FEBRUARY 2015

Breeding Worth 152 / 47%
(rel%) / Production Worth (rel%)185 / 69%
Recorded Ancestry 99%

Average weight / cow (Dec)
Herd monitored walk over weighing
474 kg [Dec 2014]

Calving start date
Heifers 23 July, Herd 2 August 2015

Est Median calving date
17 August 2015

Mating start date
25 October 2015

Empty rate (nil induction policy) after 10 weeks mating - 13% (2014-15 mating). 6 week in-calf rate 71%.

	2002/03	2003-07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Total kg/MS supplied	228,420	**277,204**	278,560	261,423	273,605	264,460	297,740	300,484	276,019	278,654
Average kg/MS/cow	381	**425**	409	384	415	395	471	477	440	498
Average kg/MS/ha	1,414	**1,720**	1,744	1,634	1,710	1,653	1,861	1,878	1,725	1742
Farm working expenses /kgMS	$2.98	**$2.68**	$3.37	$3.88	$3.38	$3.86	$3.91	$3.84	$4.28	$3.87
Dairy operating profit/ha	$1,164	**$2,534**	$8,284	$2,004	$4,696	$6,721	$4,553	$4,665	$7,578	$1200
Payout (excl. levy) $/kg (Milk price + div.)	$4.10	**$4.33**	$7.87	$5.25	$6.37	$7.80	$6.30	$6.12	$8.50F	$4.60
Return on assets	4.4%	**6.18%**	14.6%	4.8%	7%	7%	6%	6%	10%	1.6%
1 July cow numbers	631	**675**	704	704	685	694	665	650	650	580
Max. cows milked	604	**654**	680	683	660	669	632	630	628	560
Days in milk	-	**-**	263	254	266	271	272	273	259	263
Stocking rate cow equiv./ha	3.75	**4.05**	4.2	4.3	4.13	4.18	3.95	3.94	3.92	3.5
Stocking rate Kg liveweight/ha	1,838	**1964**	2,058	2,107	1,941	1914	1860	1878	1872	1680
No. cows/weeks wintered off	500/8	**515/7.8**	546/9	547/7	570/9	652/8.4	650/9.8	650/9.8	650/11.4	580/10.7
No. yearlings grazed - On/Off	0/118	**0/157**	0/171	0/200	0/160	0/166	0/141	0/138	0/140	0/126
No. calves grazed - On/Off	0/141	**0/163**	0/200	0/170	0/160	0/194	0/190	0/156	0/150	0/126
Past eaten (dairybase) (tDM/ha)	-	**-**	17.9	17.2	16.2	16.9	17.3	16.8	14.9	15.7
Purch. Suppl - fed (kgDM/cow)	550	**317**	415	342	259	463	359	434	506.8	300
Made on dairy/platform (kgDM/cow)	0	**194**	95	64	144	160	154	93	0	40
Applied N/160 eff. Ha	-	**-**	164	200	185	260	340	350	250	143

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Contents

The New Zealand Dairy Farmer, their role in over supply of milk and low prices.

The current low dairy price is due to the ancient principal of supply and demand.

Demand

- Low demand from China. They over purchased 15 months ago and have taken this long to chew through their stock. China and Vietnam are now actively importing milk.
- China economy has slowed down.
- Oil prices have been low. Traditionally these countries are key customers, very little milk is produced in the Middle East & African oil producing countries. Oil prices effects their economies ability to purchase.
- Russian embargo on western imports. Dairy being one of the key commodities being hit.
- **A key number to remember that long term demand for milk globally is projected at an increased rate of 2 – 2.6 %.**

Supply

- Over production from New Zealand in the 2013/14 season +10% growth. This has since come back.
- Over production from the USA last season. They have come back quickly, however they are still on track to a 1.1 % lift in production on 2014 season.
- Australian Growth was 2.6 % in 2014/15. The first positive growth for a decade.
- Quota's coming off in Europe. This happened April, 2015. We were not sure how severe this would be on the supply / demand relationship. The timing was lousy, markets were already depressed with China pulling out and heavy supply of USA coming through too. Ireland lifted production by 9-10 % for the first few months after the quotas came off.

Feedback from Ireland and Europe is that like New Zealand, the dairy farmers are not making any money. However, reports in recent weeks still highlight that milk production levels are not easing. Friesland Campina, a Netherlands processor has run out of processing room while trying to deal with a 6.4 % lift in production. Remember, we only need 2.6 % to meet demand.

The result

How long does it take for the supply worm graph to turn ? New Zealand is a great example of this:

Season	Milk Price $/kgMS	Growth - Agrifax NZ Production Growth Estimates (June)
2013/14	$8.40	+10%
2014/15	**$4.40**	**+2.5%**
2015/16	$4.60	-3.00%

Table. *Estimates of growth in June season end from Agrifax and milk price payout. ($/kgMS).*

We did not see a dramatic change in attitude from farmers and the associated industry to production until **July 2015**, a full year into a low payout environment. The Agrifax payout forecast fell through the $5.00 mark in October 2014. Yet it was not for another 9 months before we noted significant change in industry attitudes.

Farmers are slow to respond:

- They have invested in infrastructure and see production as a way of paying for this.
- They do not like to cull a perfectly good cow, especially when no one wants to buy her (the farmer in us all).
- Farmers are optimists, at will come all right soon. It was not until July 2015 we got a good smell of the coffee and reality hit. A second year of low prices.

We may criticise the European farmer for overproduction. Producing milk at a loss and making it all the worse for us all. However, the New Zealand farmer has been guilty of the same behaviour. It is likely to take a bit more time to get through this slug of milk. New Zealand and USA have slowed down, but we need to wait for the 2.6 % long term demand to utilise the surplus product.

Looking Backwards

In June 2013 IFCN International Farm comparison Network stated *"Milk Demand is growing faster than supply"*. This is a world respected organisation ***who did not forecast*** the imbalance of supply and demand coming up. Farmers and dairy industries are difficult to predict. Rational behaviour in the short term does not always hold. Why did NZ farmers produce more milk when the price was so low, and take so long to respond?

The last 10 seasons payout has been $5.92/kgMS (dividend $0.31). The last 6 years $6.15 / kgMS (Dividend $0.28 / kgMS). How long is it going to take to get through the European/ Ireland milk production?

Factors Affecting Future Supply and Demand - Brain Storming:

Positive Effects

- Climate change. California is one of the biggest producers of export milk, with serious pressure on it's water resources. Lake Mead (hoover dam) is currently at 37 % of it's capacity.
- Environmental legislation. Similar themes to NZ are across Europe. This will slow production gains in the future. USA will catch up. Some states already are.
- Free trade agreements. Industry leaders are all positive about the impacts of the latest rounds of free trade agreements (TPP). Canada for instance still has 200 % tariffs on milk imports.
- Russia. One day they will start buying again.
- New markets, India, Asia. New Zealand in situated well to exploit these.

- Chinese child birth policy, now two. However with 2 generations of one child families, this is likely to take a long time (if ever) to take effect.

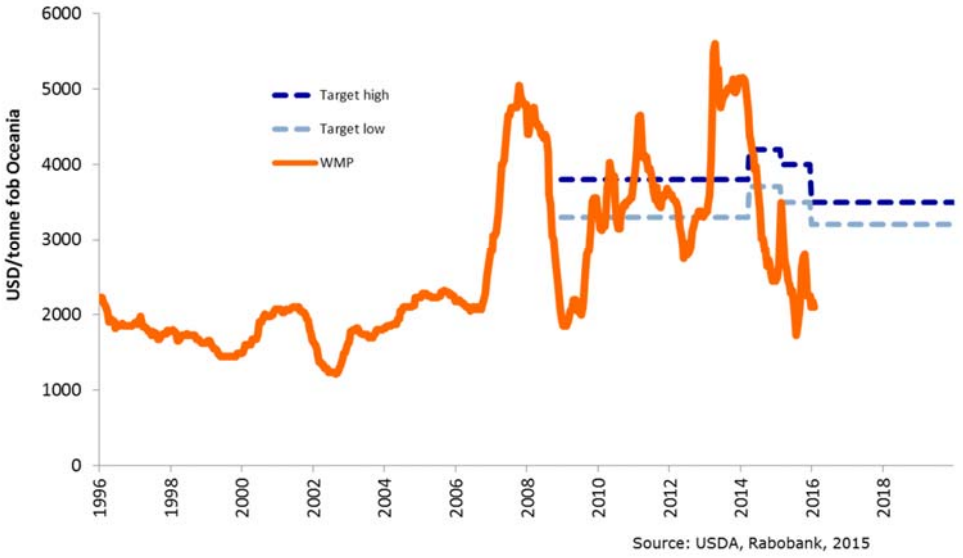
Negative Effects

- Continued slowdown of the Chinese economy and infrastructure build. This affects more than just China. The USA economy also
- Alternative sources for protein – technology. 75 % of Russian cheese is fake (Palm oil based)
- Increased supply from Europe. There is still plenty of scope in Eastern Europe to grow crops and milk cows.
- China – doing it themselves. Food security, just like water and energy security becomes important, especially for paranoid countries.
- Food safety slip ups. Fonterra Botulism.

Professor David Hughes (Doctor Food) "*In the last 30 years, the worlds population has doubled. 30 years ago, we wondered how we could cope feeding the world in the future. But we have proven that we can grow more than enough food".*

Jeremy Savage is a Farm Consultant with Macfarlane Rural Business in Ashburton. Focus on farm systems, profitability, governance and succession of farming businesses. Email: jeremy @mrb.co.nz.

Rabobank see prices returning to more sustainable levels



LUDF Strategic Objective 2011-2015

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 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.*

2011/12 to 2013/14

The strategic objective (above) was implemented in a move into 'Precision Dairying' in the 2011/12 season. This focused on minimum standards not averages, two herds, higher productivity and initially higher profitability from a similar environmental impact. Production lifted to 1878kgMS/ha or 477kgMS/cow from 630 cows and costs were similar per kgMS in 2011/12 and 2012/13.

The temporary suspension of Eco-n (DCD) in 2013 required a change in farm practice in 2013/14 in the attempt to hold nitrogen losses without the mitigation effect of Eco-n. The farm had to cull its surplus cows early in autumn 2014 to meet the farms N-loss target (at a cost of $84,000 in loss profit).

2014/15 and 2015/16

In 2014/15 LUDF adopted a 'Nil-Infrastructure, low input' farm system emerging from the P21 (Pastoral 21) research programme, in response to the tightening environmental requirements of some catchments across NZ, and to meet its historical N-loss (as above). In essence LUDF sought to upscale results from the P21 – LSE herd where 3 years of data have shown similar total production and profit was achieved with less total N-leaching than had occurred at LUDF.

The systems targets and results for last season, and targets for 2015/16 are as follows:

	2014/15 Target	**2014/15 Result**	**2015/16 Target**
Stocking Rate	3.5 cows /ha		
Nitrogen Fertiliser Input	150 kgN/ha	143 kgN/ha	160-170kgN/ha
Imported Supplement	300 kgDM/cow + winter off		
Milk Production	500 kgMS/cow and 1750 kgMS/ha	498 kgMS/cow and 1742 kgMS/ha	> 500 kgMS/cow and > 1750 kgMS/ha
Farm Working Expenses	$4.00 /kgMS	$3.87 /kgMS	$3.80 /kgMS

Summary of Performance – Results to the End January:

	2012/13	2013/14	2014/15	2015/16
Total kgMS sold	198,000 kgMS	197,000 kgMS	184,000 kgMS	190,000 kgMS
Total Cows in Milk	624	620	549	548
Total N fert applied	270 kgN/ha	184 kgN/ha	100 kgN/ha	129 kgN/ha
Total Silage Fed/cow	251 kgDM/cow	460 kgDMcow	141 kgDM/cow	114 kgDM/cow
Total Silage Fed tDM	158 t DM	290 t DM	79 t DM	64 tDM
Whole Herd WOW	490 kg	482 kg	493 kg	497 kg
Herd Ave CS	4.5	4.2	4.2	4.3 (mid Jan)
Silage made on farm (tonnes DM)	49 (78 kgDM/cow)	0	22 (40kgDM/cow)	125 (223 kgDM/cow)

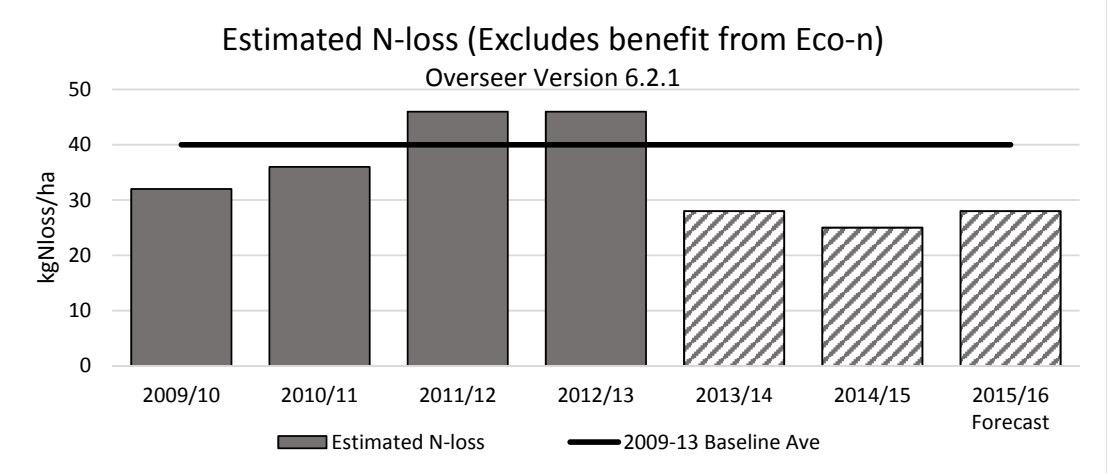
Comparing LUDF results across seasons:

This season and last season are very similar to date. Compared to the previous farm systems operated at LUDF, results thus far show

- Very similar milk production, (4% less than 2012/13, but 3% higher than last year)
- from 12% fewer cows with the use of
- approximately 50% less nitrogen fertiliser and
- on average less than one third previously purchased silage.

In addition, whole herd liveweight and average cow condition remain similar. Farm Working Expenses are lower this season, see below for details.

Indicative N-losses across years / farm systems at LUDF:



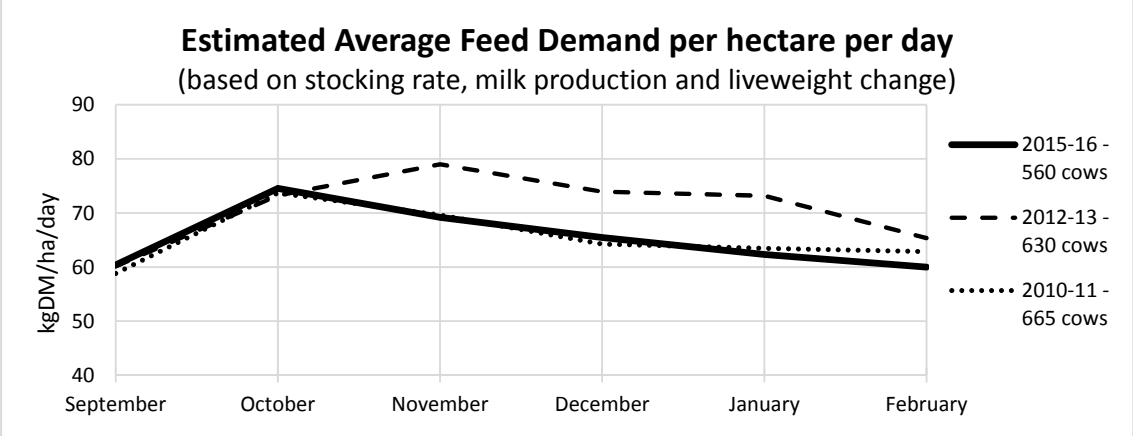
Note: N-losses are indicative only.

Brief Financial Comparison between 2012/13 Inputs and 2015/16 Inputs, using 2015/16 expenses and forecast milk price

	2012/13 Inputs	2015/16 Inputs
Variables		
N fertiliser (kgN/ha/yr)	350	165
Peak Cows milked	630	555
Imported Silage (tot tDM)	273.42	83.25
Total Milk Production	300484	280000
Milk Income	$1,333,851	$1,242,658
Net Stock Income	$123,378	$108,690
Gross Farm Revenue	**$1,457,229**	**$1,351,348**
Cow Costs	$482,029	$424,645
Feed Costs (incls N)	$382,694	$190,149
Staff	$237,176	$237,176
Land	$156,693	$149,127
Total FWE	**$1,258,592**	**$1,001,097**
FWE/kgMS	$4.19	$3.58
Depreciation est.	$116,000	$116,000
Total Operating Expenses	$1,374,592	$1,117,097
Dairy Operating Profit	**$82,636**	**$234,252**
DOP/ha	$516	$1,464

Notes:

1. Cow costs are those that are primarily dependent on the number of stock on farm. This includes wintering and replacement costs.
2. Feed costs cover silage, regrassing, irrigation etc.
3. While the above analysis is open to interpretation, it indicates the likely impact higher cow numbers and feed demand would have at LUDF if using this seasons expenses and forecast income. Expenses have been scaled based on the relative stocking rate / feed demand / milk production in 2012/13 compared to 2015/16.



LUDF – Financial Analysis:

Initial budget and revisions through the season

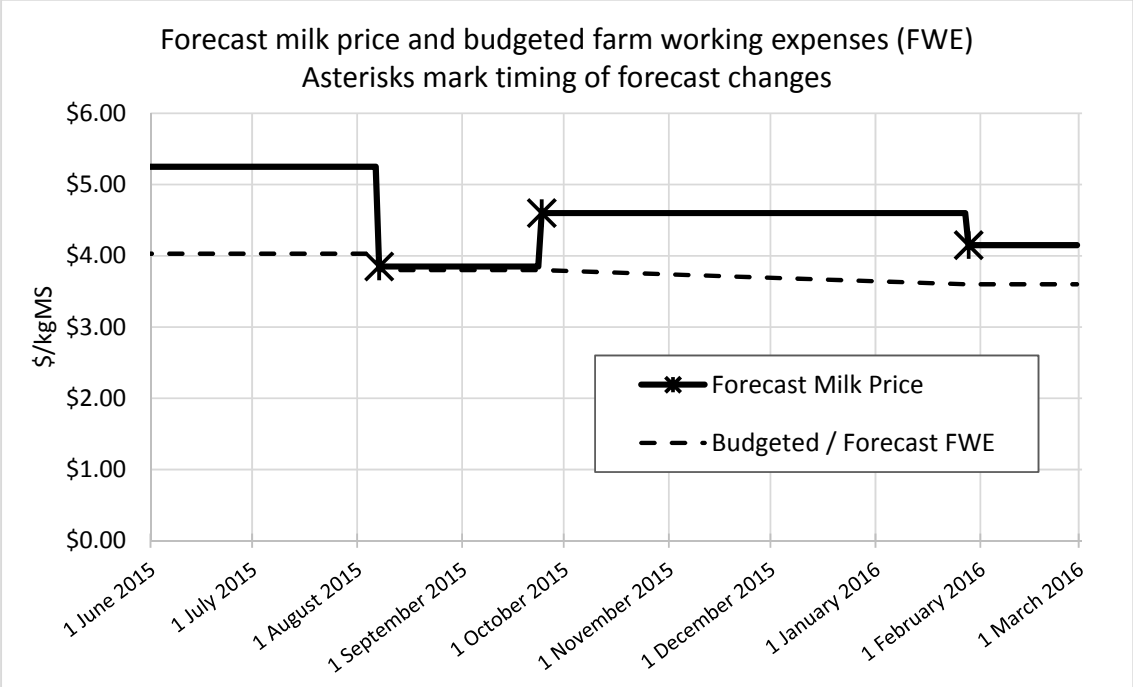
The initial budget – established late autumn 2015 - anticipated expenses of $1,129,000, milk production of 280,000 kgMS, FWE of $4.03/kgMS and an indicative milk price at the time of $5.25/kgMS. This was in essence replicating the farm system of 2014/15, with a planned reduction in regrassing from 15% of the farm to 10% of the farm. The reduction in area regrassed was expected to reduce the pressure on total feed supply (particularly in late Summer /early autumn) enabling the farm to milk cull cows for longer and thus increase total milk production.

The increase in farm working expenses from $3.87/kgMS in 2014/15 to $4.03 budgeted for 2015/16 reflected a potential increase of $51,000 expenditure. The two major areas driving this were budgeting to fully staff the farm for 12 months (compared to 2014/15 where one staff member resigned in April and was not replaced till the end of June) and the increased cost of winter feed following the 2014/15 summer drought. Other costs had varied up and down relative to the 2014/15 actuals.

Decreases in forecast milk income through the 2015 winter required a review of expenses for the 2015/16 season. Whilst needing to maintain the longterm productivity of the farm, and avoid deferring costs that would be greater in the future (such as necessary R&M), FWE of $4.00 were not sustainable with a forecast milk price at that time of $3.85/kgMS.

A line by line review of expenses resulted in a reduction of 20 cents per kgMS, primarily achieved by reducing maintenance fertiliser to half normal levels and stopping all regrassing – other than repairing any pasture damaged through early spring grazing. The detailed review also highlighted some minor but cumulative errors in the budget spreadsheet – which added some costs that had not been flowing through to the total expenses. Fertiliser expenses were cut to half pending soil test results from each paddock to determine how much may be needed. The farms use of milk powder for calf rearing was to be replaced with whole milk, however the subsequent reduction in calf milk powder price reversed this decision, with milk powder at an equivalent price of approximately $4.00/kgMS.

Following the late September milk price increase to $4.60 the farm considered adding back some of the initially budgeted maintenance expenditure (primarily fertiliser and regrassing) but determined the farm needed to hold the line to the revised budget. Maintenance fertiliser could be applied in the autumn once the payout was more certain. Deteriorating international market prices over the summer and the January decrease in forecast milk price has reinforced the merit in holding to the previously revised 'survival' budget of August 2015.



The graph above clearly shows the challenge throughout the season of running the farm in a long term sustainable manner (with appropriate reinvestment and maintenance of farm productivity) given the variation in forecast income. LUDF's budget revisions in August 2015, and very tight control on spending all season have resulted in an acceptable, short term survival position. Looking ahead to future years, the farm needs to quickly return to a sustainable budget and level of ongoing investment to maintain the productive capacity of the farm.

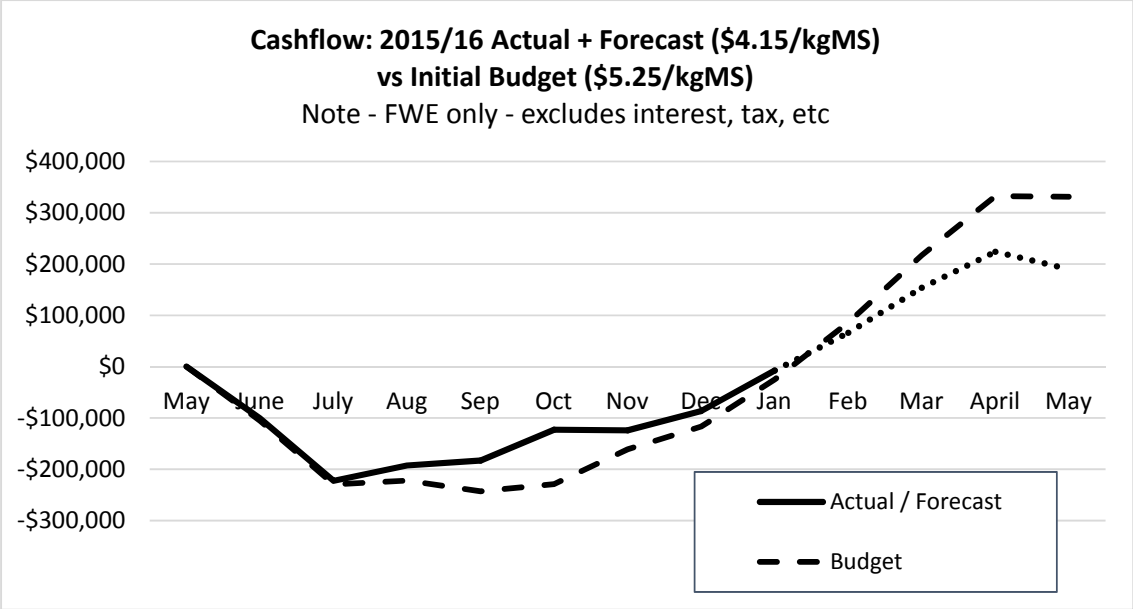
Expenses to date and Forecast Year End result:

Cashflow:

A monthly cashflow budget vs actual to date and forecast for the remaining season follows. The budgeted cashflow was based on the initial budgeted expenses, milk production and advance milk price, with overdraft interest added. Note budgeted revenue is based on $5.25 milk income (as forecast at the beginning of the season).

Actual / forecast revenue and expenses by comparison is calculated from current milk production plus remaining budgeted milk production multiplied by revenue received / forecast for remaining season, less actual expenses incurred to date, and remaining months budgeted expenses. Again, overdraft interest has been added. Milk price has been adjusted based on the revised advance rates and forecast milk price of $4.15/kgMS (as at 28 January 2016).

Note the cashflow only depicts the production year (June to end May) and only reports income and operating expenses (without debt servicing, tax, capital reinvestment etc. The cashflow graphically shows the decrease in end of year forecast cash, from over $330,000 to under $200,000.



Variances in Expenses to date (compared to budget)

As above, the budget is as agreed prior to the beginning of the season. Since then changes to the budget have been made, in response to the declining and variable forecast milk price. Throughout the season all comparisons of expenses are against initial budget, to compare progress over time. The exception is revenue in the above table, which has been updated to the current forecast milk payout. This reflects the change in forecast profit if the farm had not responded to a changing forecast milk price.

Major Variances (see table below):

1. Budgeted sale of surplus AI heifers has not occurred ($21,850). The farm has 15 empty heifers which are still to be sold however as a result of this number of MT's will not have any surplus heifers for sale. Offsetting this, the bulls exceeded their budgeted income when sold, as have cull cows sold to date and surplus calves.
2. Animal health costs are higher overall with increased expenditure (compared to budget) on Mastitus, teat spray, and small increases across a range of items. Drench costs and Bloat oil are under budget at present, largely a timing variation.
3. Breeding expenses are lower, largely the result of using bulls rather than AI for the heifers ($2500), and savings in replacement tags and protrack maintenance.
4. LUDF has not achieved savings in replacement grazing costs to date but reduced expenditure on calf meal and milk powder by $10,000.
5. High quality grass silage was purchased early in the season at a lower price than budgeted (The same tonnage was acquired).
6. As detailed in the October focus day and October focus day notes, very little GA was applied this season.

7. Effect of application cost of nitrogen not flowing through to initial budget.
8. (Short term) savings from not applying maintenance Phosphate fertiliser (see October Focus day notes).
9. September and January rainfalls have contributed to savings in irrigation electricity. R&M on irrigation to the end of January is under budget but will change with motor replacements occurring in February.
10. Minimal regrassing required to patch damaged pastures from early spring grazing, coupled with earlier decision to only regrass 1 paddock rather than 2 has created significant savings in this financial year.
11. Delayed start to the employment of a new farm assistant reduced staff expenses in June, coupled with a gap between the resignation of our other farm assistant in November and a short term replacement in February has delivered savings in employment expenses, but inhibited some staff leave – thereby contributing to a future cost for the farm.
12. Silowraps and more efficient refrigeration (investments in 2014-15) are resulting in less electricity usage at the shed compared to past years.
13. Overall effect of limiting all spending – with small savings across most areas of R&M, except for some repairs associated with the cowshed
14. Price reductions in petrol and diesel contributed nearly $4000 in savings, however the delayed replacement of the 4-wheeler has incurred higher than anticipated maintenance costs for this vehicle. Ute and tractor R&M to date is below budget.
15. Overall - significant saving to date against budget – some are primarily timing differences, but most will contribute to annual savings. The overall expenses however be considered in light of the required level of fertiliser, regrassing, R&M etc to maintain the ongoing productivity of the farm.

Sensitivity to Production:

LUDF farm profit remains very dependent on high production to offset costs and dilute farm working expenses per kgMS. Decreasing the area regrassed has enabled the farm to make silage on farm and thus potentially push more feed into the autumn. Autumn milk production will not be pursued at risk of jeopardising next seasons production (cow condition or pasture cover).

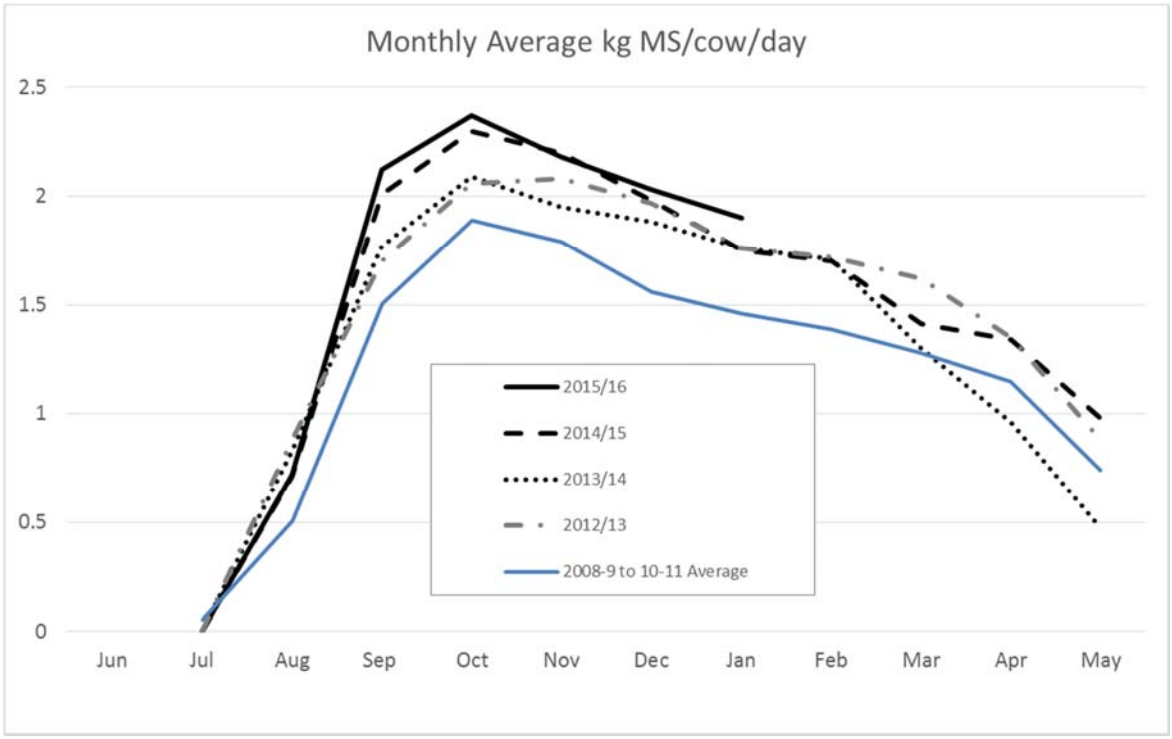
Production level	**275,000 kgMS**	**280,000 kg MS**	**285,000 kgMS**
Forecast Farm Working Exps	$1,001,000	$1,001,000	$1,001,000
FWE/kgMS	$3.64	$3.58	$3.51

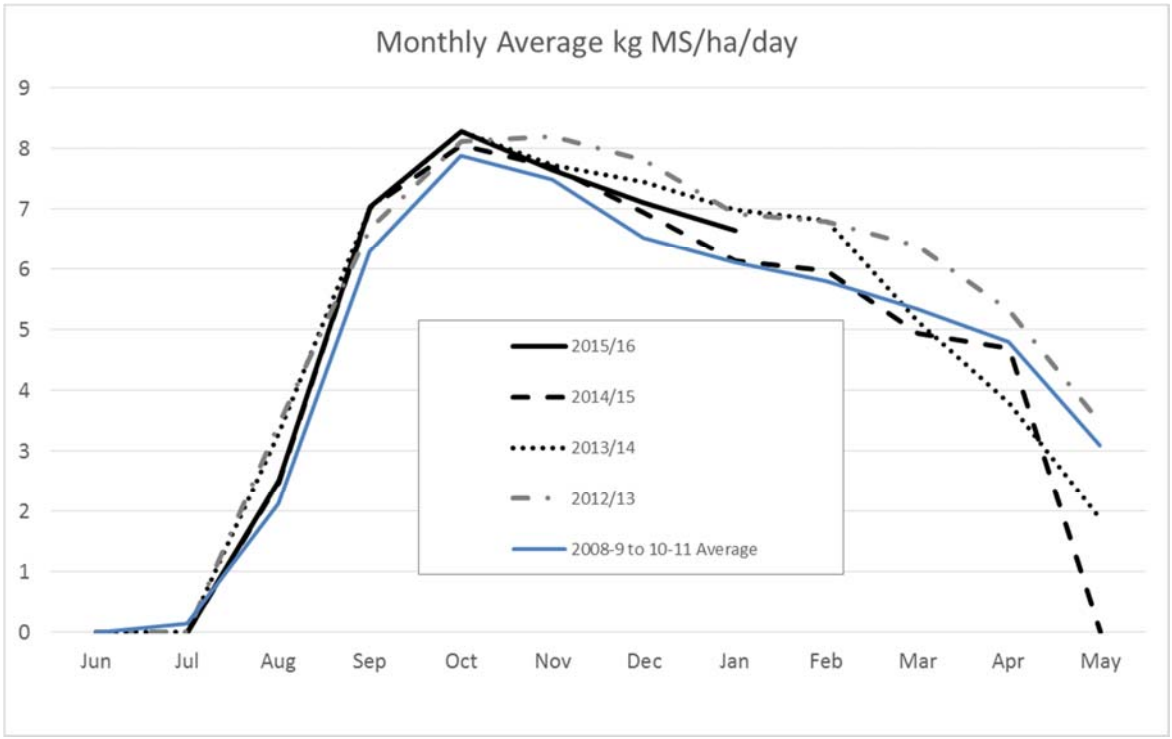
For more details on the expenses please refer to the LUDF October Focus Day notes (available on www.siddc.org.nz).

Year ending May 31	2015/16 Budget (May 2015)	Actual to end Jan	Budget to End Jan	Variance (Act - budg)	Forecast Year End	Notes
Milk production (kgMS)	280,147	192,300	192,506	-206	279,941	
Staff – 3.7 full time 160ha	1751 /ha				1750 /ha	
Peak Cow Nos and Prod.	560					
Income Milksolid Payout	$4.15 / kg MS					
Dividend /share	$0.33 / share					
Milksolid Revenue	$1,162,610	$798,045	$798,900	-855	1,161,755	
Dividend	$91,048	$62,498	$62,564	-67	90,981	
Surplus dairy stock	$138,510	$37,490	$44,110	-6,620	131,890	1
DairyNZ Levy	-$10,085	-$6,923	-$6,930	7	-10,078	
Stock Purchases	-23,200	-26,960	-26,960		-23,200	
Gross Farm Revenue	**$1,358,883**	**$864,150**	**$871,684**	-$7,534	1,351,348	
Expenses				$0	0	
Cow Costs Animal Health	$54,200	$40,291	$36,320	$3,971	58,171	2
Breeding Expenses	$39,215	$36,201	$39,816	-$3,615	35,600	**3**
Replacement grazing & meal	$139,766	$82,391	$91,554	-$9,163	130,603	**4**
Winter grazing - Herd + freight	$200,772	$186,521	$187,022	-$501	200,271	
Feed Grass silage purchased	$70,502	$58,425	$70,502	-$12,077	58,425	**5**
Silage making & delivery	$9,728	$9,285	$9,728	-$443	9,285	
Giberillin	$13,120	$234	$9,120	-$8,886	4,234	**6**
Nitrogen	$32,754	$33,453	$32,428	$1,025	33,779	**7**
Fertiliser & Lime	$33,317	$11,302	$32,317	-$21,015	12,302	**8**
Irrigation - All Costs	$70,600	$38,162	$45,292	-$7,130	63,470	**9**
Re-grassing	$25,535	$8,654	$25,535	-$16,881	8,654	**10**
Staff Employment	$260,400	$145,261	$168,485	-$23,224	237,176	**11**
Land Electricity-farm	$37,200	$16,591	$23,200	-$6,609	30,591	**12**
Administration	$24,700	$13,585	$14,384	-$799	23,901	
Rates & Insurance	$21,020				21,020	
Repairs & Maintenance	$54,500	$26,911	$39,296	-$12,385	42,115	**13**
Shed Expenses excl. power	$9,850	$7,490	$9,472	-$1,982	7,868	
Vehicle Expenses	$31,336	$16,452	$24,939	-$8,487	22,849	**14**
Weed & Pest	$500	$783	$500	$283	783	
Cash Farm Working Expenses	**$1,129,015**	**$731,992**	**$859,910**	-$127,918	1,001,097	**15**
FWE/kgMS	**$4.03**				**$3.58**	
Depreciation est.	$116,000				116,000	
Total Operating Expenses	$1,245,015	$731,992	$859,910	-$127,918	1,117,097	
Dairy Operating Profit	$113,868				$234,252	
DOP/ha	**$712**				**$1,464**	
Cash Operating Surplus	$229,868				$350,252	
Cash Operatg Surplus per ha	**$1,437**				**$2,189**	

Update on LUDF performance season-to-date

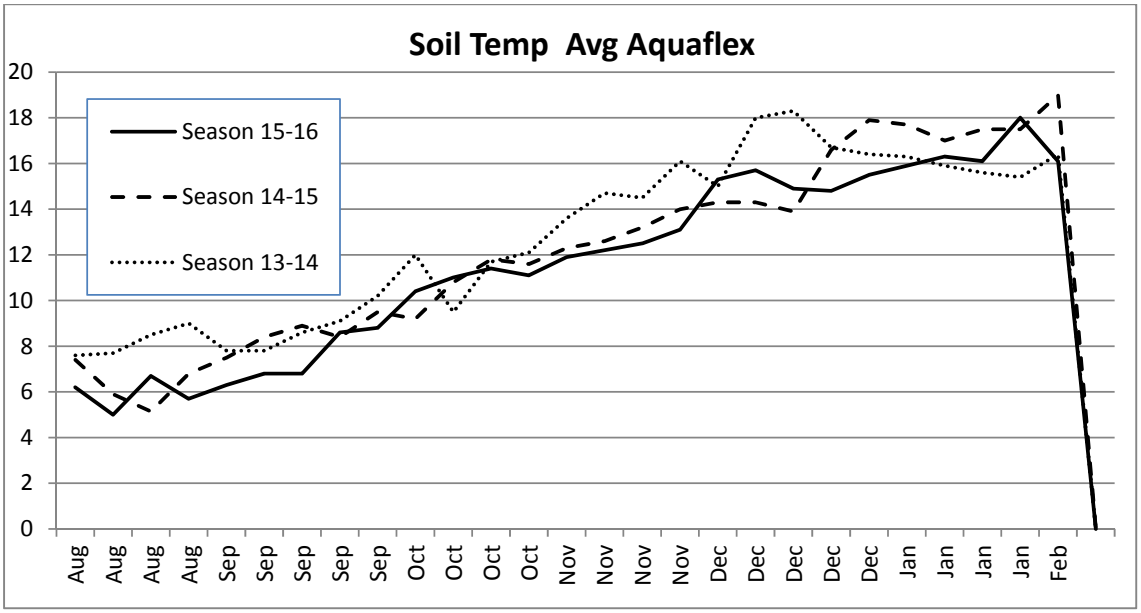
Milk production

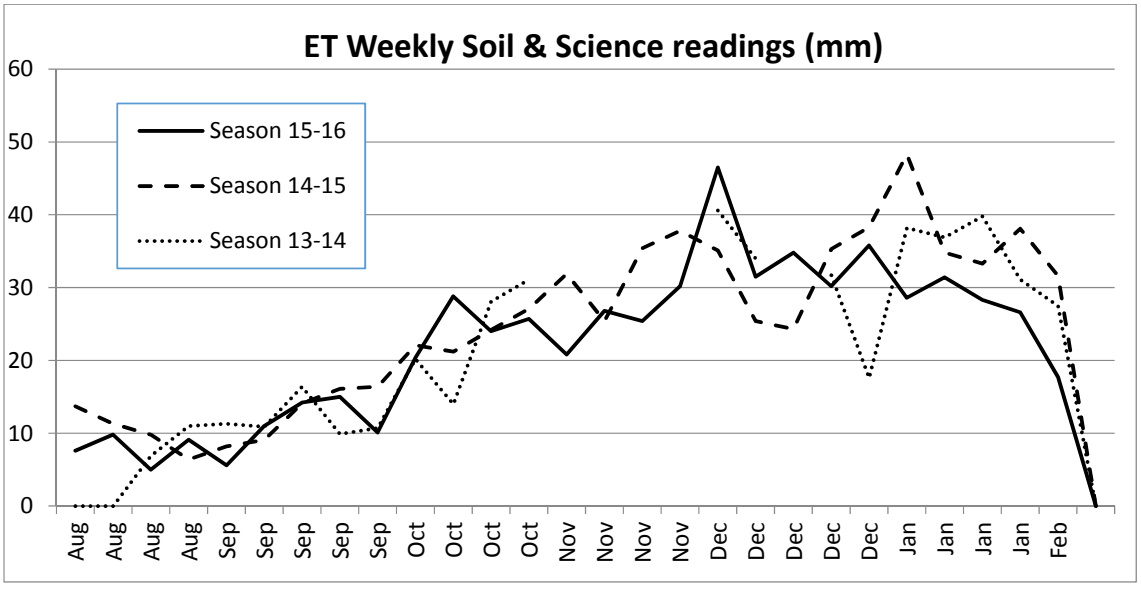


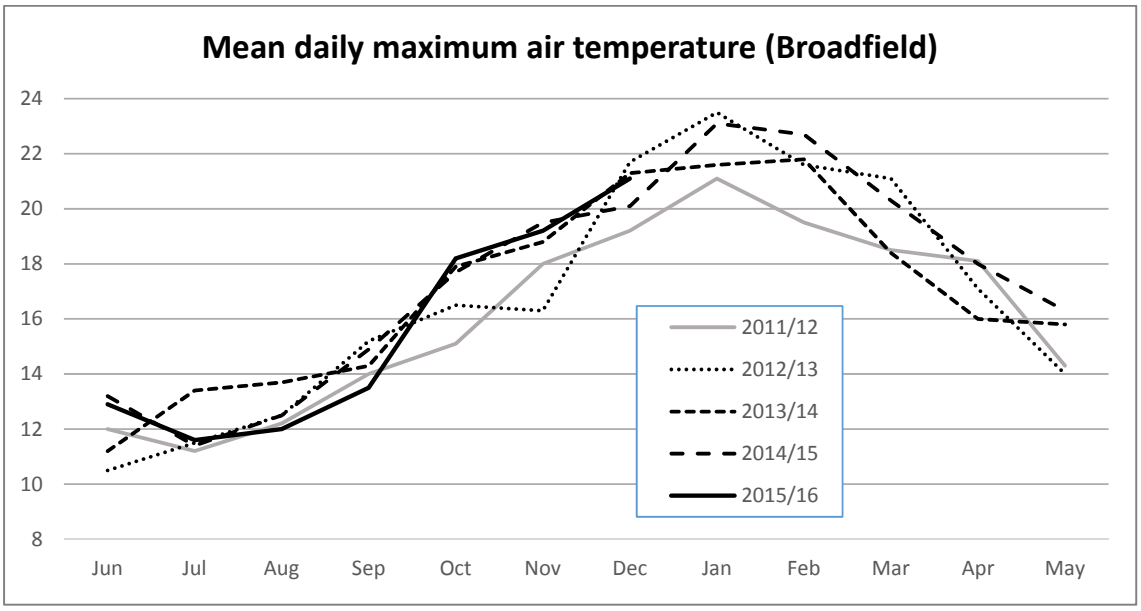


LUDF has carried 5 less cows than last season through the whole season, however this has had little to no effect on milk production on a per cow or per hectare basis. The main difference with respect to season 2014/15 is that cows peaked a little higher (almost 2.5 kgMS/cow/day) and held better through December and January. The decline from peak has been smoother this season also. This has resulted in LUDF being 2% ahead of last season in terms of Season-to-date production.

Weather and Environment

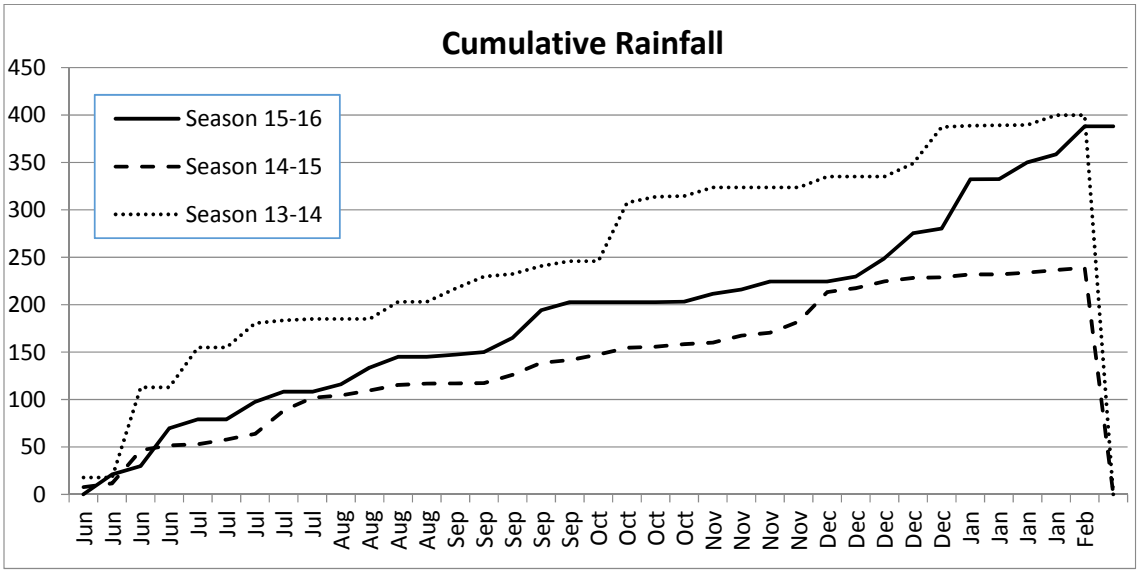


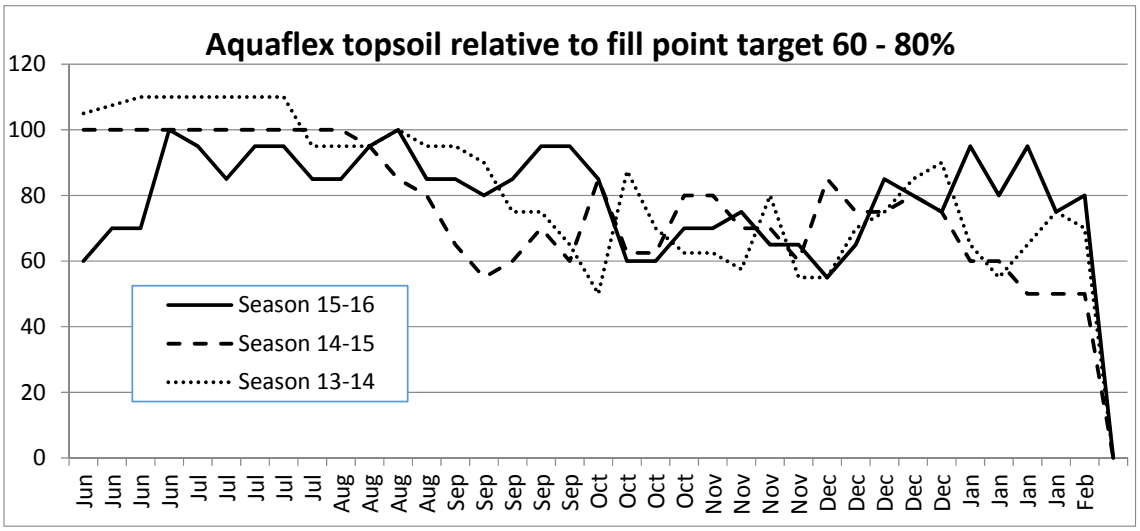


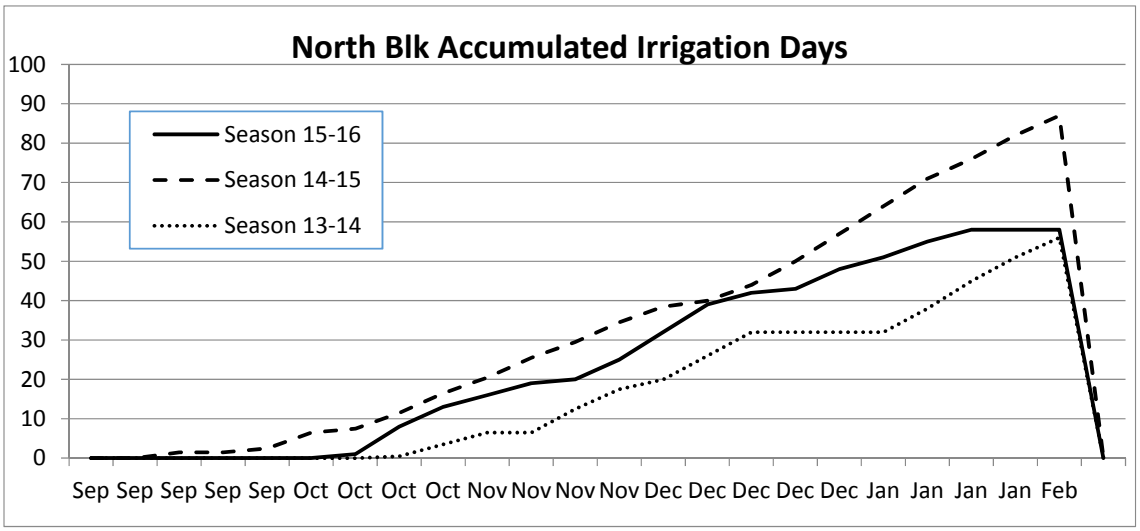


In general, the region has enjoyed a hot summer, with some cooler temperatures through January. Spring North-westerly winds, although present, have not been nearly as numerous or strong as last season.

Both air temperature and soil temperatures have been below last season's levels through the whole period, except for some readings in the month of December.

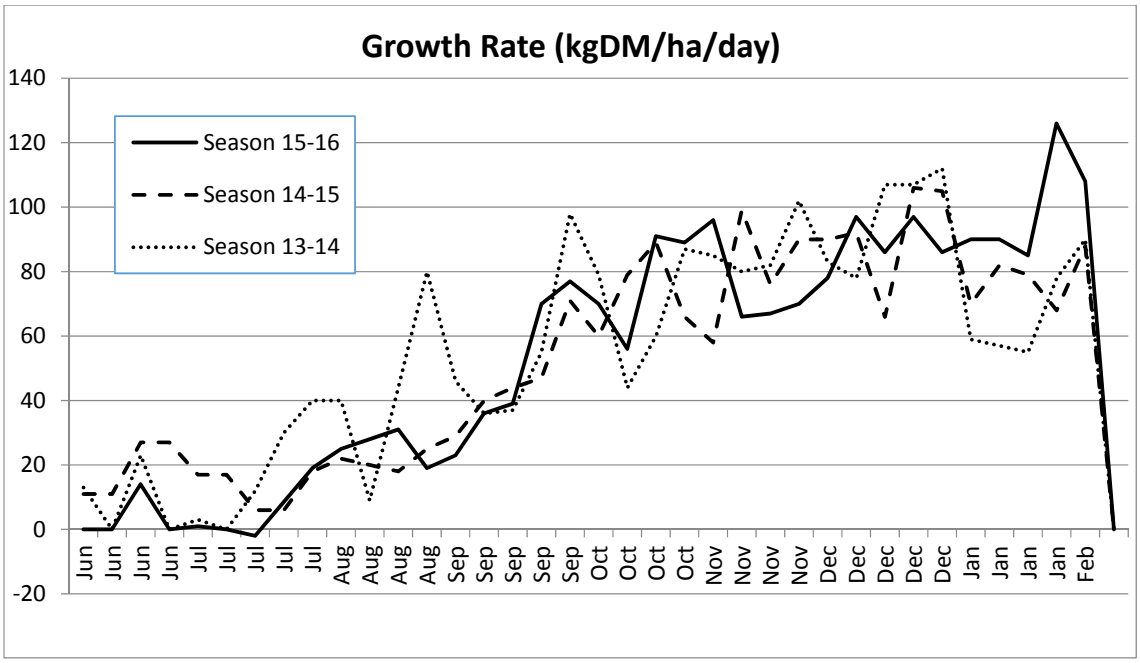


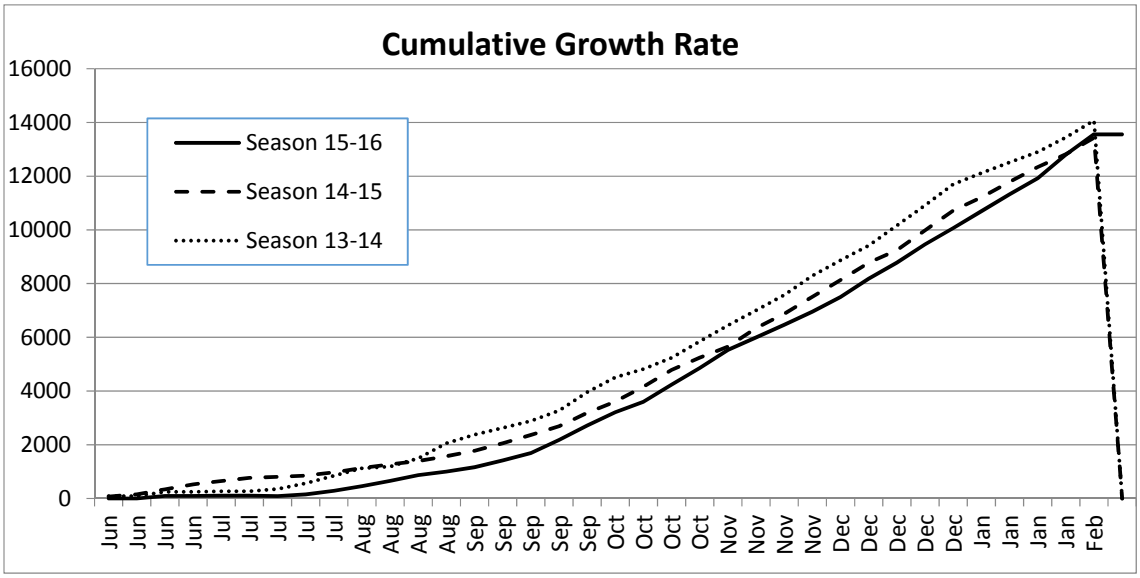




Januarys welcome rainfall enabled irrigation to be turned off for part of this period, and helped ensure optimal soil moisture was maintained through most of the season. This was a welcome contrast to the anticipated dry summer.

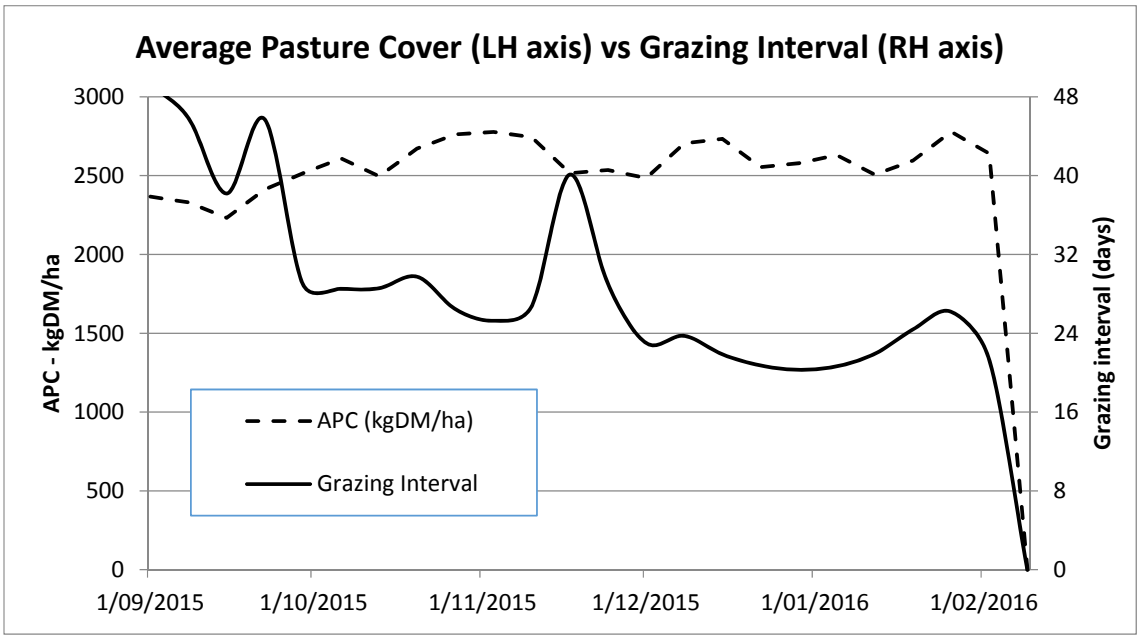
Pasture Management (grazing and quality)

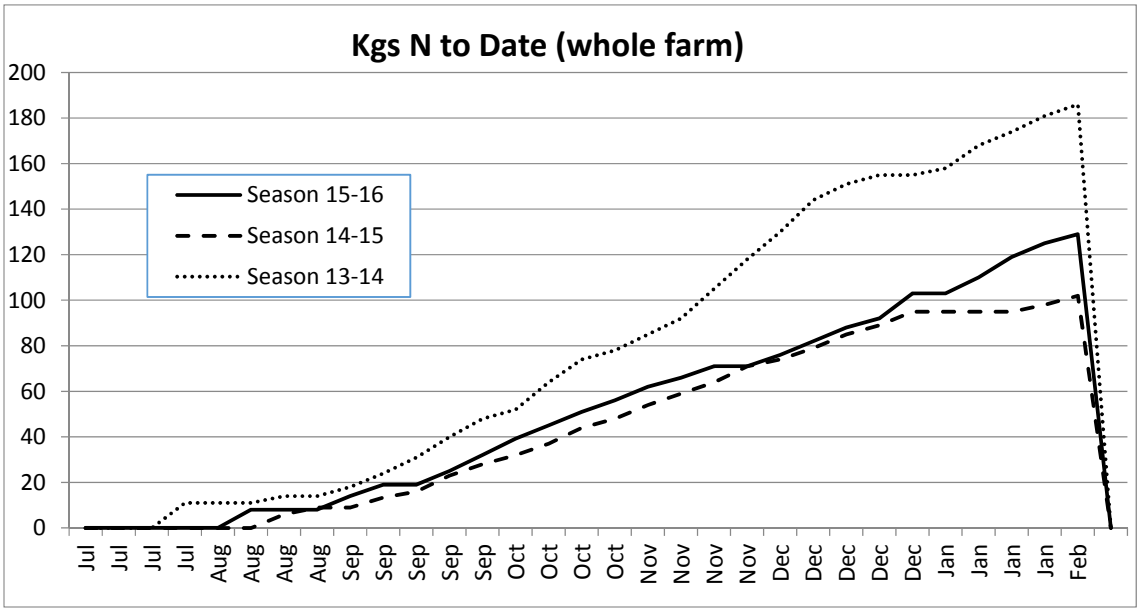




Growth rates have remained slightly below those of previous seasons with the exception of the month of January and February-to-date. The break from high temperatures and dry conditions in January, with the rain and cooler temperatures, has resulted in very high growth rates through this month.

The total amount of grass grown was lower than previous seasons's right up until mid January, when high growth rates contributed to a lift compared to past seasons.

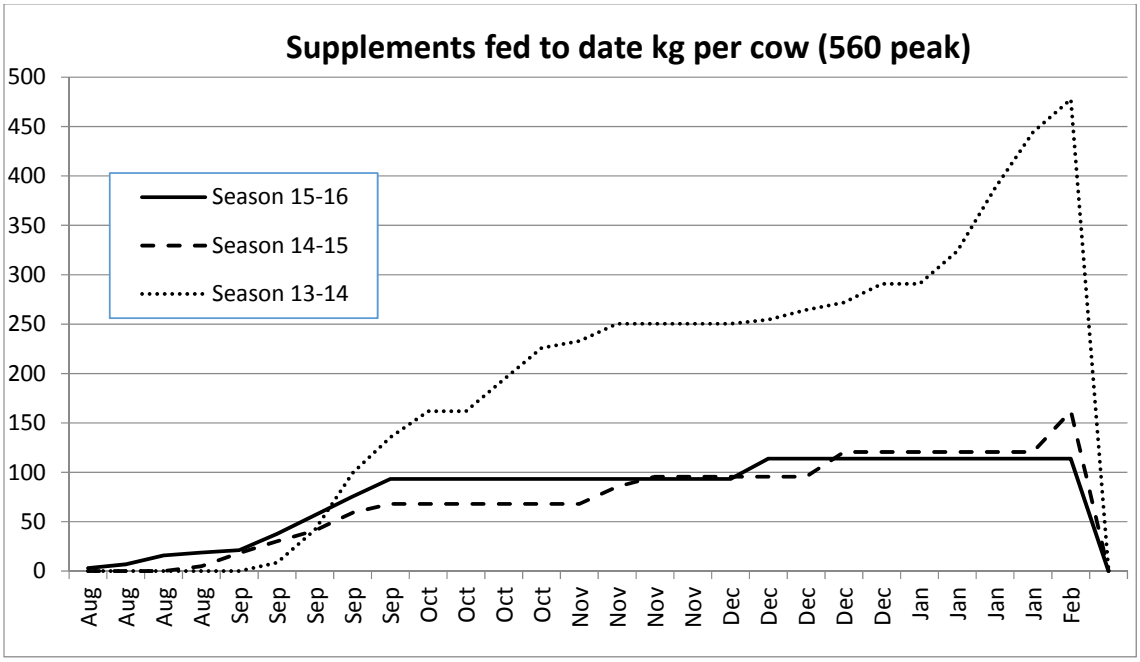




Having had one season experience running this system, plus the challenge of the volatile but low forecast milk price, a number of changes were made to the way grazing was managed:

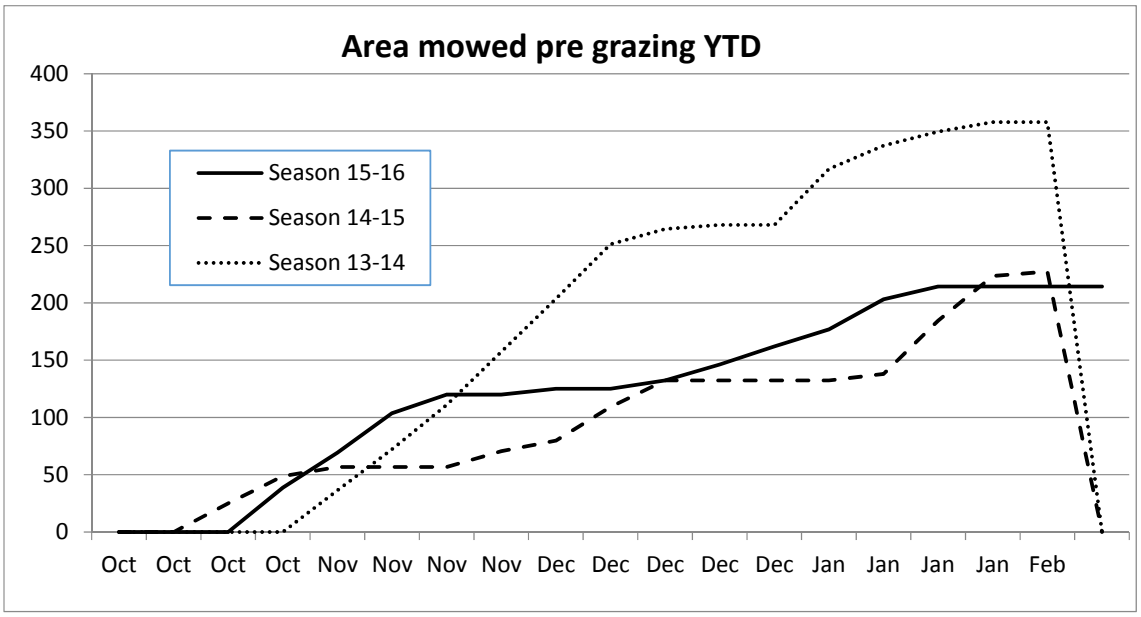
1. There has only been 1 paddocks regrassed (to reduce expenditure). This resulted in more pasture available for grazing through high growth periods when regrassing is typically undertaken at LUDF.
2. A little more Nitrogen was used through the summer to avoid, as much as possible, the drop in pasture quantity and quality observed in the previous season when effectively no N was applied in January. (Overseer results indicated only a small increase in potential N-loss was likely from the addition of up to 30kgN applied in January).

3. The grazing rotation in November was slower than the previous year (around 30 days average this season).
4. December had an average round length of 22 days and January was similar when including the whole area. This resulted in more pasture available and the need to harvest true surpluses for silage.
5. Silage was harvested in early November, early and late December, mid and end January and early February this season, compared to early December and mid-January in season 2014/15.

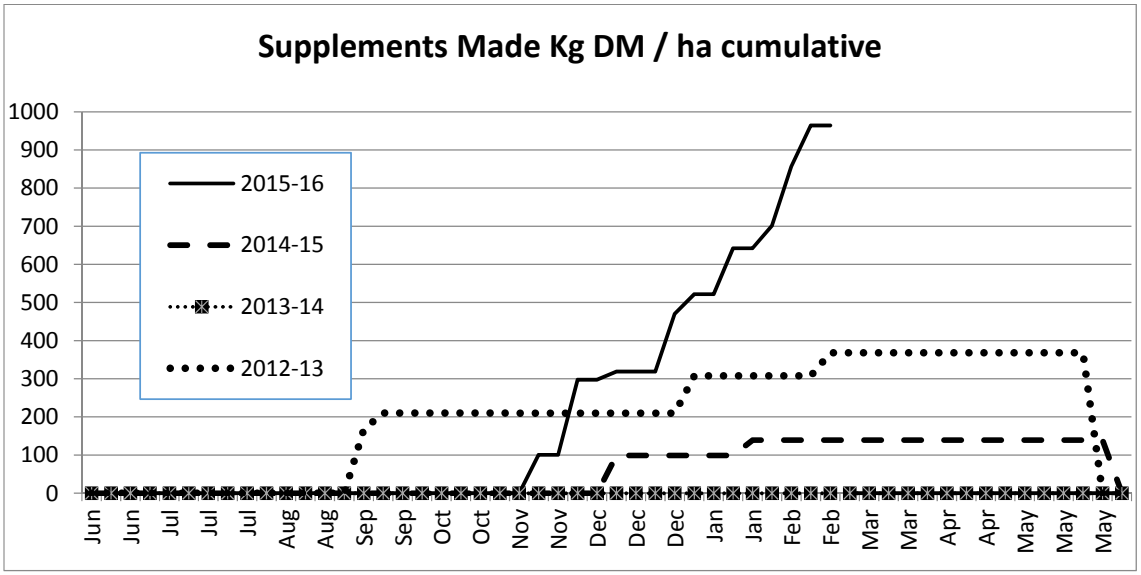


Supplement use was higher than past years in the early part of calving – the result of cooler winter temperatures and little winter growth. Strategic use at that time to hold to the spring rotation planner, yet meet cow requirements resulted in pastures able to grow well through spring, and the herd able to consume high quantities of pasture.

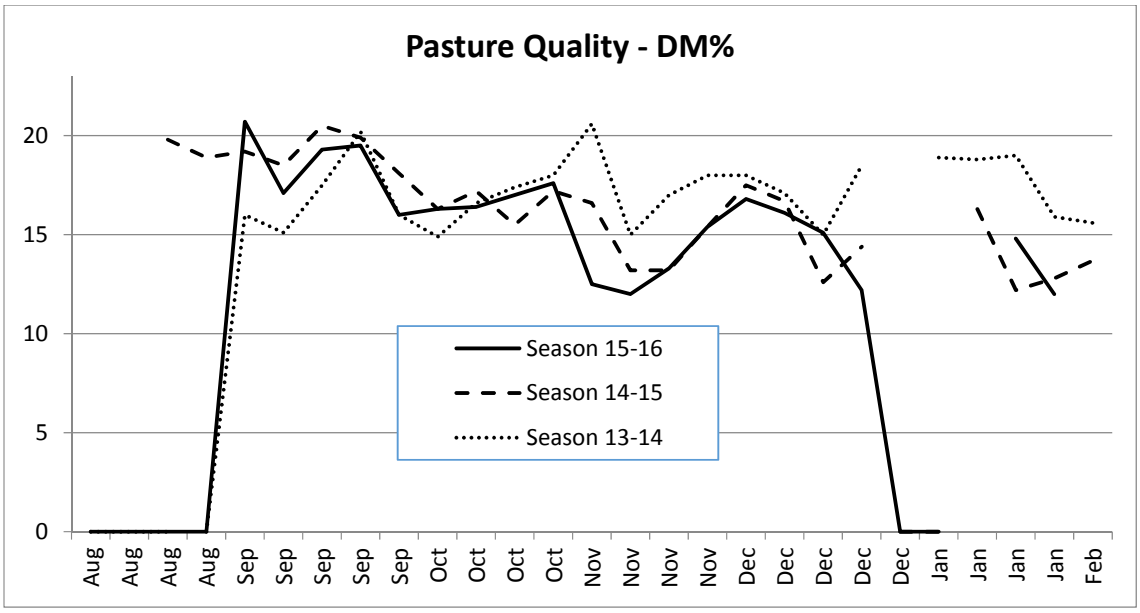
Cows have been fully fed on pastures for most of the summer period (except one week in early December), which has resulted in less supplements fed to-date.



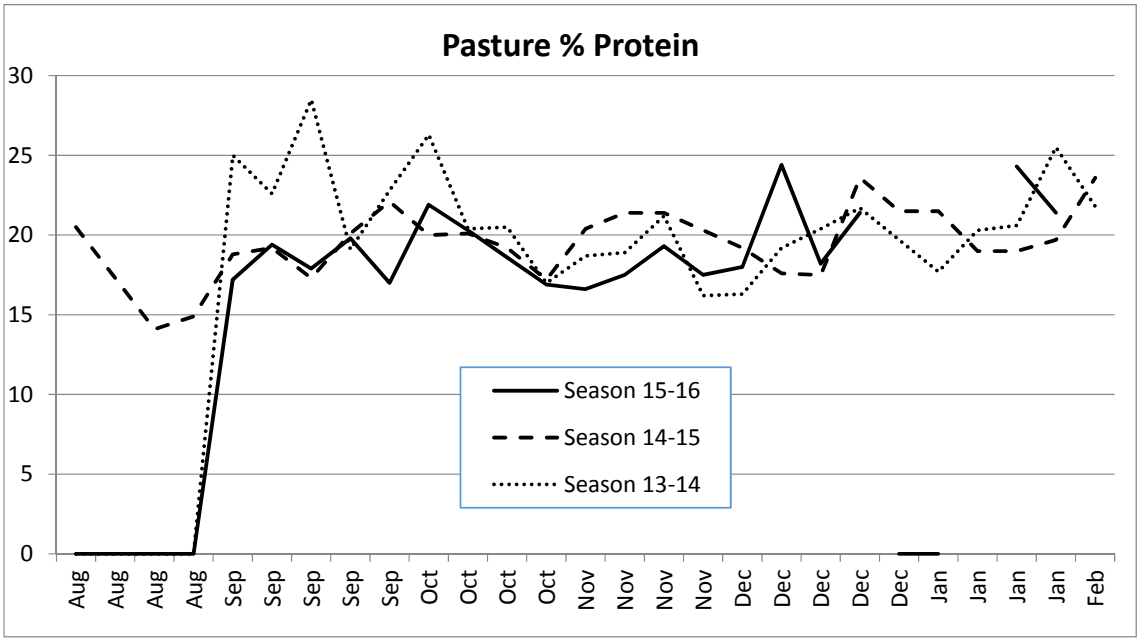
Area mown pregrazing is shown above, and is similar to last year. In addition, the silage harvested on the platform this year has contributed a further 75 ha mowing, such that effectively the whole farm has been mown twice through the grazing season.



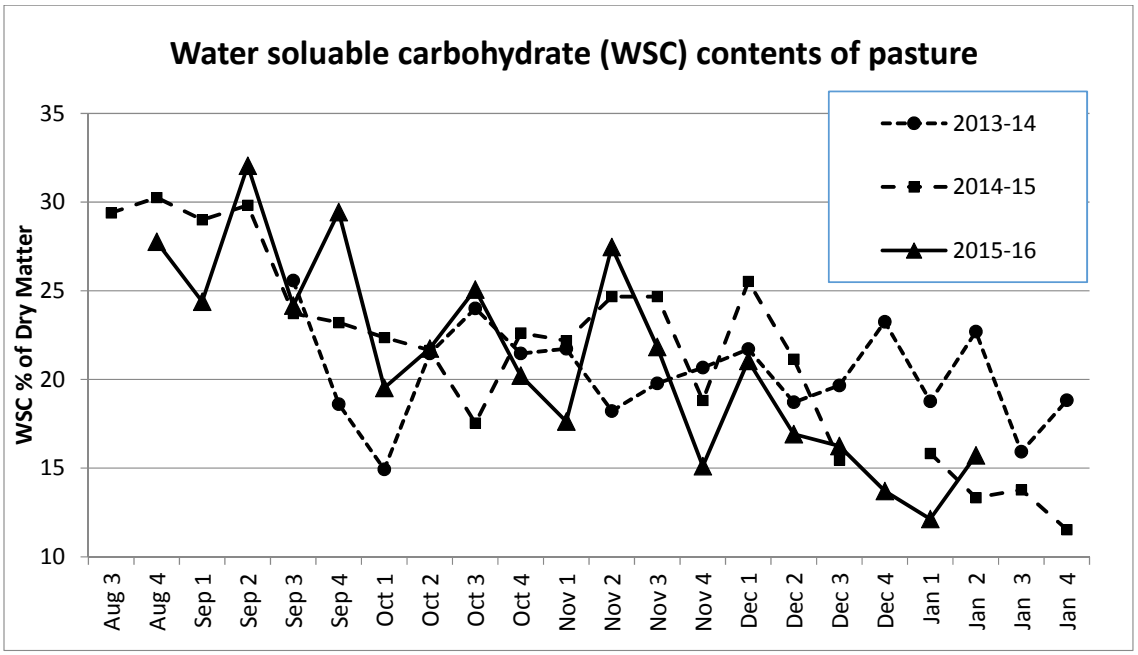
Pasture Quality



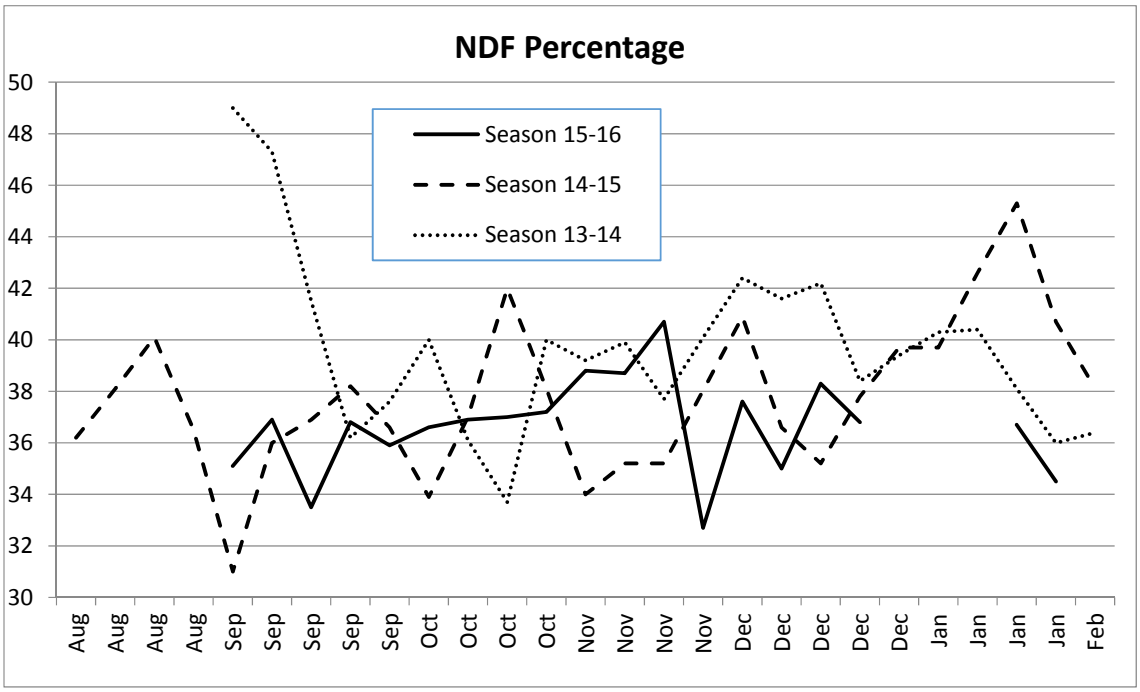
Pasture DM% broadly reflects trends from previous years

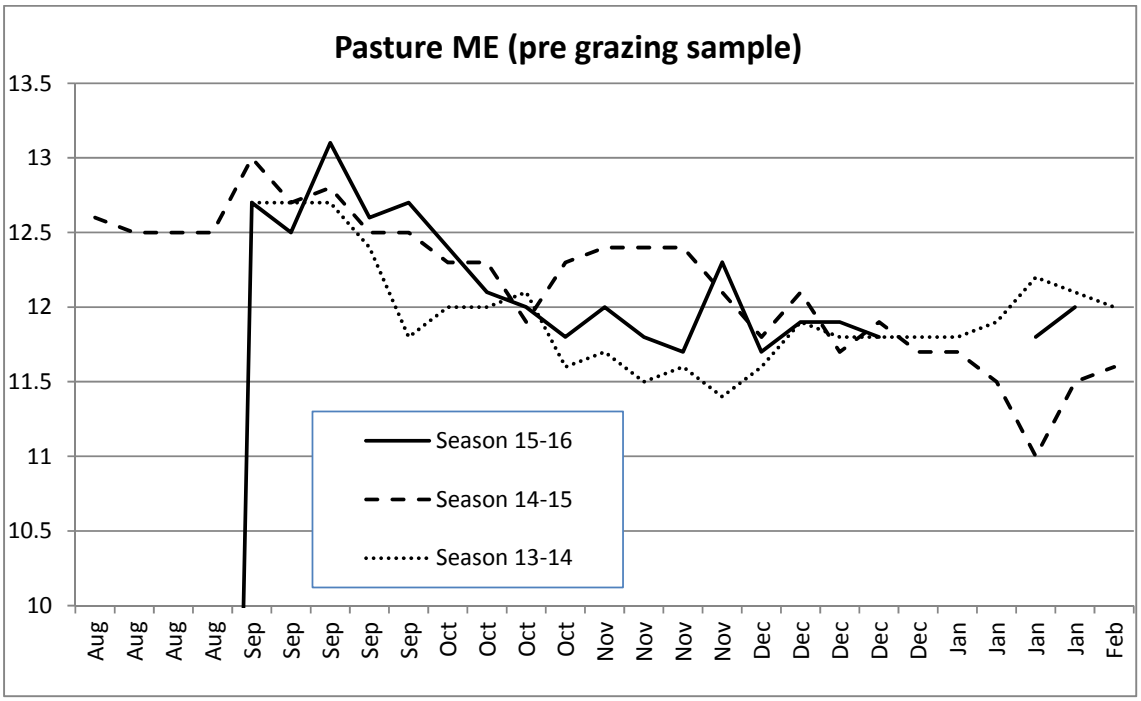


As for pasture DM%, trends for protein percentage are similar to those of previous seasons. Levels were slightly lower than previous years during late October and November despite ongoing use of N fertiliser through that time.

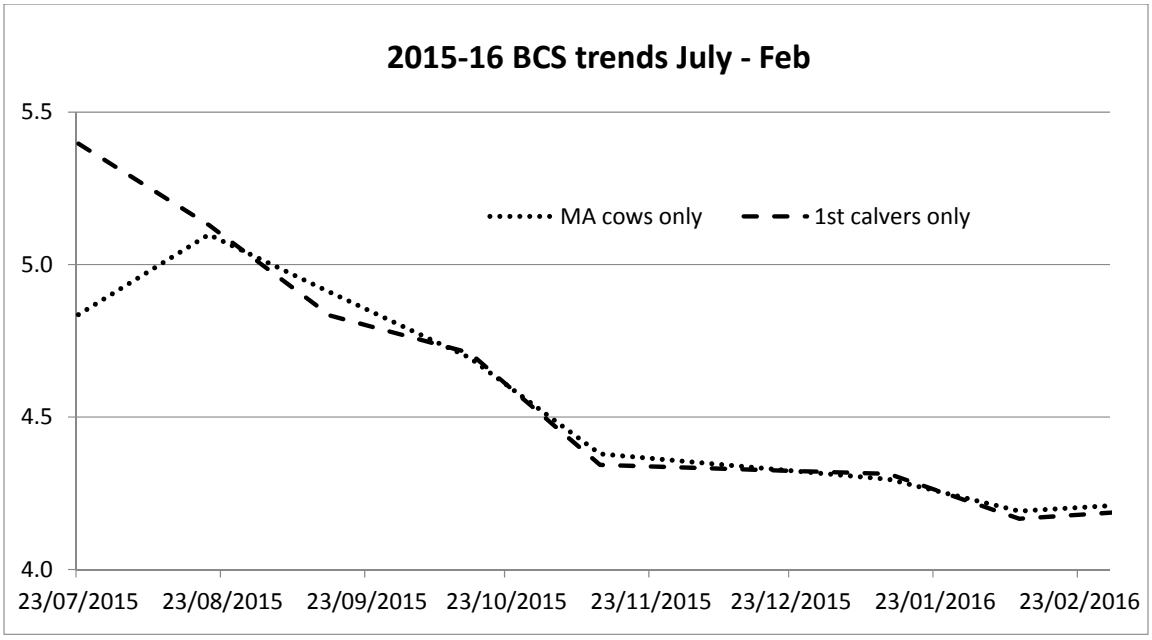


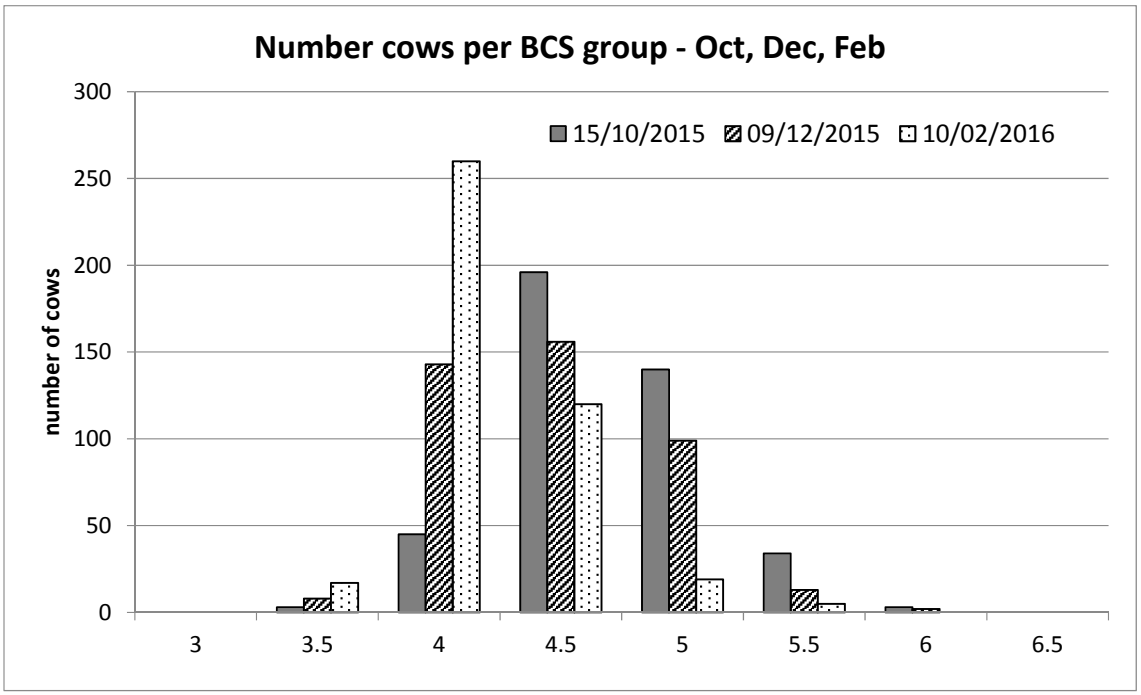
Despite the reduced use of N fertiliser at LUDF over the last two years, WSC levels have on average been lower, especially through the summer months. Hot summer conditions including higher overnight summer temperatures are linked with lower concentrations of WSC

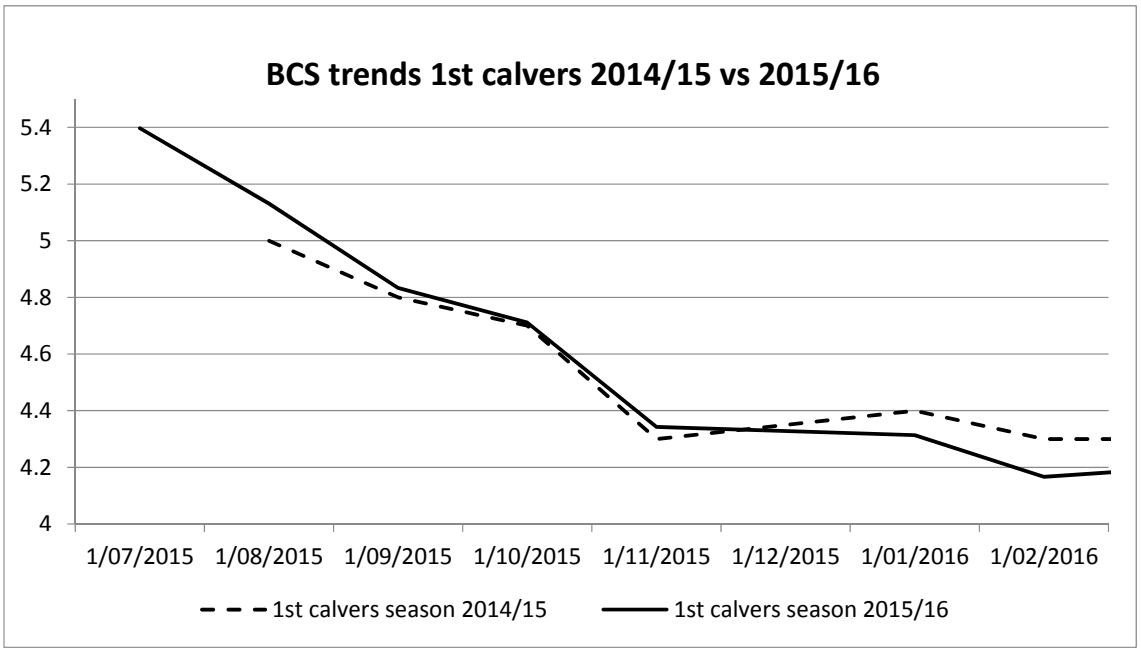


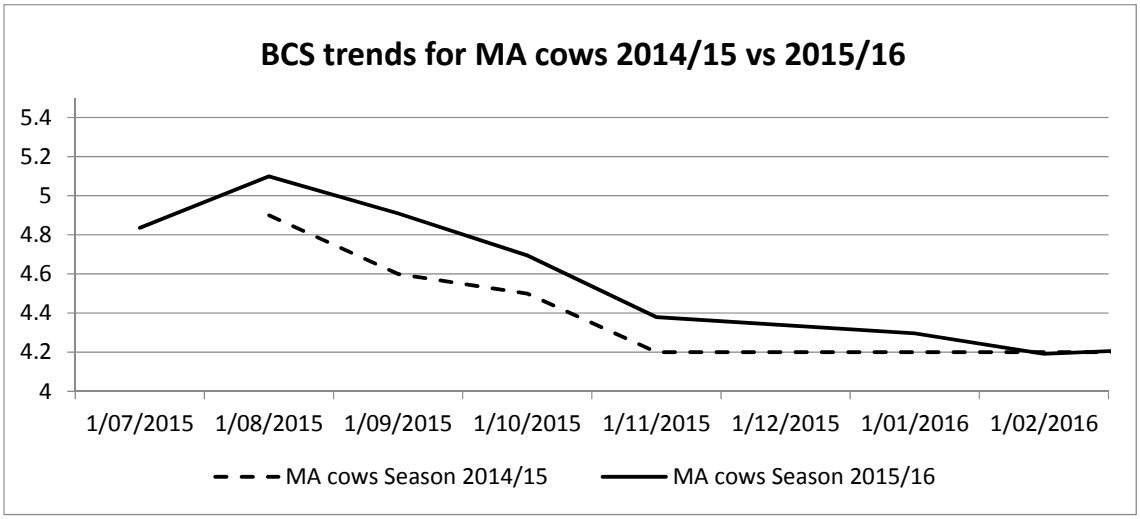


Herd BCS and Health 2015/2016



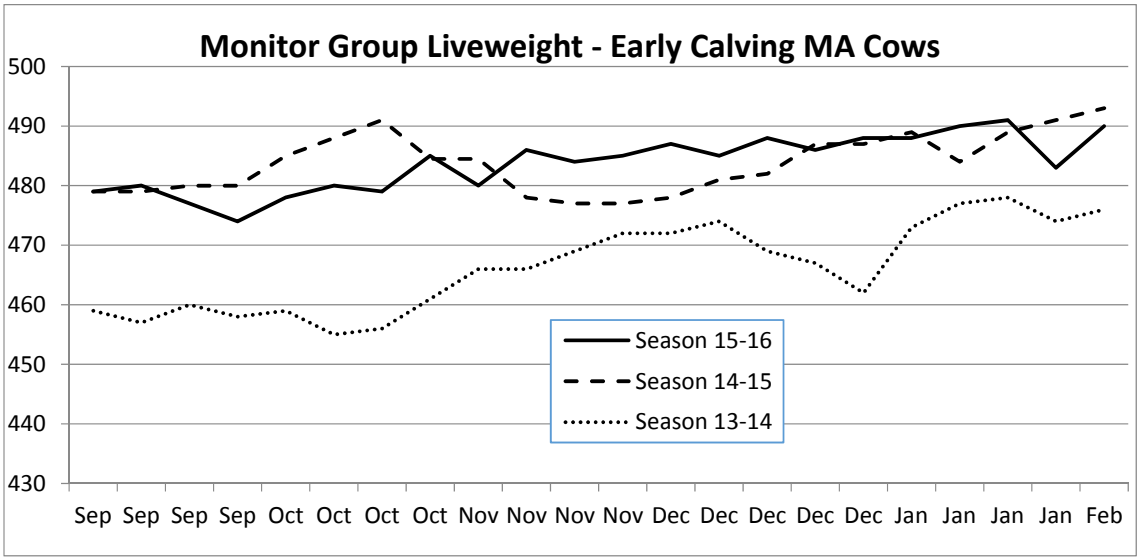

Number cows per BCS group - Oct, Dec, Feb
number of cows
300
250
200
150
100
50
0
15/10/2015
09/12/2015
10/02/2016
3
3.5
4
4.5
5
5.5
6
6.5


BCS trends 1st calvers 2014/15 vs 2015/16
5.4
5.2
5
4.8
4.6
4.4
4.2
4
1/07/2015
1/08/2015
1/09/2015
1/10/2015
1/11/2015
1/12/2015
1/01/2016
1/02/2016
1st calvers season 2014/15
1st calvers season 2015/16



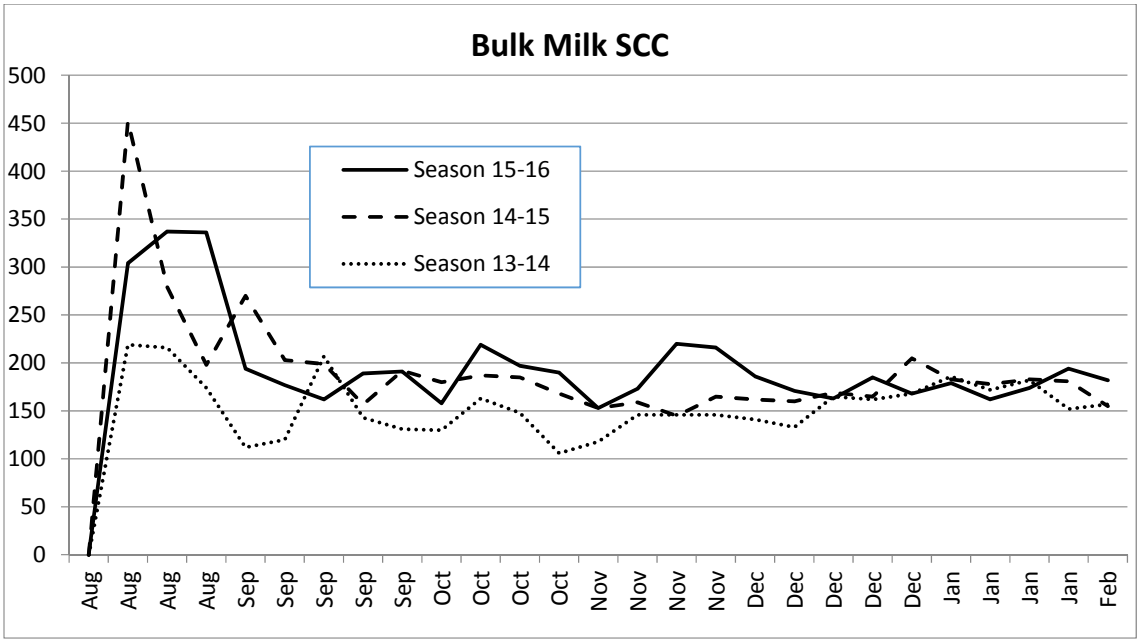
The noticeable difference in BCS between both seasons is the increased average BCS of MA cows this year compared to last year. During the previous season (2014/15), the BCS of 1st calvers were consistently above that of the MA cows whereas during season 2015/16 that difference in BCS disappeared in August and has not re-appeared.

	20-Aug	15-Sep	15-Oct	12-Nov	09-Dec	13-Jan	10-Feb
MA cows Season 2014/15	4.9	4.6	4.5	4.2	4.2	4.2	4.2
1st calvers season 2014/15	5	4.8	4.7	4.3	4.3	4.4	4.3
BCS difference	**0.1**	**0.2**	**0.2**	**0.1**	**0.1**	**0.2**	**0.1**
MA cows Season 2015/16	5.1	4.9	4.7	4.4	4.5	4.3	4.2
1st calvers season 2015/16	5.1	4.8	4.7	4.3	4.5	4.3	4.2
BCS difference	**0.0**	**-0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

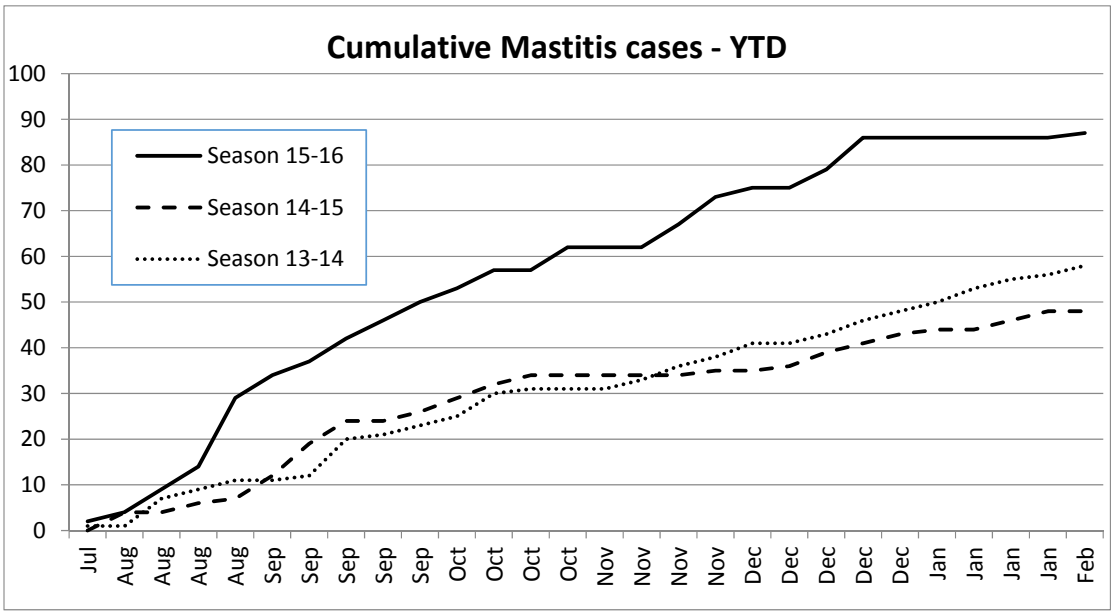


Average liveweight of the early calving monitor group has fluctuated a bit less than in previous seasons, with a small but steady increase from September onwards this year.

Health



Mastitis



Higher levels of mastitis have occurred this season, with the herd being continuously stripped through this period.

During October/November, the whole plant was checked and milking technique, liners, teat spray and vacuum performance assessed to try and find out where the issues were.

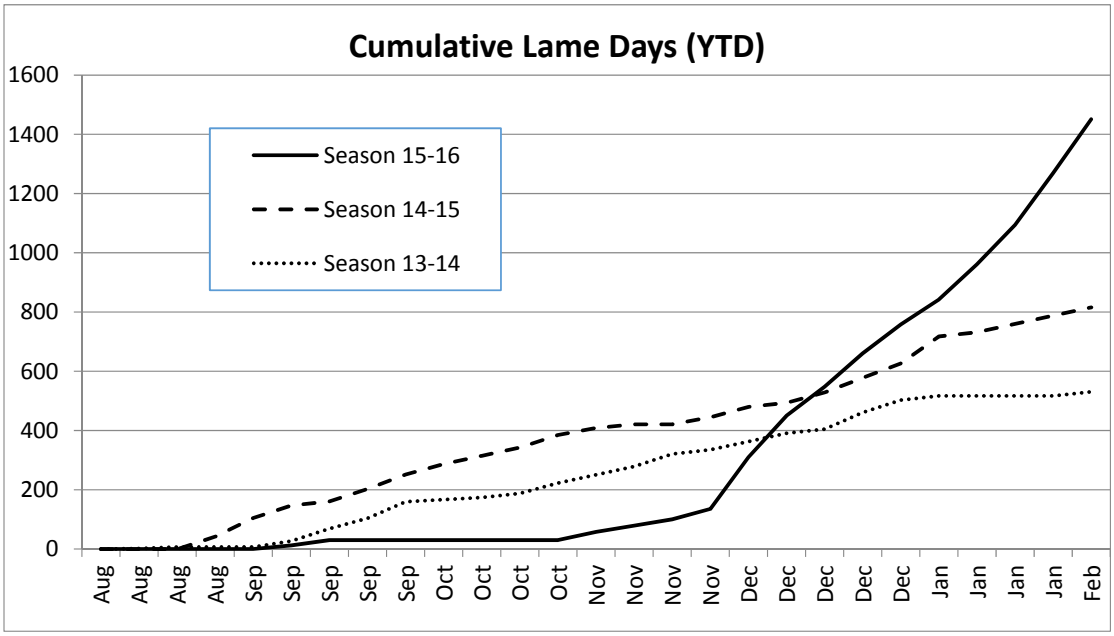
Three main changes happened after this evaluation:

1. All liners were changed
2. The vacuum was dropped slightly
3. The teat spray was changed (from iodine to chlorhexidine based)

These changes were able to keep the occurrence of new mastitis cases in check to-date.

LUDF is also now part of a Mastitis Focus Report project, now in the final stages of validation through DairyNZ and InfoVet. Further information around this will be shared in future focus days.

Lameness



Analysis of InCalf results (Courtesy of LIC)

Three year trends in 6 week in-calf rate show a disappointing decline for LUDF.

LUDF					
	3 week ICR	**6 week ICR**	**Not in-calf**	**3 week SR**	**Conception rate**
2015	51	69	13	88	54
2014	49	72	13	89	54
2013	56	78	12	88	61

Dropping from the 2013 high of 78% 6 week in-calf rate, the current season is 69%, down 3% from the previous season.

Despite being 2% ahead of last year at the 3 week mark, the cows' in-calf rates dropped significantly in the second round of mating.

This appears to be driven by lower second round conception rates, and potentially lower than expected second round submission rates. This is not yet fully explained and is the focus of an in depth investigation.

Region - Canterbury				
	# Detailed FFR herds	**6 wk ICR**	**3 wk SR**	**Conc Rate**
2015 (to date)	74	69	85	59
2014	472	67	83	51
2013	453	67	81	51

Groups or times of interest:

- Mating performance dropped for all cows after 11th November (second round slump)
- Mid-calvers were noticeably poorer with a 46% conception rate and they comprised 20% of the herd.
- First calvers and early calvers did well on conception rate overall at 61% and 59%. These two groups achieved a 75% 6 week in-calf rate.

Some preliminary areas investigated to date:

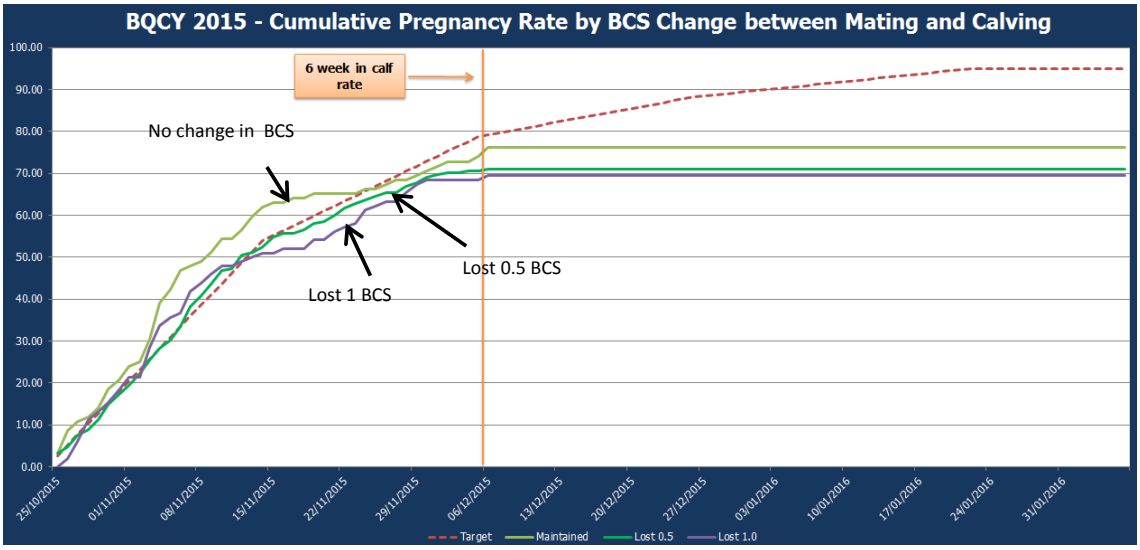
Note: *Caution with interpretation is recommended as our analyses only looked at one factor at a time.*

Reproduction is complex, with multiple factors interacting and influencing final results. Further monitoring and investigation is on-going.

1. BCS (body condition score) and BCS loss over mating – performance impacts were in line with expectations from industry BCS research. BCS management was very tight to industry recommended targets this season. Heifer BCS management was particularly good, being proportionately under-represented in the group losing 1 BCS unit.

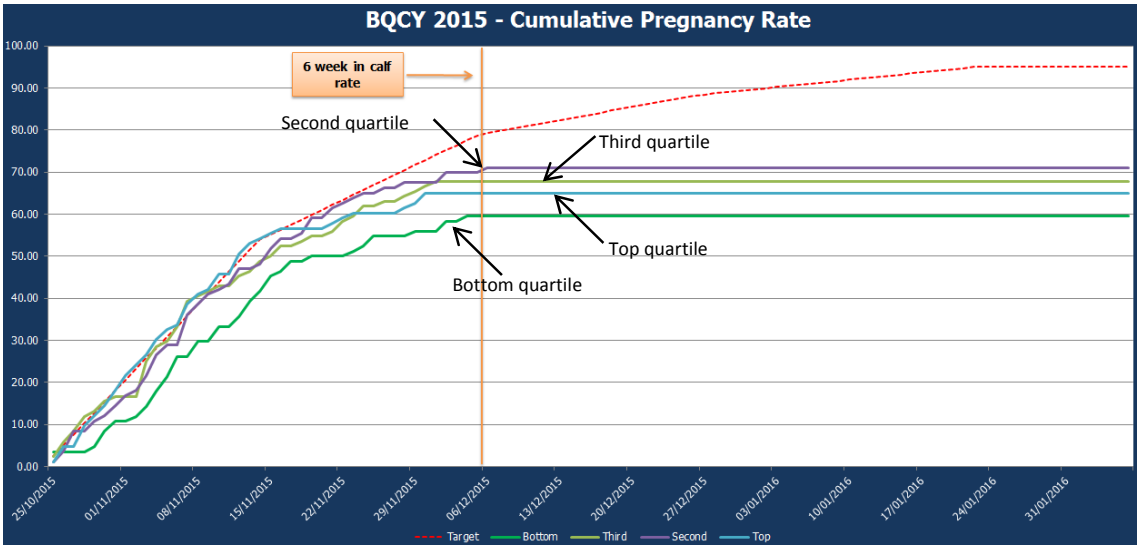
- It was noted, however, that all BCS loss groups were affected by the second round slump in performance.

Early Season Body Condition Loss Between Calving and Mating



2. Milk production – the herd had very high production this year with cows averaging 2.63kg MS/day as measured by the October herd test. Performance by quartile of MS production in 4-8 year olds showed that the bottom quartile of cows for production had the poorest reproductive results. Gain, all groups were affected by the second round slump.

Quartiles of Milk Solids Production – Mature Cows (4-8yo)



Quartiles of Milk Solids Production- mature cows

	Top Quartile	Second Quartile	Third Quartile	Bottom Quartile
3-week submission rate	90	90	85	86
3-week in-calf rate	55	48	50	44
6-week in-calf rate	66	70	69	62
Overall AB conception rate	54	53	54	48
0-3 week AB conception rate	58	51	58	50
3-6 week AB conception rate	39	56	47	45
Average BW	144	137	133	127
Average PW	231	180	161	133
Kg MS average	3.3	2.9	2.6	2.1
Kg MS range	3.0-5.1	2.7-3.0	2.4-2.7	0.1-2.4

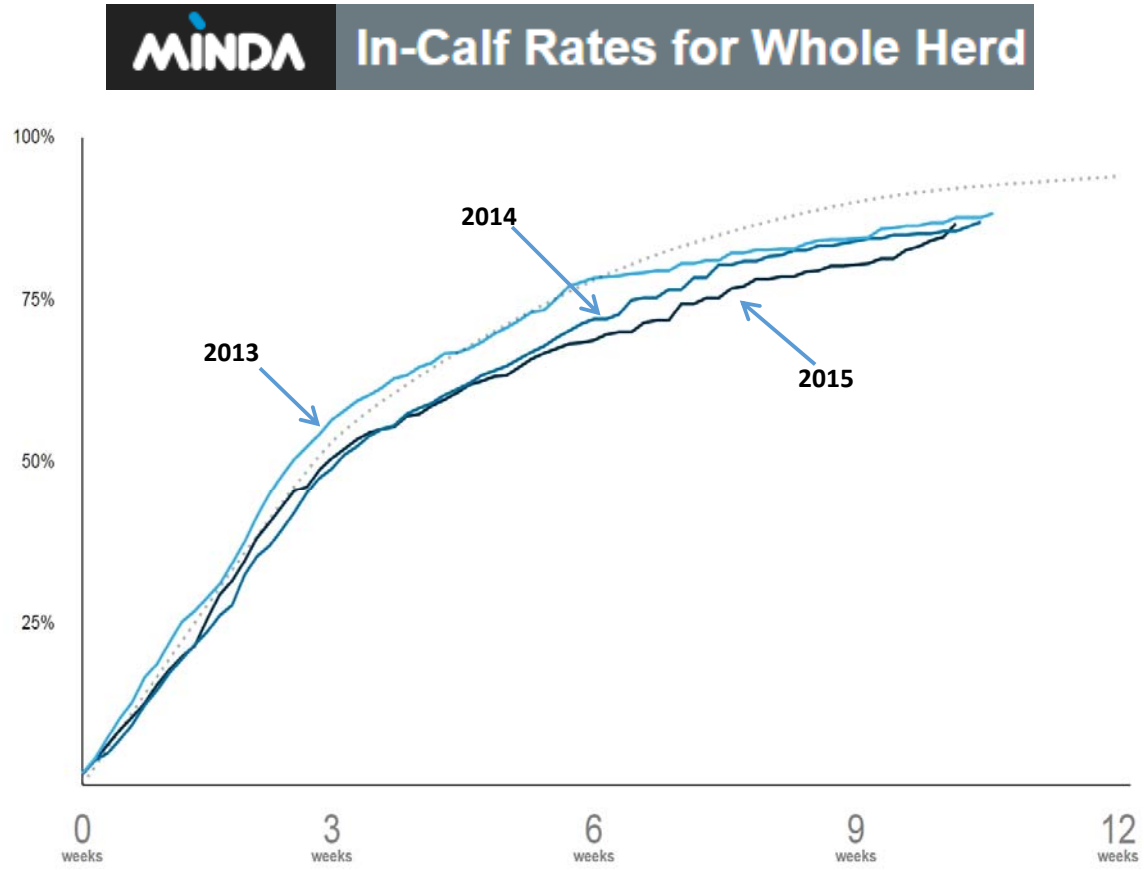
3. Somatic Cell Count – cows above or below 150,000 SCC/mL showed little difference in conception rates in the first or second round, or in 6 week in-calf rate.

4. Anoestrous cows pre-mating – as expected, cows without a pre-mating heat had a significantly lower 6 week in-calf rate, but their conception rates improved over time whilst the cycling cows pre-mating suffered a larger drop in conception rates in the second round. This group comprised 50% late calvers.

	Didn't have a pre-mating heat	Did have a pre-mating heat
Number of cows	103	453
3-week submission rate	68	92
3-week in-calf rate	23	58
6-week in-calf rate	47	73
Overall AB conception rate	36	58
0-3 week conception rate	32	61
3-6 week conception rate	43	48
BW	149	152
PW	188	184
% late calvers	50	4
% 9+ yos	6	8

5. Nutritional measures are complex but further investigation is on-going in this area. A slight drop in milk production per cow on a weekly basis occurred over the period of reduced reproductive performance.

In-Calf Rates for the last 3 years



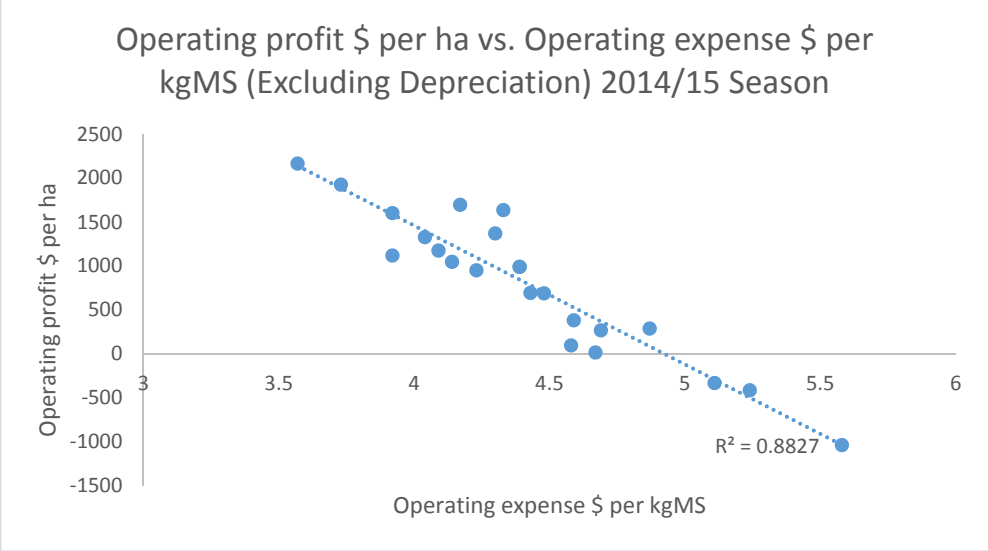
	3 Weeks	6 Weeks	9 Weeks	9+ Weeks	Not In-Calf Rate	
Spring 2015	51%	69%	80%	87%	13%	LIC
Spring 2014	49%	72%	84%	87%	13%	LIC
Spring 2013	56%	78%	84%	88%	12%	LIC
Spring 2012	50%	73%	83%	87%	13%	LIC

Focus on Farm Programs for Low Cost Farm Systems

Jeremy Savage, Macfarlane Rural Business.

The ceiling has been the limit for Canterbury Dairy Farm programs. On high performing, well irrigated farms the ceiling has been 2,000 – 2,200 kgMS/HA. But at what cost? Both to the environment, and of greatest urgency the past 15 months, to the financial returns.

We have been analysing farm programs with Dairy Systems Monitoring (DSM). This is a data base that benchmarks client's performance relative to each other. FarmMax Dairy is used to model farm performance. We use cashflow forecasts, and actuals (Cashmanager) to compare financial performance. As much as possible, we use the same procedures as Dairy Base.



The relationship Operating Expenditure $/kgMS (excl. depreciation) and Operating Profit $/Ha.

Operating Expenditure continues to be the key driver of profitable farm systems. Analysis of the main KPI's from the client base:

Relationship			R Squared
Operating Expenditure ($/kgMS)	Vs	Operating Profit ($/Ha)	0.88
Feed Harvested (kgDM/cow)	Vs	Operating Profit ($/Ha)	0.62
Production Per Cow (kgMS/cow)	Vs	Operating Profit ($/Ha)	0.72
Production per Ha (kgMS/Ha)	Vs	Operating Profit ($/Ha) $6.00/kgMS	0.28
Production per Ha (kgMS/Ha)	Vs	Operating Profit ($/Ha) $4.40/kgMS	0.09
Production per Ha (kgMS/Ha)	Vs	Operating Profit ($/Ha) $8.00/kgMS	0.51

Observations of Client Base Farm Systems:

1. **Farm Working Expenditure $3.60 - $4.00 / kgMS**
   - Per cow Production 470 – 520 kgMS/cow
   - Using 500 – 700 kgDM of supplement.
   - Feed harvested per cow 3,800 – 4,200 kgDM/cow
   - Stocking rate driven off achieving feed harvested per cow. Typically 3.2 – 3.6 cows/HA.
   - Cheaper irrigation sources, eg shallow water, surface water.

2. **Farm Working Expenditure $4.00 - $4.40 / kgMS**
   - Wider Range of feed harvested per cow 3,600 – 4,000 kgDM/cow
   - Per cow Production 440 – 470 kgMS/cow
   - Using 600 – 800 kgDM of supplement.
   - Dearer water

3. **Farm Working Expenditure $4.40+ / kgMS**
   - Higher stocking rate which does not support a higher feed harvested per cow. Per cow Production 440 – 470 kgMS/cow
   - Using 900 – 1,200 kgDM of supplement.
   - Lower feed harvested per cow 3,300 – 3,500 kgDM/cow
   - Sometimes leasing land for support, which is not being well utilised.
   - Expensive irrigation water with higher charges.

4. **Exceptions to these rules:**
   - High input farms (Supplement 1,200+ kgDM/cow) achieving very high per cow production (550 – 600 kgMS/cow).
   - Farms with one-off expenditures, eg, storm damage impacting supplements and repairs.
   - Farms run in conjunction with arable farm programs. When grass can be brought across the boundary, costs can sometimes be very low. These farms also have a shared cost structure associated with overheads and vehicles.

Focus on Feed Harvested

We have noted a number of farms able to achieve a low cost structure sustainable by focusing on very high feed harvested per cow, high per cow production while minimising supplement use. This has been a deliberate strategy. This is also a key focus of the LUDF (Lincoln University Dairy Farm).

Feeding levels over time

	2003/04	2007/08	2009/10	2013/14
Feed Harvested (TDM/HA)	12.1	11.5	12.3	11.6
Stocking Rate	3.30	3.32	3.42	3.47
Per Cow Production (kgMS)	382	383	416	438
Pasture Harvested kgDM/cow	3,667	3456	3600	3,346
Forage Harvested kgDM.cow				43
Supplements kgDM/cow	623	680	637	967
Feed Intake Per Cow (kgDM)	4,290	4,136	4,237	4,355
Supplement as % of Diet	15%	16%	15%	22%
KGDM per KgMS	11.2	10.8	10.2	9.9
Milk from Supplement per cow (kgMS)	55	63	63	97

Table. Changes in feed use over time (average of client base each year)

We now have over 10 years of calibrated model data for DSM. There are a number of key points to note from the data and trends, starting with 36 farms, peaking at 92 for 2013/14.

- Feed harvested is not lifting.
- We have increased our stocking rate over time
- Supplement use and forages have increased over the last 2 seasons in particular. As previously noted, this is due to an increased standard of management around feeding cows, in particular feed quality and maintaining feed intakes and consistency of feeding.

Many farms are operating with the stocking rate too high. The cows are not being fed enough to express their genetic potential for milk production. The breeding being carried out allows cows to increase production by 1-1.5 % per year. For the cows to achieve this production, they need to either be fed more supplements, or offered more grass. If your farm is not improving in feed grown for the year, you will need to drop your stocking rate to feed the cows on pasture – the most profitable option. Taking this theory to a conclusion, you need to drop your stocking rate by 1 % per year to make a return on your breeding. A stocking rate which is 3.5 cows/ha today, @ 400 kgMS/cow (1,400 kgMS/ha) equates to 3.32 cows/ha in 5 years @ 432 kgMS/cow (1,430 kgMS/ha).

We noted that the average stocking rate in DSM is not dropping. Farmers are responding to increase per cow production potential by increasing supplement use rather than dropping their stocking rate. Similar trends are noted in the LIC New Zealand Dairy Statistics.

"Stocking rate is the most important driver to your farm's profitability", a line often pushed by key farm system researchers, Holmes, Penno etc. We have noted that stocking rate can be manipulated to drive the feed harvested per cow.

We have defined the appropriate stocking rate as:

$$\textbf{Stocking Rate} = \frac{\text{Feed Harvested Per Hectare (kgDM/Ha)}}{\text{Feed Harvested per Cow Target (kgDM/cow)}}$$

We used feed harvested as defined by FarmMax Dairy or UDDER. Both models are similar.

Observations from our client base, and from consultants using DSM nationwide:

Target Pasture Harvested per Cow	Typical Dynamics of Farm and Cows
3,800 – 4,200 kgDM/cow	High quality pastures, reliable growth and good shoulder season growth (eg, LUDF).
3,600 – 3,800 kgDM/cow	High quality pastures. Often high altitude farms with limited growth in the shoulders.
3,400 – 3,600 kgDM/cow	Poorer quality pastures. Drought prone.
3,400 or less	Drought prone farms. OAD.

Key Learnings from our client base when adopting a high pasture harvested farm program.

- Absolute focus on feed intakes is needed. The cows must be always presented with high quality feed that they will eat quick! Quick decisions are needed if you do not have the ideal, palatable feed.
- You need to get the cows up to a good peak in the spring. This is easier with a low stocking rate. Once the peak is up, you need to keep the production up. Use of high quality supplements in the summer maybe required in short bursts to keep cows milking well. This ensures they carry on eating afterwards at high rates to harvest the grass.
- The pressure stays on the pasture. High performing cows are hungry cows. The demand (kgDM/Ha) from high performing cows is as high as average performing cows at higher stocking rates. You do not "lose" the farm.
- You need to have focus, and a good 2IC on farm to keep the cows up when the manager is on leave.

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Autumn Management

Given the current pay-out environment and the opportunity to harvest a moderate amount of home grown silage this summer, it is critical to plan the autumn feed management considering the dual needs to maximise profitability this season and set the farm up well for next season.

The three most influential aspects for a good start to the spring season are:

- Sufficient quantity of good quality pasture for freshly calved cows
- A spring rotation plan to guide pasture use from calving to balance date
- Cows calving on the appropriate BCS:
    - All MA cows calving at minimum BCS 5
    - All 1st and 2nd calvers at minimum BCS 5.5

To ensure the above outcomes occur, the well-tried BCS rules are the first critical step for LUDF. Secondly, decisions are required regarding the ongoing use of N fertiliser, home grown silage, purchased silage and culling of surplus cows. The following autumn plan and sensitivity tables will be used to guide these decisions.

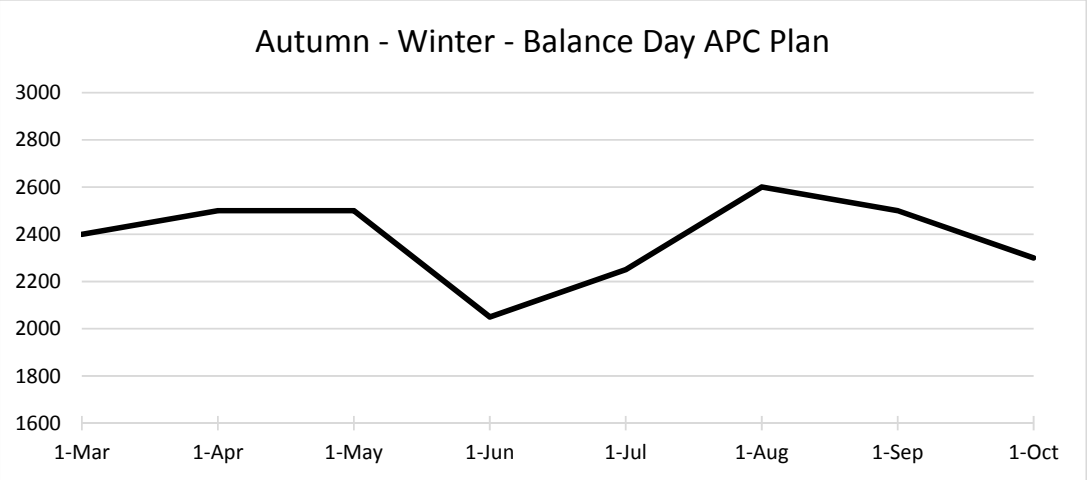
BCS preparedness for calving season 2016/17:
To ensure BCS targets at calving are met, the following dry-off rules are used:

Rising 3 year Old

Cow Condition	Dry off time (days before Calving)	Date cow need to be dried off (calving date 1-15 August)	Date cow need to be dried off (calving date 15-30 August)
3.5	120	1-15 April	15-30 April
4	100	20 April -5 May	5-15 May
4.5	80	10-20 May	20 -30 May
5	60	NA	NA

Mixed Age Cows (4 years old and older)

Cow Condition	Dry off time (days before Calving)	Date cow need to be dried off (calving date 1-15 August)	Date cow need to be dried off (calving date 15-30 August)
3.5	100	20 April – 5 May	5-15 May
4	80	10-20 May	20 -30 May
4.5	60	NA	NA



LUDF plans autumn pasture management and drying off decisions to ensure APC targets of 2050 kgDM/ha at the end of May, 2600 kgDM/ha at the planned start of calving (beginning August) and 2300 at balance date (late September /early October). To achieve these targets the following options are utilised:

Period	**Management Decisions**		
Now till end May	Dry-off Herd based on CS targets and calving date as above	Cull cows based on feed supply / demand	Manage APC down to target 2050 at end May
	Continue with N at 25kgN/ha on non-effluent area till late March (est 1.5 more rounds N)	Feed home grown silage to milkers and possibly culls depending milk price and silage cost	Feed purchased grass silage only if economic and only to cows to be wintered
	Extend round length to push available pasture later into autumn	Split herd as required: consider high CS cows and cull mob to achieve tidy and consistent residuals where applicable	Enure Shogun paddocks are grazed out during late May to capitalise on their winter growth potential
June – end July	Manage shape feed wedge and APC based on winter growth rates with cows on platform as required	Flexible on farm wintering herd able to be moved off farm if conditions dictate	Prepare for calving - includes monitor cows off farm for health and CS gain. Administer Selenium to herd pre and post winter.
End July – End September	Calving	Use Spring Rotation Planner and modify use supplement / springers on farm as required based on pasture growth rates	
Late September / early October	Balance date		

As all the decisions are linked, and consequences follow each decision, the coming autumn pasture management will influence how well the farm gets through to balance date – typically late September / early October. Setting the farm up for the next season starts now, when there are still 3 grazing rounds before drying cows off.

Critical questions include:

1. What is the date and APC for dry-off on your farm?
2. What is the APC target at calving on your farm?
3. What is the balance date and APC required by balance date on your farm?
4. What is the plan to ensure all cows meet BCS targets at calving?
5. What transition period is needed for wintering, how might this impact available days for BCS gain?
6. If wintering on the platform, is this accounted for in the Spring Rotation Planner, including timing when the wintering area will return as milking pasture?

Analysis on feed costs through Autumn

This season's summer, with the rainfall and growing conditions, has seen LUDF's growth rates hover 20-30 kgDM/ha above demand. This has meant surplus pasture, and an opportunity to harvest those surpluses as silage. Subsequently more silage is now available on the platform, both from (unused) purchased source and home-made silage.

In the current payout environment careful analysis is required when evaluating whether supplements should be fed to known cull cows. Where this production is viable, it can contribute to diluting costs and thus add to profit.

A feed budget for Autumn was created to understand where the feed deficits/surpluses would be.

LUDF Autumn feed budget, 2016

Date (7 days periods)	Start Autumn Plan 16 Feb	23 Feb	1 Mar	8 Mar	15 Mar	22 Mar	29 Mar	5 Apr	12 Apr	19 Apr	26 Apr	3 May	10 May	17 May	24 May	Dry-off 31 May
Supply																
Growth Rate - kgDM/ha/day	70	70	60	60	60	60	60	45	45	45	45	30	30	30	30	30
Decrease in APC (ave/day) - kgDM/ha/day							6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
Total supply	**70**	**70**	**60**	**60**	**60**	**60**	**67**	**52**	**52**	**52**	**52**	**37**	**37**	**37**	**37**	**37**
Demand																
No Dry cows (based on BCS rules)								10	10	25	85	85	125	185	235	235
Intake Dry Cows (kgDM/cow/day)								16	16	16	16	16	16	16	16	16
No cows Culled											50	32				
Total No Milking Cows	550	550	550	550	550	550	550	540	540	525	415	383	343	283	233	233
Production: MS/cow/day	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5
Ave Intake - kgDM/cow/day (incl. 0.5 BCS gain)	19	19	18.5	18.5	18.5	18.5	18	18	18	18	18	17.5	17.5	17.5	17.5	17.5
Total Demand - kgDM/ha/day	**65**	**65**	**64**	**64**	**64**	**64**	**62**	**62**	**62**	**62**	**55**	**50**	**50**	**49**	**49**	**49**
Difference between supply and demand																
Supply-demand	5	5	-4	-4	-4	-4	5	-10	-10	-10	-4	-14	-13	-13	-12	-12
Home Grown Silage Required - kgDM/ha/day	0	0	4	4	4	0	0	10	10	10	4	14	13	13	12	19
Silage /cow/day	0.0	0.0	1.0	1.0	1.0	0.0	0.0	3.0	3.0	3.0	1.4	5.7	6.2	7.2	8.5	13.0

Summary of silage requirements			
Total home grown silage fed (kgDM total)	117,000	APC at 16/2/16 (kgDM/ha)	2470
Ave Home grown silage fed per cow (kgDM for the period)	209	APC at dry-off (kgDM/ha)	2050

Feed Budget Assumptions

1) Growth rates are based on historic data averaged over the last 3 seasons less 10kgDM/ha/day to provide a conservative estimate of available feed. Growth rates include continued use of N through to 10-15 April
2) The farm has 2 groups of silage available for use:
    a. 137 tDM silage harvested from the platform (244kgDM/cow based on 560 cows)
    b. 104 tDM in stock from the silage purchased for the milking season (185 kgDM/cow based on 560 cows)
3) All cows at minimum 4.5 BCS by the end of May.
4) Cows will be dried of as required on BCS rules above
5) Dry cows have been kept on the farm, in previous years they have been grazed off farm on a weekly basis. This season depending on grazing costs relative to silage costs, average pasture cover, and ground conditions they may be grazed on the platform after drying off (particularly light condition, early calving cows dried off in April).

If growth rates are as budgeted and thus below historical average (as in above budget), the farm potentially has enough home-made silage to keep culls in milk till near the end of the season, and dry cows on farm as well. If growth rates are similar to past years, not all home grown silage may be required.

The question remains however: is it profitable to feed silage (home-grown or purchased) to cull cows if required? To ascertain this, the margin over feed has been calculated, assuming that cull cows would need to be fully fed on silage to understand the true cost of keeping that animal in the herd.

Assuming costs as follows for home – grown silage:

Applied cost N:	12 cents/kgDM
Mowing and baling cost:	16 cents/kgDM
Total cost:	28 cents/kgDM

Calculating the applied cost of Nitrogen Fertiliser:

Urea - $560/tonne, 46% N (460kgN/tonne Urea) = $1.22/kgN

Application rate - 25kgN/ha (54 kg Urea /ha)

Cartage and Spreading at approx. $13/ha and 25kgN/ha = $0.52/kgN applied

Applied cost urea = $1.74 /kgN applied

Response rate (mid-summer, irrigated pasture): 15 kgDM/kgN applied

Therefore cost = $1.74/kgN applied / 15 kgDM = 12 cents /kgDM

Note the N fertiliser was applied to maintain available feed and pasture quality for the milking herd, so can be argued as a pasture cost that was incurred whether or not a surplus was generated and is therefore not a specific cost of the silage.

Monthly cost and response for home-made silage (including N response at 15:1 but excluding feedout costs and any wastage associated with feeding out)

	February	March	April	May
kgMS/cow/day	1.8	1.7	1.6	1.5
kgDM/cow/day reqd	19	18.5	17.5	17
Feed cost ($/kgDM)	0.28	0.28	0.28	0.28
$/cow/day @ full silage diet	5.3	5.2	4.9	4.8
Income @ $4.10/kgMS	7.4	7.0	6.6	6.2
Daily Margin	2.1	1.8	1.7	1.4

Sensitivity to cost / production level (assuming March feeding levels)

Margin –March feeding levels		**Silage cost**				
		0.25	**0.30**	**0.35**	**0.40**	**0.45**
Production kgMS/cow/day	**1.5**	1.53	0.60	-0.33	-1.25	-2.18
	1.6	1.94	1.01	0.09	-0.84	-1.77
	1.7	2.35	1.42	0.49	-0.43	-1.36
	1.8	2.76	1.83	0.91	-0.02	-0.95
	1.9	3.17	2.24	1.32	0.39	-0.54

The sensitivity table shows any feed costing 35 cents per kgDM or more, at a payout of $4.15/kgMS leaves very little (or no) margin unless milk production per cow per day is over 1.7kgMS/cow/day.

Additional considerations in regard to culling decisions:

1. Beef schedule and potential income from selling cull cows early. This can be important for cashflow matters. It is important to remember that as weather turns, all farmers typically want to sell stock at the same time, such that some farmers may end up having to keep stock on farm longer than desired, with impacts on feed supply for remaining stock.
2. Keeping purchased feed may carry significant risk if the feed quality will deteriorate over time. If an alternative market is available to sell and recoup costs, this may be advantageous for some farmers (and may provide a valuable cashflow benefit).
3. Calculating whether it is viable to supplement a high producing cull cow remains an important exercise to ensure maximum profit is achieved from existing (on farm) supplements.
4. An additional and important aspect of this management decision is to also consider feeding requirements for dry cows that may be kept on the platform between drying off and the end of May.

Overseer Impact on Various Autumn Management Scenarios

A further consideration is the possible impact autumn stocking rate, production, and supplement use may have on estimated N-losses per hectare. The following table compares a range of scenarios for LUDF compared to the 2014-15 autumn management whereby culls were sold at the end of February. In these examples the volume of autumn fed silage has not been adjusted, the assumption is pasture grown is adequate to support the stocking rate / milk production in each scenario, but once pasture demand exceeds supply culls will be removed.

	March / April Cow Numbers	**January N Fert use (Average across whole platform)**	**Total N Fert applied**	**Total Milk Production**	**Overseer Estimated N-loss**
Early Culling: 2014-15 result – cull cows sold end Feb.	472 / 470	Ave 3 kgN/ha	137 kgN/ha	276,654 kgMS / (498 kgMS / cow – 560 peak cows)	25 kgN/ha
End April Culling: 2015-16 Forecast – Culls sold end April	550 / 550	Ave 3 kgN/ha	137 kgN/ha	276,654 kgMS / (498 kgMS / cow – 560 peak cows)	27 kgN/ha
2015-16 Forecast Culls sold end April + 7400 kgMS	550 / 550	Ave 3 kgN/ha	137 kgN/ha	286,054 kgMS / (515 kgMS / cow - 555 peak cows)	27 kgN/ha
2015-16 Forecast Culls sold end April + 7400 kgMS + extra 30 kgN Jan	550 / 550	Ave 33 kgN/ha	160 kgN/ha	286,054 kgMS / (515 kgMS / cow - 555 peak cows)	28 kgN/ha

Net effect – higher production, more cows in Autumn and more N in January together results in additional N-loss of approx. 3kgN/ha (12% higher).

Lincoln University Dairy Farm - Farm Walk notes

Tuesday 16 February 2016

LUDF – focus for 2015/16 Season: Nil-Infrastructure, low input, low N-loss, maximise profit. Farm system comprises 3.5 cows/ha (peak milked), Target 150kgN/ha, 300kgDM/cow imported supplement, plus winter most cows off farm. FWE of less than $1.08 million and Target production of 500kgMS/cow (>100% liveweight in milk production).

Critical issues for the short term

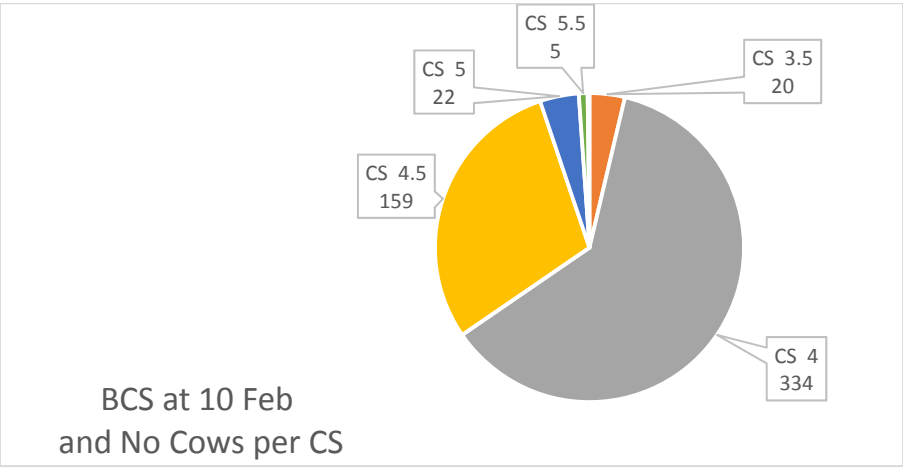
1. **Monitor average pasture cover on the milking platform**
2. **Monitor pasture quality with the focus turning to pushing cover ahead into the autumn (while retaining pasture quality).**
3. **Make appropriate and timely decisions with regard to any further mowing or silage**
4. **Supplement cows with Magnesium**

Key Numbers - week ending Tuesday 16th February 2016

Ave Past Cover	2660 kgDM/ha	Past Growth Rate	109 kgDM/ha/day
Round length	22.8 days (for 160 ha)	Ave Supplement used	0 kgDM/cow/day
No Cows on farm	548 (all cows are milking into the vat)	Ave Soil Temp (week)	18.1 degrees
Ave Milk Production	1.79 kgMS/cow	SCC	173,000

Herd Management

1. There are currently 548 milkers on farm. 24 cows are on once-a-day milking (lames).
2. This week we had 4 new lame cows and no new case of mastitis this week.
3. Cows were body condition scored again on Wednesday 10th February. The average BCS for the whole herd was 4.2. The split is shown below:



4. The farm is continuing to run two herds. The make-up of these herds changed on the 18/01/16 according to the BCS information from the mid-January condition scoring. The aim of redrafting

of the herds is to target preferential feeding of lighter and early calving cows, encouraging as much weight gain as possible and minimising the need to dry off light condition score cows early in the autumn.

5. The small herd has 144 early calving cows with a BCS below 4.5. The large herd has the remainder of the cows (later calving and heavier BCS (405 cows). The small herd continues to be preferentially fed, generally getting the first part of each paddock and not being pushed as much to achieve target grazing residuals.
6. Magnesium is being supplemented to the milking herd as Mag Chloride in the stock water.
7. All 2015 born heifer replacements (total 155) are grazing on the East Block. They received their second / booster 7 in 1 vaccination on Monday 11th January.
8. All calves are on pasture only.
9. Cow live weight is holding steady between 488 and 492 kg/cow (monitor group)

Mating

10. 6 weeks AI Mating for the milking herd started on 25th October 2015 and bulls were removed on 5th January (10 weeks mating).
    a. Our 3-week Submission rate was 89%
    b. Our 6 week submission rate was 97.7%
    c. Our 6 week InCalf is 68% based on the most recently available information from MINDA on the Web. These results are based on pregnancy scanning completed on 11th January 2016.
    d. The final scan was done last week and we have 76 empty cows (of the 549 available)
    e. More analysis on these reproductive outcomes will be provided as this becomes available to the management team.

Mating of 15 Month Old heifers

11. The 125, 15 month old heifers were run with 8 bulls at any one time from 15th October till mid-December. Bulls were rotated in and out of the heifers on a weekly basis.
12. Pregnancy testing of the R2s was completed on the 1/02/2016. 19 out of the 123 animals (125 R2s minus 2 freemartins) were empty (15% empty rate). This result is disappointing, we understand other farms have also experienced this rate of empties. It is broadly similar to past years.

Growing Conditions

13. The average 9 am soil temperature for the week was 18.1 degrees (0.7 degrees higher than last week). The soil temperatures seem to continue a steady increase, similar to that observed in December/January last season
14. There 9.8 mm rain over the last week.
15. Both North and South pivots have been on for the last 7 days.

Figure 1: Soil temperature history for the last 2 weeks

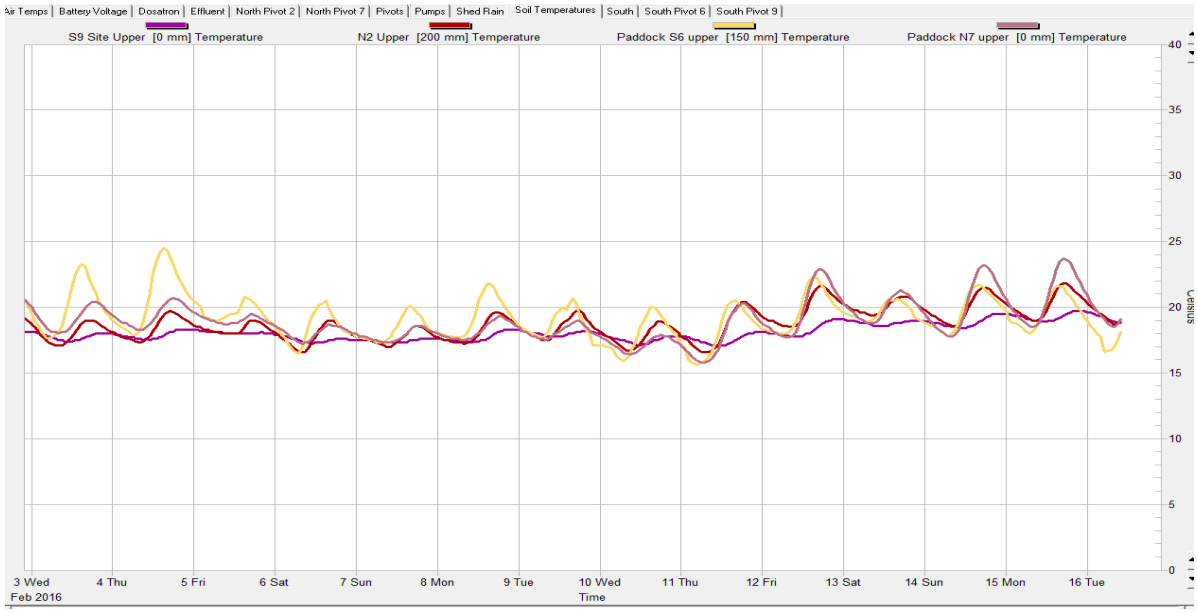
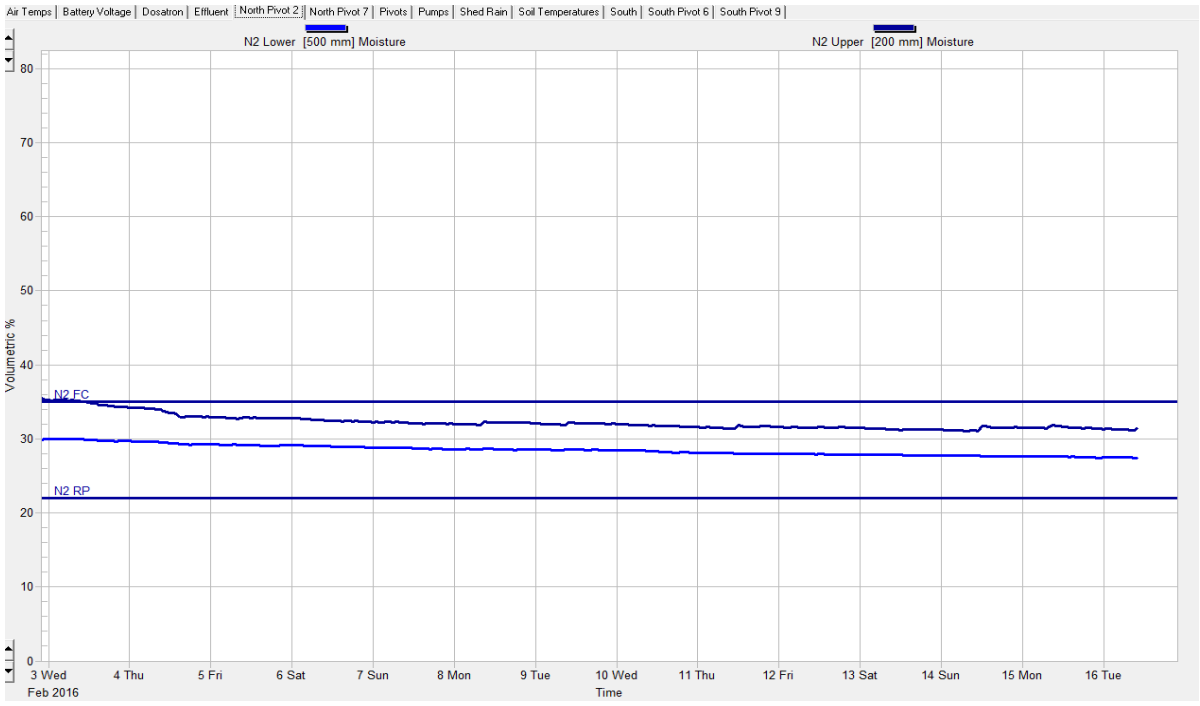


Figure 2: Soil moisture history for the last 2 weeks (Paddock N2).



Nitrogen

16. 49.9 hectares received nitrogen as urea at 25kgN/ha over the last week. Season to date we have used 147 kgN/ha.
17. At this stage, the farm is continuing to apply low rates of N to the non-effluent areas, following grazing, to maintain pasture quality and quantity, on the basis that home grown N boosted pasture remains profitable heading into the autumn (and cheaper than purchased supplement). Nitrogen use decisions continue to incorporate predicted farm N losses by Overseer. For this stage of the season, ongoing N use remains acceptable as predicted by Overseer.

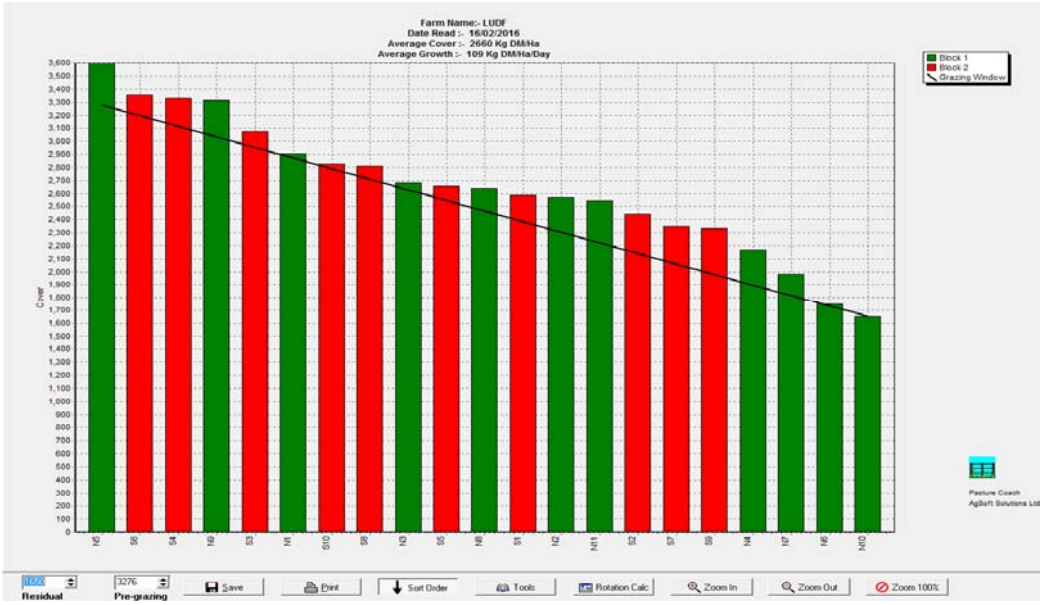
Pasture and Feed Management

18. There was no silage harvested this week.
19. Our average round length this week was 22.8 day round for the week (7.02 ha grazed per day) over 160 effective ha of the milking platform. This is 2 days longer than the previous week.
20. There were 5 ha pre-graze mown (pdk N7) done this week to help control some of the high covers on that particular paddock (first on the wedge last week).
21. Pasture quality and plating:
    a. Pasture quality remains relatively good. Some seedhead remains apparent, mostly on N5 (highest cover on the feed wedge – 3600kgDM/ha). This could be potentially due to heat stress of the grass earlier in January.
    b. The pregraze mowing and ex baleage areas show a slower rate of growth in the week following mowing, however, when it comes to the second and third weeks, this growth increases to over 100 kgDM/ha/day in some paddocks, with a quality that visually looks high.
    c. The rising plate meter is probably still over-estimating some readings due to the plantain in the mix (which continues to seed).
    d. Fertility patches are a lot less evident this week and certainly much less evident compared with this time last year when N was not applied during January 2015.
22. Based on the full farm area of 160 ha in the grazing round, the target pregrazing cover and demand line in the feed wedge has been calculated using a target rotation length of 25 days, an intake of 19 kgDM/cow/day, 548 cows (for the week ahead) and a post grazing residual of 1650 kgDM/ha. Target pregrazing cover is therefore:

    (Stocking rate x *Intake from pasture* x Rotation) + Optimum residual = Pre-grazing Cover.
    (548 cows / 160ha x 19 kgDM/cow/day x 25 days) + **1650** = 3276 kgDM/ha.

    This expected per cow dry matter intake demand is based on calculations that allow for milk production, a little weight gain, maintenance requirements and distance walked. (See DairyNZ facts and figures for these details). At LUDF this calculates to approx. 200 - 220MJME at present. Feed testing last week suggests pasture was approximately 11.4 MJME, therefore 220MJME requires approximately 19 kgDM / cow / day. This is equivalent to a demand of 65kgDM/ha/day across 160 ha.
23. Average pasture cover has increased from last week's cover of 2477 kgDM/ha to 2660kgDM/ha. This is not a surprise given that the growth rate was 109 kgDM/ha/day, and our demand is still around 65 kgDM/ha/day. This resulted in a surplus of 28 tDM this week (increase from the 11 TDM surplus we had last week)

Figure 3: This week's feed wedge



24. Grazing behaviour: on observation, cows are being able to easily achieve the post-grazing residuals, grazing pastures that are coming back from either pre-graze mowing or silage harvesting (very good quality pastures on observation). Round length this weeks was around 23 days (2 days longer than the previous week), which would mean that cows are finding more DM in the paddocks than last week.
25. Should conditions remain the same, it is likely that some more surplus could develop through the week.

Feeding Management for the coming week:

26. Given all of the above, the key decisions for the week ahead:
    a. It was decided to capitalize on the high growths achieved to start extending the round without the need to use supplements. Our first step towards this is targeting a 25 day round for this week (6.4 ha/day). However, we need to remain very vigilant of growth rates. Previous experience and historic data indicates that, given the right conditions, this farm can grow well into the 90 kgDM/ha/Day through March, so extending the round too early and too fast could result in potential quality losses due to covers getting too high.
    b. In light of the above, plus the observation on grazing behaviour, it was decided that no area would be harvested for silage for the week. However, it is expected that there could be some more surplus to be harvested next week if pregraze quality cant be held.
    c. We will continue to closely observe rotation length and cow behaviour (intake and production) through the week. Temperatures are forecasted to reach daily highs of up to 22-25°C with small amount of rain so the challenge of ongoing higher than typical daily pasture growth rates (potentially around 100 kgDM/ha/day) is expected to continue.
    d. Continue to monitor rate of drop off peak milksolids production (stable over the past week) as an important indicator of both feed intake as well as pasture quality.

LUDF Weekly report	19-Jan-16	26-Jan-16	2-Feb-16	9-Feb-16	16-Feb-16
Farm grazing ha (available to milkers)	160	160	160	160	160
Dry Cows on farm / East blk /Jackies/other	0/0/0/0	0/0/0/0	0/0/0/0	0/0/0/0	0/0/0/0
Culls (Includes culls put down & empties)	0	0	0	0	1
Culls total to date	14	14	14	14	15
Deaths (Includes cows put down)	0	1	0	0	0
Deaths total to date	11	12	12	12	12
Calved Cows available (Peak Number 560)	550	549	549	549	548
Treatment / Sick mob total	0	0	1	3	0
Mastitis clinical treatment	0	0	1	2	0
Mastitis clinical YTD (tgt below 64 yr end)	86	86	87	89	89
Bulk milk SCC (tgt Avg below 150)	174	194	182	206	173
Lame new cases	4	5	5	6	4
Lame ytd	98	103	108	114	118
Lame days YTD (Tgt below 1000 yr end)	1094	1269	1451	1577	1745
Other/Colostrum	0	0	0	0	0
Milking twice a day into vat	531	524	522	528	524
Milking once a day into vat	19	25	26	18	24
Small herd	144	140	140	140	138
Main Herd	368	384	383	388	386
MS/cow/day (Actual kg / Cows into vat only)	1.98	1.91	1.85	1.84	1.79
MS/cow to date (total kgs / Peak Cows	322	336	348	361	373
MS/ha/day (total kgs / ha used)	6.80	6.54	6.34	6.27	6.12
Herd Average Cond'n Score	4.30	0.00	0.00	0.00	4.20
Monitor group LW kg WOW early MA calvers	491	483	490	490	488
Soil Temp Avg Aquaflex	16.1	18.0	16.1	17.4	18.1
Growth Rate (kgDM/ha/day)	85	126	108	90	109
Plate meter height - ave half-cms	15.0	16.3	15.3	14.1	15.4
Ave Pasture Cover (x140 + 500)	2596	2779	2640	2477	2660
Surplus/[defict] on feed wedge- tonnes	30	54	34	11	28
Pre Grazing cover (ave for week)	3347	3366	3517	3648	3451
Post Grazing cover (ave for week)	1650	1650	1650	1650	1650
Highest pregrazing cover	3436	3600	3636	3916	3636
Area grazed / day (ave for week)	6.56	6.11	7.51	6.27	7.02
Grazing Interval	24	26	21	26	23
Pasture ME (pre grazing sample)	12.0	11.4	11.4	12.0	11.4
Pasture % Protein	21.4	23.0	23.0	20.5	22.9
Pasture % DM - Concern below 16%	12.0	9.1	9.1	14.8	13.5
Pasture % NDF Concern < 33	34.5	37.8	37.8	37.4	42.7
Mowed pre or post grazing YTD	214.3	219.3	219.3	231.5	236.5
Total area mowed YTD	255.6	268.1	283.8	307.3	312.3
Suppls fed to date kg per cow (560 peak)	113.8	113.8	113.8	113.8	113.8
Supplements Made Kg DM / ha cumulative	642.4	701.3	701.3	964.35	964.35
Units N applied/ha and % of farm	25units/ 33.7%	25units / 25.6%	25units / 15.6%	25units / 41.4%	25units / 31.1%
Kgs N to Date (whole farm)	119	125	129	139	147
Rainfall (mm)	17.8	8.4	29.6	0	9.8
Aquaflex topsoil rel. to fill point target 60 - 80%	80	60-90	70-90	70-90	60-80

We walk the farm every Tuesday at 9am. Farmers or their managers and staff are always welcome to walk with us. Please call to notify us of your intention and bring your plate meter and gumboots.

Pasture Yield Mapping

Anna Taylor, AgResearch. anna.taylor@agresesearch.co.nz, Samuel Dennis, Grounded Samuel@grounded.co.nz Karen O'Neill, Westlea Clarke-Hill.

The C-Dax pasture meter is used already on many farms to measure pasture yields

This project investigated yield mapping on a range of farms to determine how best to use this technology to improve pasture yields.

Can yield mapping:

Save time?

Save money?

Provide new information?

Drive up pasture yield

What did we do?

- Collected pre- and post-graze measurements with the C-Dax pasture meter on 6 LUDF paddocks at almost every grazing for two years (September 2012 to October 2014)
- Data was plotted into a pasture yield map using standard GIS mapping software to give a detailed graphic representation of covers in the paddocks.

From this data we wanted to achieve two things:

- Develop a protocol for 'how to' yield map
- Investigate the usefulness of yield mapping

What did we find?

1. Pasture yield can differ dramatically within-paddock – Total feed intakes varied from 7 to 14 t DM/ha in one of the paddocks sampled
2. Data may be collected at up to 50m run spacings (though narrow enough to capture all features of interest) and in pre-grazing phase (in the last third of the regrowth period).
3. An estimate of annual pasture yield can be made from maps taking in summer months, the optimal time for irrigated Canterbury dairy farms was found to be December. This suggests

that other farms should be mapped approximately one month after reaching peak pasture growth rates

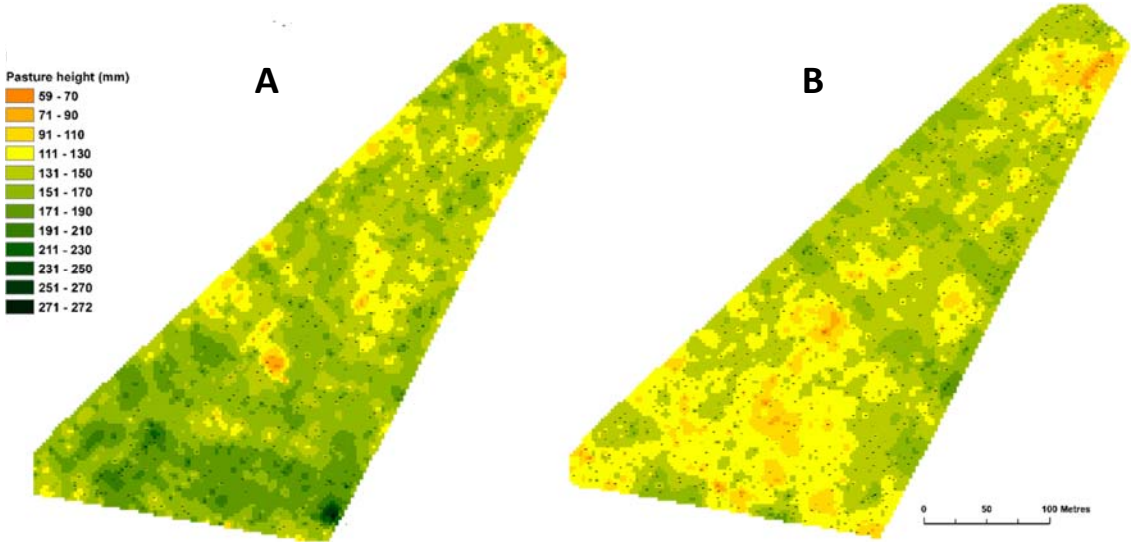


Figure 1. Paddock N3 at LUDF in October 2013 (A) and February 2014 (B)

This figure demonstrates how the yield pattern on a paddock can change between spring and summer. If you map pre-grazing pasture covers on a paddock at LUDF in December, the areas with the highest pasture cover will tend to have the highest total annual yield, and the areas with the lowest pasture cover will tend to have the lowest annual yield. The same is generally true for any summer map. This is because on this irrigated property the highest pasture growth rates occur, and therefore a large proportion of total annual pasture yield is produced, during late spring and summer. Furthermore during this period the major factor limiting yield is water, so most yield variation is linked to differences in irrigation, differences that are not visible at other times of the year.

What else can a yield map tell us?

1. Better understanding of the variability in pasture production on farms in general
2. Pasture renewal
    a. Identifying poorest, patchiest paddocks for renewal
    b. Identifying parts of paddocks for rejuvenation, to save renewal costs
    c. Identify areas of poor performance so the causes can be investigated and corrected if possible, preventing recurrence in new pasture.
3. Irrigation
    a. Identify problems with systems
    b. Asses the effectiveness of system changes, map before and after change.

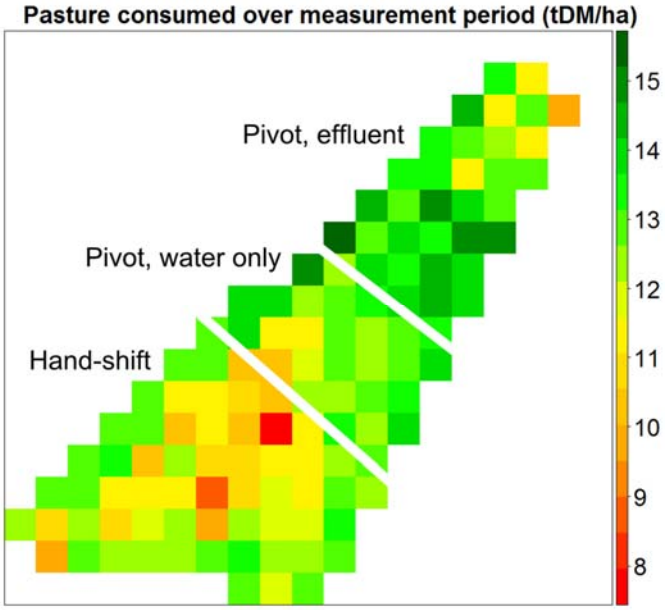


Figure 2. Total consumed pasture measured on paddock N3 over the majority of the 2012/13 season (the total yield here is slightly less than that reported by the farm as not every grazing was measured).

Total annual pasture yield was calculated by subtracting post-grazing map from pre-grazing map to map pasture intake. The sum represents the total pasture intake over the recording period. Pasture yield varied across the irrigated area with the highest yield (15 t/ha) occurring in areas receiving water and effluent followed by the outer edge of the pivot (13 t/ha) that received water only. The lowest yields (11 to 13 t/ha) were measured under the hand-shift irrigators

4. Yield mapping can be used to zone a farm into areas of comparable performance, to inform
    a. Soil fertility management
    b. Fencing
    c. Variable rate irrigation

In this case, these zones related primarily to irrigation, effluent, and topography. The correlations between yield and other factors were most visible in summer. Yield mapping may help to guide fertiliser applications when there are areas where growth is severely restricted for any reason or for larger paddocks. However, this was not the case on the fertile high performance property where this was tested.

5. Economic analysis
    a. Map gross margins (yield map plus further financial information)
    b. Inform large investment decisions - irrigation, drainage
    c. Financial impact of pasture pests, compaction, poor fertility
    d. Benefits of shelter, effluent application, drainage

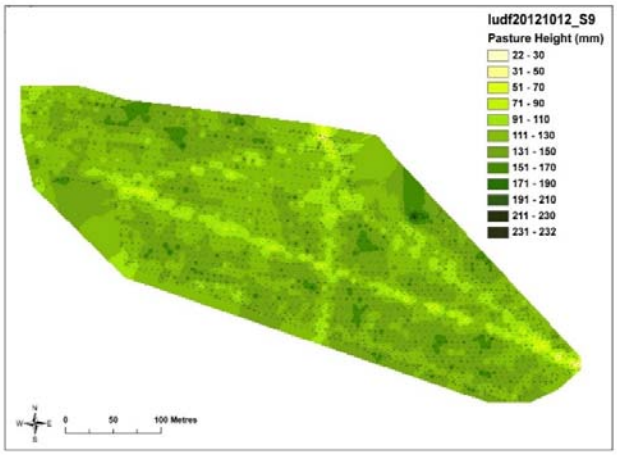


Figure 3. S9 October 2012, compaction from traffic to and from silage pit. This had disappeared by summer.

6. Find representative transects for
    a. Regular pasture yield monitoring
    b. Soil sampling

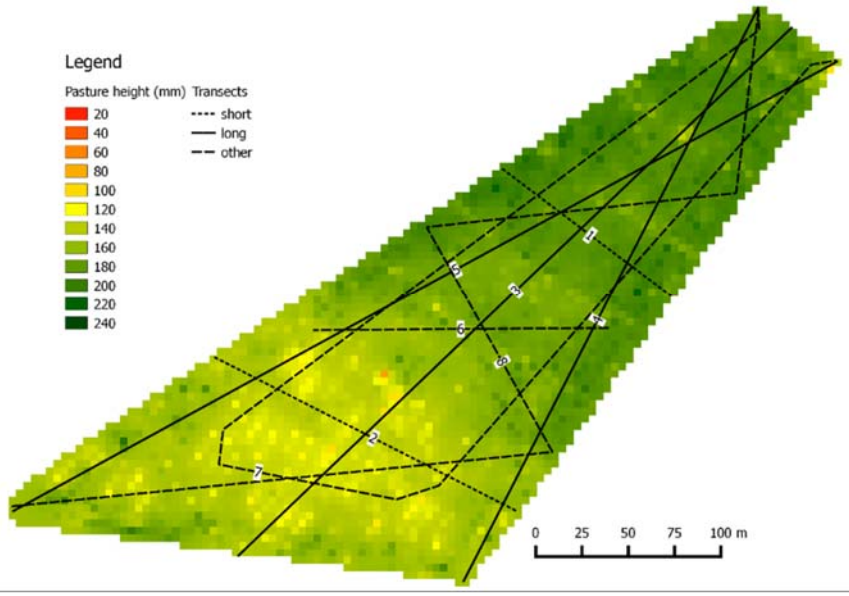


Figure 4. December pasture cover and potential transects, LUDF paddock N3

In this map, the mean pasture height is 164 mm, or 3700 kgDM/ha.

Transect 1 approximately represents the transect used to measure pasture cover on the weekly farm walks. In this map, the mean height of this transect is 188 mm, 4130 kgDM/ha. This is substantially different from the paddock mean (3700kgDM/ha). Transect 2 represents the opposite extreme, a poor transect that underestimates pasture

7. On-farm research
    a. Quick measurement of large field plots, split paddock trials
    b. Palatability comparisons (mapping grazing residual)

Where to from here?

Pasture yield mapping is a practical and understandable tool. It has potential to be the first step to assess many different issues.

There is a need for industry-friendly software to produce yield maps.

This project was funded by MPI (SFF), DairyNZ and Ravensdown

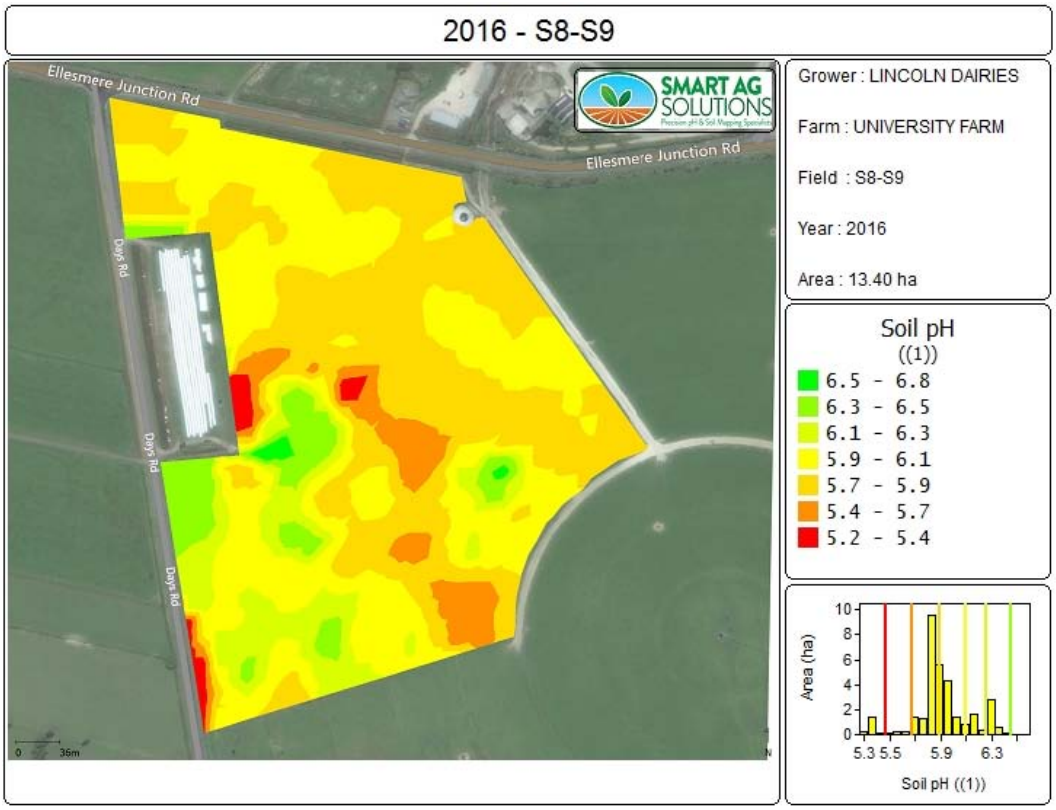
Smart AG Solutions – Mapping Soil pH, Organic Matter and Soil Texture

Precision soil testing and mapping can provide:

- 20-25 soil pH samples per hectare and
- 200-250 soil EC and OM samples per hectare

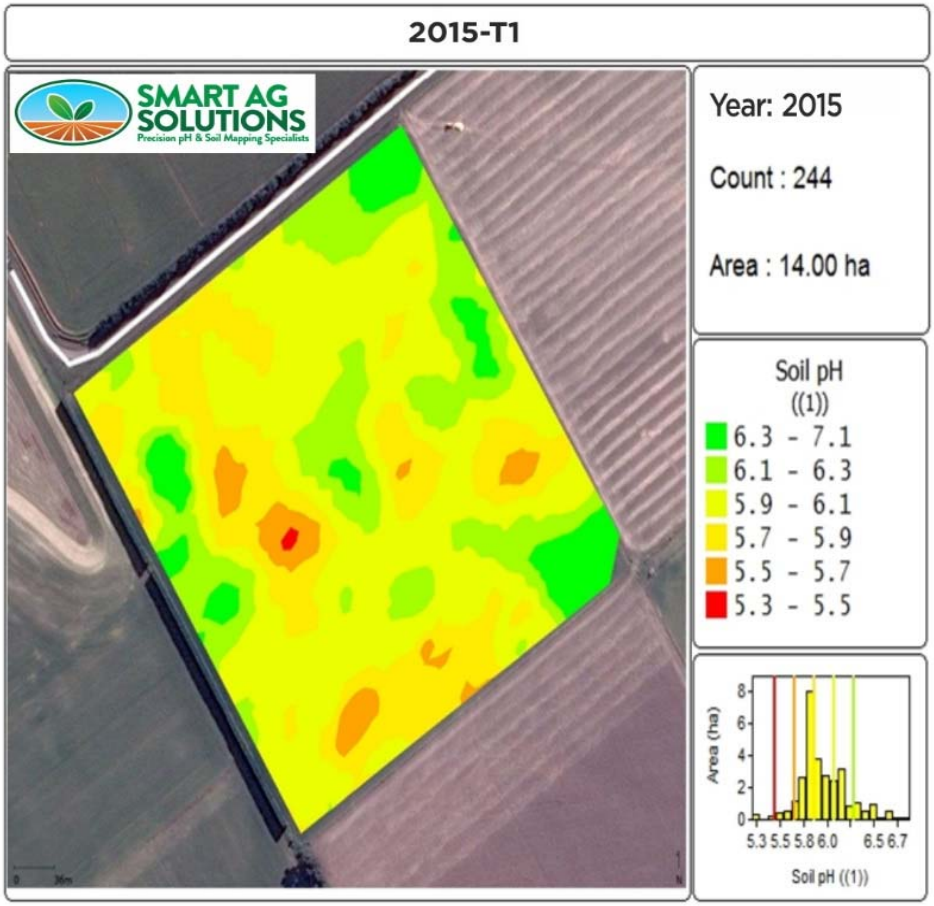
Soil pH maps guide precise lime placement by capturing true pH variability
Soil EC maps provide the precision needed for zone sampling and VRA
Soil OM accurately maps soil providing the precision needed for Variable Rate Applications

Mapping of a range of paddocks at LUDF to explore the within paddock variability has found less variability than one might have expected. This provides confidence to continue the whole paddock sampling process; the evidence from LUDF to date does not warrant more intensive subsampling and fertiliser application within the paddocks sampled to date.



By comparison, the following picture of a 14 ha paddock reported an average pH of 5.6, but a range from 5.3 – 7.1.

Precision pH Map with 244 samples taken.



The economics of blanket application vs detailed soil mapping and variable application are as follows:

	Blanket Application	Variable Application
Soil Test	$43	
Soil Mapping $78/ha	-	$1092
Lime required	56 tonnes	19.6 tonnes
Lime (Supply and Spread)	$35/tonne	$35/tonne
Lime cost	$1960	$686
Total Cost	$2003	$1778
Total saving per hectare		$16/ha

In addition to saving $16/ha, the farm has reduced the pH variation in the paddock - which should contribute to enhanced yields over time – and acquired detailed soil maps to aid ongoing paddock management.

Environmental Changes – Constraints or Opportunities?

Key Steps:

1. Get engaged locally and understand requirements within your farms location.
2. Develop and implement a farm environment plan (Sustainable Milk Plan or equivalent). A farm environment plan (FEP) must be provided at the time the resource consent application is lodged.
3. Prepare for consent applications if / when required:
    a. Farms within **orange zones that leach more than 20kgN/ha required a consent from 1 January 2016**. Two exceptions exist:
        i. If, the current (and lawfully established farming activity) has the same (or similar) character, intensity, and scale as it did in 2012, those farms have 6 months in which to apply for a resource consent from 1 January 2016.
        ii. Farms in orange zones that have sub-regional plans as below.
    b. Farms within **red zones that leach more than 20kgN/ha need a resource consent from 1 January 2017**, with similar exceptions as above for orange zones:
        i. If, the current (and lawfully established farming activity) has the same (or similar) character, intensity, and scale as it did in 2012, those farms have 6 months in which to apply for a resource consent from 1 January 2017.
        ii. Farms in red zones that have sub-regional plans as below.
    c. Specific rules are in effect for Hurunui-Waiau, Selwyn-Waihora, Hinds Plains (Ashburton District) and the South Coastal Canterbury Area (Waimate District)
        i. Farms in both **Selwyn Waihora and Hinds require consents – by 1 January 2017.**
        ii. The 6 month window for farms operating a lawfully established farming activity that has the same (or similar) character, intensity, and scale as it did in 2012, also have 6 months in which to apply for a resource consent from 1 January 2017.
    d. Farms in areas classified as green or light blue are permitted activities if they leach less than 20kgN/ha, OR are less than 50ha OR have leaching losses that don't increase more than 5kgN/ha/yr.
    e. All other farms (and farms with uncertainty regarding the above) should contact ECAN to determine the requirements for their farms.
4. ECan are preparing material to assist with the consenting process with zone specific consent application forms and supporting material on their website. (see below)

DISCLAIMER:

The material presented here is a simplification and general guide only. Please ensure you determine the specific requirements and timeframes for your farm(s).

Contact ECAN, DairyNZ or your local milk supply representative, farm consultant or fertiliser staff for more information.

Further Information:

Additional information on the requirements of the Land and Water Regional Plan, and the zone specific chapters such as Selwyn-Te Waihora Plan Change (PC1), Hinds Plains (PC2) etc is available directly from ECAN.

A range of material is available on their website. For example

1. Frequently Asked Questions for Dairy Farmers:
   http://ecan.govt.nz/publications/Plans/lwrp-dairy-farmers-faq.pdf

2. Selywn – Te Waihora Plan Change 1 – Frequently asked questions

3. Hinds Plains
   http://ecan.govt.nz/publications/Plans/**pc2**-faq-feb.pdf

4. See also following summary of Plans – where are we up to, and Detailed information on the individual planning processes in each zone.

Plans – Where are we up to?

As at February 2016

Land & Water Regional Plan (LWRP)

- Region-wide (except Hurunui-Waiau*) 'holding position'
- In effect now, partially operative
- Plan Change 4 ("Omnibus") – notified 12 September 2015

*Hurunui-Waiau

- Separate plan is operative – see www.ecan.govt.nz/hwrrp

Selwyn and Te Waihora (Plan Change 1, LWRP)

- Operative

Hinds Plains (Plan Change 2, LWRP)

- Hearing decision 13 February 2016

Banks Peninsula

- Lake Forsyth/Te Roto o Wairewa plan (Plan Change 6, LWRP) – Hearing April 2016

Waitaki

- Lower Waitaki – South Coastal Canterbury (Plan Change 3, LWRP) – Hearing on now
- Plan Change 3 to Waitaki Catchment Water Allocation Regional Plan – hearing on now
- Waitaki sub-regional section, LWRP (Plan Change 5) – notification 13 February 2016

Nutrient Management Plan Change (Plan Change 5, LWRP)

- Notification 13 February 2016

Sub-regional sections, LWRP for other areas

- Christchurch-West Melton, Hurunui-Waiau, Kaikōura and Waimakariri coming up in the next few years

Proposed air plan

- Hearing on now – see www.ecan.govt.nz/airplan

More information www.ecan.govt.nz/lwrp

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Facilitating sustainable development in the Canterbury region

E16/5235

Requirements for LUDF:

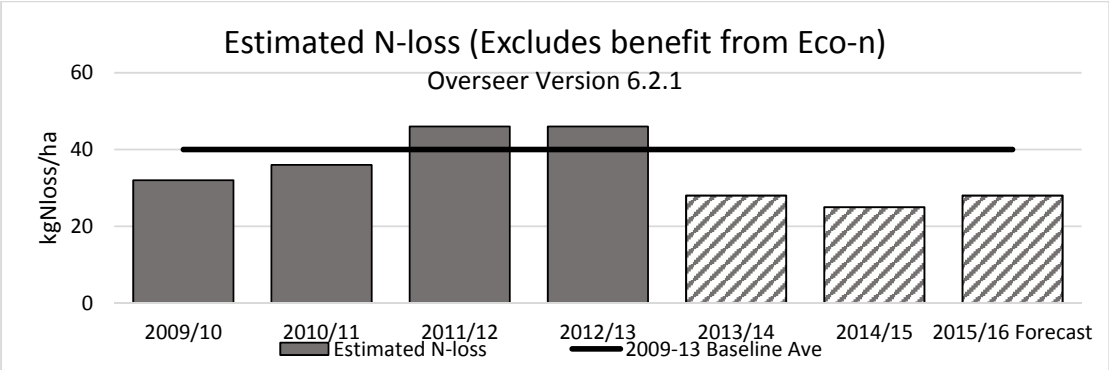
As LUDF is in the Selwyn-Waihora zone, its requirement include:

1. Until 1 January 2017, ensure the nitrogen loss calculation does not exceed the nitrogen baseline;
2. By 1 January 2017, further reduce discharges of nitrogen, phosphorus, sediment and microbial contaminants. This requires:
    a. Implementing a Farm Environment Plan, prepared in accordance with Schedule 7 Part A
    b. Achieve a rate of nitrogen and phosphorus loss that is consistent with good management practice for the property's baseline land use taking into account:
        i. The type of farming activity; and
        ii. The drainage characteristics of the soil; and
        iii. The climatic conditions and topography of the property; and
        iv. The type of irrigation system used (if any); and
        v. Whether the practices set out in Schedule 24 have been fully adopted; and
        vi. The nitrogen baseline for the property and the level of any enduring reductions in nitrogen loss already achieved relative to that baseline.
3. A controlled activity consent is required as part of (2) above. This must be applied for within 6 months of 1 January 2017 (as on previous page).
4. By 1 January 2022, further reduce losses of nitrogen from farming activities by implementing management practices that means the required reduction in the losses of nitrogen from the property are 30% (below its 2017 level)

In practice, LUDF's management changes over the past 4 years as it has sought to maintain (relative) profitability, while operating with lower nitrogen losses, has resulted in N-losses that are below the farms 2009-2013 baseline (see graph below).

Currently, ECAN is reviewing the alignment between the indicative 'good management practices' referred to above and the property specific GMP calculation arising from the ECAN portal developed as part of Plan Change 5 (PC5) and notified on Saturday 13th February 2016. Until this material is provided, it is difficult to ascertain LUDF's rate of N-loss when operating within the good management practice referred to above (2b).

Indicative N-losses across years / farm systems at LUDF:



Note: N-losses are indicative only.

DairyNZ Sustainable Milk Plan

Contact Person(s):	Peter Hancox	***Farm Name:***	LUDF	***Plan Writer:***	Angela Harvey, DairyNZ
Physical Address:	1504 Shands Road,	***Ownership type:***	Owner with Manager	***Date:***	28-Jan-16
Email Address:	hancoxp@lincoln.ac.nz / ron.pellow@siddc.org.nz	***Supply Number:***	37581	***Region:***	Canterbury

Farm Identifiers, Location, & Key Statistics:

Title Legal Description:	RS6028; RS4565; RD4426; Part RS3684; Part RS3031; Part RS2803; Part RS2719; RS2775; RS2718; Part RS6377		**(ha):**	186.00	**District/Zone:**	Selwyn/Waihora Zone	
Additional Title:			**(ha):**	0.00	**Catchment:**	Selwyn Waihora	
Additional Title:			**(ha):**	0.00	**Climate Site:**	0	
Total Effective Area (ha):	160	**Total Farm Area (ha):**	186		**Peak Herd Size:**	555	**Stock Rate:** 3.47

Major environmental risks identified for this farm:

These environmental risks shall be managed through practices and actions identified in this plan.

A range of soil types with Temuka - being poor draining soil prone to pugging damage

Also small area of shallow stony soil with rapid drainage prone to leaching nutrients

Water courses boundarying property

Resource Consents Held:

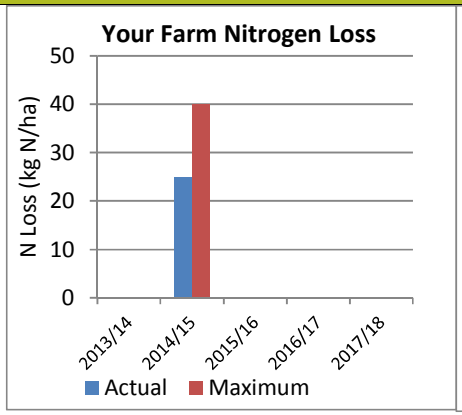
Farming land use:	
Effluent:	CRC083973
Ground Water Take:	CRC010786
Surface Water Take:	
Human Sewage:	
Other:	

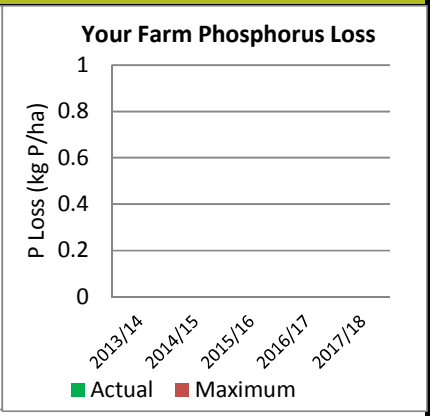
Effluent System Indicators:

Application Area (ha):	34	**Consented:**	Research far
Kg effluent-N/ha/yr applied:	198	**Consented:**	200
Storage Volume (m³):	345	**Consented:**	uent storage
Storage Lining Material:	Pond - Concrete		

Nutrient Management Indicators:

Date of last NB:	20/01/2016	
NB created by:	Ron Pellow	
Overseer Version:		6.2.1
N Baseline (2009-13) (kg N/ha):		end 2016, t
Overseer Version:		6.2.1
Nitrogen Leached:	**Actual**	**Max**
2014/15 (kg N/ha):	25	40
2015/16 (kg N/ha):	0	0
Phosphorus	**Actual**	**Max**
2014/15 (kg P/ha):	0	0
2015/16 (kg P/ha):	0	0





Comments:

Summary of management areas within this farm:

Irrigation System Summary:

Irrigation Scheme:	0					
Total Annual Volume (m^3):	0	**Irrigation Flow (L/sec):**				98
Irrigation Type:	Centre Pivot	**Number:**	1	**Ha:**		49.9
Irrigation Type:	Centre Pivot VRI	**Number:**	1	**Ha:**		77.1
Irrigation Type:	Moveable Sprinklers e.g. K-Line, skids	**Number:**	0	**Ha:**		33
Irrigation Type:	0	**Number:**	0	**Ha:**		0
Irrigation Water use efficiency (%):	0%	**Target (%):**	0%	**Water Takes:**		2

Other livestock classes

Livestock class:	0	**Number:**	0	**Months:**	0
Livestock class:	0	**Number:**	0	**Months:**	0
Livestock class:	0	**Number:**	0	**Months:**	0

Soil & Topography Summary:

Soil Type 1:	Wakanui					**Area (ha):**	49
Soil Type 2:	Eyre					**Area (ha):**	8
Soil Type 3:	Templeton					**Area (ha):**	73
Contour %:	**Flat %:**	100	**Rolling %:**	0		**Steep %:**	0

Cropping Summary:

Crop Type 1:	N/A	**Area (ha):**	0
Crop Type 2:		**Area (ha):**	0
Crop Type 3:		**Area (ha):**	0

Water Use Summary:

Dairy Shed Type:	Rotary			**No of Cups:**	50
Total Water Use (L/day):	0			**L/cow/day:**	0

Remaining compliant with this Sustainable Milk Plan

This Sustainable Milk Plan alone does not guarantee compliance.

The good management practices and actions identified shall be carried out with supporting evidence of such practices, to meet the objectives and targets at the time of this Sustainable Milk Plan being developed.

The farmer is responsible to ensure this Sustainable Milk Plan is kept true and up-to-date and to inform DairyNZ when changes are required.

This Sustainable Milk Plan will be subject to periodic audit. Farm audits will generally be scheduled in advance with the farmer, however farmers shall be prepared for an audit to take place at any time.

Auditing:

Last Audit Date:	
Auditor Name:	
Last Audit Result:	
Auditor Organisation:	

This farm will be subject to periodic audit. Audits will generally be conducted by appointment, however Environment Canterbury hold the right to check compliance of this Sustainable Milk Plan at any time.

Predicted audit frequency based on audit result (may vary):	

Targets:

The target document used to generate this Sustainable Milk Plan was:	Version 3: 31 August 2015

These targets being addressed by this Sustainable Milk Plan have been prepared to help you the farmer, meet your Regional Council regulatory requirements and your requirements under the Sustainable Dairying Water Accord at the date the Sustainable Milk Plan is developed. It also takes into consideration requirements of your milk company environmental conditions of supply and conditions of your irrigation scheme resource consents (if applicable). The target document listed above is available through the DairyNZ website. The target documents are subject to change as regulatory conditions change. While all reasonable endeavours have been made to ensure the accuracy of the information in this document, DairyNZ Limited does not accept responsibility for any loss or damage, however caused, which you may directly or indirectly suffer in connection with your use of this document and expressly disclaims any and all liability that may arise from any such loss arising out of your use of or reliance on information contained or accessed through this Sustainable Milk Plan. You as the owner of this document are fully responsible of ensuring your Sustainable Milk Plan meets and continues to meet your regulatory requirements.

Water & Irrigation Management

Objective: To operate irrigation systems efficiently and ensuring that the actual use of water is monitored and efficient.

Level	Environmental 'Good Management Practices' currently carried out:	Evidence Required:	Note
Compliance	Watermeters are installed on all bores to measure water usage	Site Visit of water meters	
Above GMP	There are alert systems in place to detect losses such as the dosetron which is an indicative measure of stockwater losses and also monitored through recording daily water usage volumes	Site Visit and daily water volume records	
GMP	Steps are being taken to minimise water use around the dairy shed e.g. scrapper on backing gate, and cooler water is recycled and use for yard wash water	Site and Discussion	
GMP	The South block pivot has been bucket tested to measure the application depth and distribution uniformity to ensure efficient use of water; and the North Block VRI pivot is currrently undergoing a full performance assessment by an external company	Bucket test results	
Above GMP	The moveable K-line and Sprinkler systems are aligned by GPS on the motorbike to ensure even coverage of water on these areas and they are also on a timer of 2 hours on and 1 hour of to ensure no over water occurs this is adjust to fit weather conditions	Site GPS and timer	
GMP	Aquaflex is used for irrigation scheduling and VRI is installed on the North block Pivot to enusre variable rates of water applied to different soil types to stay below field capacity, and turned off over non productive areas such as laneways	Soil moisture trace	
0			

Level	Agreed actions for improvement:	By Who?	When?	Evidence Required:	Complete	Note
GMP	Ensure VRI recording system is operational and capturing all irrigation events (starting and stopping) and maintenance/repairs undertaken and keep invoices filed for proof of external repairs and what was undertaken	Peter	1/04/2016	Site computer records		
Above GMP	Investigate use of a soloniod on the cooler system that only runs when milk pump is running to reduce water use in dairyshed	Peter	1/12/2016	Discussion		
SDWA	Investigate installation of a water meter to measure dairyshed water use in the dairyshed by 2020 as a requriement under the Sustainable Dairy water Accord	Peter/Ron	1/01/2020	Site Water Meter		
GMP	Look into sending some of the current staff on an Irrigation operators and managers training day through IrrigationNZ	Peter	1/12/2016	Discussion		
GMP	Ensure any actions that are noted from the bucket test and performance assessment are addresses and these are recorded to show efficiency of the irrigation system	Peter and staff	1/07/2016	Maintenance records		
0						

Nutrient Management

Objective: To maximise nutrient use efficiency while minimising losses to water.

Level	Environmental 'Good Management Practices' currently carried out:	Evidence Required:	Note
SDWA	Farm physical information such as fertiliser and supplementary fed use is supplied annually to Fonterra as part of the Supply Fonterra Nitrogen programme	Fonterra Nitrogen Report	
GMP	A Nitrogen baseline has been calculated for the farm and a nutrient budget is in place that represents the current farming system and it is the most recent version of Overseer and is used when making farm system change decisions and fertiliser decisions	Nutrient Budget reports	
Above GMP	All paddock soil testing is undertaken annually and the trends are used to tailor individual paddock fertiliser recommendations to ensure nutrient levels are within optimum range for maximum pasture productions levels	Soil test results/Fertiliser recommendations	
GMP	Decisions around timing of fertiliser applications take into consideration soil temperature (>6 degrees), soil moisture and plant uptake, also is only applied August through to April	SmartMap - fertiliser application records	
Above GMP	Changes have been made to the management practices to reduce the amount on nutrient lost - VRI has been installed on the North Block Pivot ; Reduced Stocking rate; Reduced imported supplpement levels; reduced amount of Nitrogen fertiliser being	Discussion/Nutrient Budgets	
0			
0			

Level	Agreed actions for improvement:	By Who?	When?	Evidence Required:	Complete	Note
GMP	Continue liasing with Fonterra Sustainable Dairying advisor around block setup and assumptions made for the Nitrogen programmes nutrient budget to better align with the current farm system	Ron	1/06/2016	Discussion/New Nitrogen Report		
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0						
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Effluent Management

Objective: To manage the risk associated with the operation of effluent systems to ensure effluent systems are compliant 365 days of a year.

Level	*Environmental 'Good Management Practices' currently carried out:*	*Evidence Required:*	*Note*
Compliance	Is aware of the permitted activity/resource consent conditions that must be meet around discharge application depth and around scheduling - Use deferred irrigation in wet conditions and utilise aquaflex soil mositure monitoring for application decisions	Consent/Soil mositure trace	
Above GMP	A Warrant of Fitness has been undertaken on the effluent system to assess the compliance and management of the current system	WOF report/May 2014 Focus Day handout	
Above GMP	Nutrient value of the effluent has been tested, so this can be considered for decisions around fertiliser and strategic nitrogen use	Test values	
GMP	A regular maintenance programme is in place to ensure efficient and compliant use of effluent -on a daily basis filters at sump are cleaned and pots are unblocked on the application system - Application events and repairs and maintenance are recorded in the	Dairy Dairy	
GMP	A bucket test was performed to measure the application depth of the applied effluent	Bucket test results	
0			
0			

Level	*Agreed actions for improvement:*	*By Who?*	*When?*	*Evidence Required:*	*Complete*	*Note*
GMP	Investigate a safety aparatus such as a ladder/rope or life buoy for the irrigation saucer to reduce the risk of human injury/accidents	Peter	1/01/2017	Observation/Discussion		
GMP	Continue to undertake a annual bucket test on the effluent system to measure the application depth of applied effluent - http://www.dairynz.co.nz/environment/effluent/managing-and-operating-effluent-systems/	Peter/Staff	1/05/2016	Bucket test results		
GMP	Ensure Maintenance and repairs are being recorded in the Dairy Diary to show efficient use and compliance with effleunt land applications	Peter/Staff	1/01/2017	Dairy Diary - Maintenance records		
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Waterway & Biodiversity Management

Objective: To manage wetlands and water bodies so that stock are excluded as far as practicable from water, to avoid damage to the bed and margins of a water body, and to avoid the direct input of nutrients, sediment, and microbial pathogens.

Level	*Environmental 'Good Management Practices' currently carried out:*	*Evidence Required:*	*Note*
SDWA	All waterways (only present on the boundaries of the property) and wetlands are permanently fenced so stock can not enter flowing water	Fonterra Waterways Maps/Site Visit	
GMP	A large area of strategic native planting has been undertaken along waterways to reduce runoff and sediment loss to waterways these areas are managed for weeds through a contractor regularly spraying	Site Visit	
GMP	All waterways are fenced 3m average distance and carrex are planted to stop erosion of banks into the creek	Discussion/Site Visit	
0			
0			
0			
0			

Level	*Agreed actions for improvement:*	*By Who?*	*When?*	*Evidence Required:*	*Complete*	*Note*
GMP	Ensure maintenance and upkeep of Riparian areas such as spraying is recorded in the Dairy diary	Peter	1/01/2017	Dairy diary		
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Land & Soil Management

Objective: To maintain or improve the physical and biological condition of the soils in order to minimise the movement of sediment, phosphorus and other contaminants to waterways.

Level	Environmental 'Good Management Practices' currently carried out:	Evidence Required:	Note
GMP	Very aware of vulnerable soils on the property managed accordingly with on-off grazing in wet conditions, and VRI has been installed on the north block to ensure soil mositure levels are addressed under different soil types	Discussion	
GMP	Annual maintenance of laneways - Recapping where required; ripping and conpacted annually	Maintenance records/Site visit	
0			
0			
0			
0			
0			

Level	Agreed actions for improvement:	By Who?	When?	Evidence Required:	Complete	Note
GMP	Ensure Records of Laneway maintenance and repairs are being kept in the Dairy diary	Peter	1/09/2016	Dairy Diary		
0						
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0						

Storage Infrastructure & Waste Management

Objective: To manage the number and locations of offal and rubbish pits to minimise risks to health and water quality.

Level	Environmental 'Good Management Practices' currently carried out:	Evidence Required:	Note
GMP	Dead animals are disposed of as quickly as practical by an off farm collection service	Collection invoices/Discussion	
GMP	Off-farm rubbish collection for household and farm waste by means of a skip and Plasback collects and recycles baleage wrap	Site Observation	
GMP	DairyShed Chemicals are stored in a lockable shed and clearly labelled to reduce the risk of accidental miss identification, Contractors supply there own chemicals for use	Site Chemcials	
0			
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Level	Agreed actions for improvement:	By Who?	When?	Evidence Required:	Complete	Note
GMP	Put a bucket of sawdust with lid near the fuel storage so if a fuel spill occurs spread sawdust over to absorb reducing impact to the environment	Peter	1/03/2016	Site Bucket at fuel storage		
0						
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ECan LWRP – Plan Change 5

Tony Fransen, DairyNZ

Disclaimer: This document has been put together by Tony Fransen (DairyNZ) to try and build understanding what Environment Canterbury's LWRP proposed Plan Change 5 means to farmers in different areas of Canterbury. Please note that the current rules in the operative LWRP are still the rules which you need to comply with. This is a summary for the purposes of engaging on key issues only; please seek further advice before making any business decisions.

The proposed Plan Change 5 (PC5) was formally notified by Environment Canterbury on 13 February 2016. It contains two parts:

- **Part A:** Changes to Nutrient Management provisions of the overarching Canterbury Land and Water Regional Plan (LWRP) framework
    - Changes to thresholds for permitted land use activities
    - Introduction of GMP loss rates and the farm portal
    - Changes to farm environment plan requirements (FEP) including auditing specifications

- **Part B:** Changes to Section 15 Waitaki and South Coastal Canterbury Section

How does Plan Change 5 (Part A) relate to:

Everyone:

The rules in Part A (and some of Part B) do not have legal effect until this Plan Change is made Operative. This means the existing nutrient management rules of the LWRP 5.41- 5.59 still apply and consents may need to be applied for under these rules. However it is likely that ECan will refer to the proposed rules or policies of Plan Change 5 and assess likely ability to comply with these when deciding on the duration to grant the consent.

The Hurunui/Waiau Zone?

For areas such as the Waipara and Conway catchments the LWRP rules and Plan Change 5 will apply. For the Hurunui, Waiau and Jed catchments the rules of the Hurunui & Waiau Rivers Regional Plan (HWRRP) apply. Under the HWRRP the farmers are required to either join a 'collective' or apply for consent by 1/1/2017 part of which includes having a Farm Environment Plan as set out in Schedule 2 of the HWRRP. Part of the conditions in Schedule 2 include a reference to how industry agreed best management practice nitrogen and phosphorus loss rates will be applied within the collective and also how they might be applied on farm. This means that the industry agreed GMPs are still relevant for the Hurunui and Waiau catchments. There is also a plan change likely in the Hurunui/Waiau Zone ~2018 which may consider introducing specific reference to the ECan Farm Portal.

The area covered by Plan Change 1: Selwyn Waihora Zone?

Proposed changes to the FEP requirements will apply to Selwyn/Waihora farmers too.

The nutrient management rules of Plan Change 1 override those of Plan Change 5. However, the rules in Plan Change 1 relating to consent requirements for properties losing more than 15 kg N/ha/yr include a matter of control for the consent application is meeting good management practice nitrogen and phosphorus loss rates and any reductions required below GMP in line with policies 11.4.14 to 11.4.16. Policy 11.4.14 refers to good management practice and then reducing N loss by a percentage based on your sector i.e. Dairy 30%; Dairy Support 22%. (for more info see rules 11.5.9-11.5.13)

Therefore even though the rules of Plan Change 5 do not have direct effect on the area covered by Plan Change 1, the Farm Portal and the resulting GMP Loss rates for nitrogen and phosphorus could be considered in the assessment for consent applications and therefore what farmers may need to comply with.

The area covered by Plan Change 2: Hinds Plains?

Proposed changes to the FEP requirement will apply to the Hinds Plains farmers too.

The rules of Plan Change 2 override the nutrient management rule changes of Plan Change 5. However, in Plan Change 2 there are policies in Plan Change 2 (specifically 13.4.11 for Upper Hinds, and 13.4.13 for Lower Hinds) which refer to 'all existing farming activities to discharge no more nitrogen than the loss rate that could be reasonably expected from the implementation of good management practices'. These policies are likely to create a link or expectation that the portal would be used to determine these 'loss rates'. However this is an issue that needs to be worked through with ECan. There is also reference to nitrogen loss rates to a percentage below GMP loss.

The area covered by Plan Change 3: South Coastal Canterbury?

This is the most difficult area to determine what the link may look like between Plan Change 3 and Plan Change 5. Plan Change 3 has reference to Flexi-Caps and Maximum Caps to nitrogen loss from the property in the draft rules. Through the hearings process there has been recognition that these numbers may not be achieving their intended purpose and need updating or replacing due to Overseer changes and hearing evidence. Therefore as a decisions version to resolve the submissions and hearing evidence of this plan change is being worked on there is some potential that further linkages to Plan Change 5 could result.

Changes to the FEP schedule will also link to the area covered by Plan Change 3.

The area covered by Plan Change 5b: Waitaki?

The plan change for the Waitaki catchments as released in Plan Change 5b are directly linked to Plan Change 5A nutrient management rules and reference to the Farm Portal. The Waitaki rule variations in all catchments require farmers to be achieving good management practice loss rates as a minimum requirement. In some catchments a percentage reduction below this level is also required. Some catchments notably the Valley and Tributaries area will follow the green zone rules as written in Plan Change 5A.

What are the changes proposed in Plan Change 5A?

These first points are the general rules for thresholds and the new tools used in the rule framework. The specifics of how the rules are applied can be seen in the coloured tables that follow which relate to the coloured nutrient allocation zones (i.e. Red, Orange, Green, Light Blue, and Lake).

Permitted activity thresholds

The LWRP operative rules referred to permitted activities being farming operations smaller than 5 ha in total area or a calculated nitrogen loss of less than 20 kg N/ha/yr. The proposed PC5 rules change the total area threshold to allow permitted activities up to 10 ha. The 20 kg N/ha/yr has been removed and replaced with permitted activity allowed for farms with less than 20 ha of winter forage crop grazed by cattle and less than 50 ha of irrigation.

Good management practices

The most significant changes of Plan Change 5A relate to the introduction of good management practice. This comes in several parts, the first being the inclusion of descriptive targets within **farm environment plans** that reflect good management practice; the second and most significant being the requirement to achieve **good management practice nitrogen loss rates** from 2020 as calculated by loading an Overseer file through the ECan Farm Portal and generating a good management practice loss rate for your enterprise.

1. Farm environment plans

Schedule 7 has proposed changes, these relate broadly to:

1. Additional management area for water use (non-irrigation) included
2. Targets added to each management objective (Nutrient, effluent, soil, irrigation, waterbody, point sources, water use)
3. Reference to Phosphorus risk zones being assessed for risk of phosphorus or sediment loss
4. Addition of flood protection or erosion control assets
5. Addition of public access routes and access routes for river, stream, drain maintenance
6. FEP required to have Farm Portal report included as per the date required by the rules relating to the coloured zones
7. Addition of the term Certified Farm Environment Plan Auditor and the Certified Farm Environment Plan Auditor Manual (these documents sit outside of the plan and therefore can be reviewed and updated if required)

Additional Schedule 7A for a management plan for farming activities, mostly relates to permitted activities. Not required to be audited. A management plan must include:

1. Property details
2. Farm maps and identified risk and management areas
3. Good management practices from previous 12 months
4. Actions to be undertaken in the next 12 months

2. Good management practice loss rates

The proposed good management practice nitrogen loss rate rules apply to farms with greater than 20 ha of winter crop grazed by cattle or greater than 50 ha of irrigated land. These farms will need to upload annual farm Overseer files into the ECan Farm Portal. The portal contains modelling proxies which have been developed to simulate good management practice and they overwrite information within your Overseer file to generate what good management nitrogen loss rates should be for this farm.

The modelling proxies have been developed by a technical group with some testing of sample batches of farms. The ECan Farm Portal is now available for you to test what impact this has on your own farm.

A full list of the modelling proxies is available within Schedule 28 of Plan Change 5. These are described in detail relating to which GMP they are reflecting. As the modelling proxies are listed in the schedule of the plan, to change these will require a plan change.

There is also a disclaimer on Schedule 28 which states: “For the avoidance of doubt, Good Management Practice Loss Rates as estimated by the Farm Portal prevail over the formulae, methodologies and figures contained in Schedule 28” in reference to necessary changes to the Farm Portal as a result of version changes to the Overseer software.

RED ZONE

From the top of the table work your way down selecting the area statement that represents your farm and the requirements for your farm will be listed below.

<table>
<tr><td rowspan="2">Less than 10 ha</td><td colspan="3">Greater than 10 ha</td></tr>
<tr><td colspan="2">Less than 20 ha of winter grazing AND less than 50 ha of irrigation</td><td rowspan="2">More than 20 ha of winter grazing OR more than 50 ha of irrigation</td></tr>
<tr><td></td><td>No more than 10 ha of new irrigation developed (from 13/2/2016)</td><td>More than 10 ha of new irrigation developed (from 13/2/2016)</td></tr>
<tr><td>Permitted activity (5.43A)</td><td><u>Permitted activity if (5.44A):</u>
<u>1.</u> Register in Farm Portal by 1/7/2017, update info at least every 24 months.
<u>2.</u> Management Plan in place within 12 months of rules becoming operative</td><td colspan="2"><u>Controlled activity if (5.44B):</u>
<u>1.</u> Have an FEP
<u>2.</u> Nitrogen Loss Calculation does not exceed:
a. Until 30/6/2020: Nitrogen Baseline <u>and</u>
b. From 1/7/2020: Baseline GMP Loss Rate
<u>3.</u> FEP prepared or reviewed by accredited farm consultant
<u>If 2. or 3. above not meet then restricted discretionary activity (5.45A) if:</u>
<u>1.</u> Have an FEP
<u>2.</u> Nitrogen loss calculation exceedance of either:
a. Nitrogen Baseline until 30/6/2020 <u>or</u>
b. Baseline GMP Loss Rate from 1/7/2020
was undertaken lawfully prior to 13/2/2016.
<u>In any case where an FEP is required if this is not supplied this is a non-complying activity (5.47A).</u>
<u>Any unlawful exceedance of the Nitrogen Baseline is prohibited (5.48A).</u></td></tr>
</table>

Exceptions:

Relevant for most red zone dairy farms

Irrigation Scheme or Principal Water Supplier: If land is subject to a resource consent held by an irrigation scheme or principal water supplier that contains a limit on the rate or amount of nitrogen loss that is allowed. (5.41A) then land use is subject to the consent conditions and nutrient load limits of the irrigation scheme.

Water Permits: Land is subject to a water permit for irrigation granted prior to 18 January 2014 which specifies a maximum rate of nitrogen loss and requires the consent holder to hold a Plan to mitigate loss of nutrients. (5.41A)

Multiple NAZ's on one property: If the farm crosses a nutrient allocation zone (NAZ) boundary, rules on the NAZ apply to the respective land area in each NAZ. For consent requirements compliance with the earliest occurring consenting date is required. (5.42A)

Farming Enterprise: Properties managed collectively for nutrient management purposes within the same NAZ can apply for a consent as a 'farming enterprise' all the land must be covered with a farm environment plan and the nitrogen loss calculation must not exceed the nitrogen baseline prior to 30/6/2020 and from 1/7/2020 the Baseline GMP loss rate. This is a discretionary activity (5.46A).

ORANGE ZONE

From the top of the table work your way down selecting the area statement that represents your farm and the requirements for your farm will be listed below.

Less than 10 ha	Greater than 10 ha	
	Less than 20 ha of winter grazing AND less than 50 ha of irrigation	**More than 20 ha of winter grazing OR more than 50 ha of irrigation**
Permitted activity (5.53A)	Permitted activity if (5.54A): 1. Register in Farm Portal by 1/1/2017, update info at least every 24 months. 2. Management Plan in place within 12 months of rules becoming operative	**Controlled activity if (5.54B):** **1.** Have an FEP **2.** Nitrogen Loss Calculation does not exceed: a. Until 30/6/2020: Nitrogen Baseline **and** b. From 1/7/2020: Baseline GMP Loss Rate **3.** FEP prepared or reviewed by accredited farm consultant **If 2. or 3. above not meet then restricted discretionary activity (5.55A) if:** **1.** Have an FEP **2.** Nitrogen loss calculation exceedance of either: a. Nitrogen Baseline until 30/6/2020 **or** b. Baseline GMP Loss Rate from 1/7/2020 was undertaken lawfully prior to 13/2/2016. **In any case where an FEP is required if this is not supplied, or any other condition listed above is not met, this is a non-complying activity (5.56AB).**

Relevant for most orange zone dairy farms

Exceptions:

Irrigation Scheme or Principal Water Supplier: If land is subject to a resource consent held by an irrigation scheme or principal water supplier that contains a limit on the rate or amount of nitrogen loss that is allowed. (5.41A)

Water Permits: Land is subject to a water permit for irrigation granted prior to 18 January 2014 which specifies a maximum rate of nitrogen loss and requires the consent holder to hold a Plan to mitigate loss of nutrients. (5.41A)

Multiple NAZ's on one property: If the farm crosses a nutrient allocation zone (NAZ) boundary, rules on the NAZ apply to the respective land area in each NAZ. For consent requirements compliance with the earliest occurring consenting date is required. (5.42A)

Farming Enterprise: Properties managed collectively for nutrient management purposes within the same NAZ can apply for a consent as a 'farming enterprise' all the land must be covered with a farm environment plan and the nitrogen loss calculation must not exceed the nitrogen baseline prior to 30/6/2020 and from 1/7/2020 the Baseline GMP loss rate. This is a discretionary activity (5.56AA).

GREEN or LIGHT BLUE ZONE

From the top of the table work your way down selecting the area statement that represents your farm and the requirements for your farm will be listed below.

Less than 10 ha	Greater than 10 ha	
	Less than 20 ha of winter grazing AND less than 50 ha of irrigation	**More than 20 ha of winter grazing OR more than 50 ha of irrigation**
Permitted activity (5.57A)	Permitted activity if (5.57B): 1. Register in Farm Portal by 1/1/2018, update info at least every 24 months. 2. Management Plan in place within 12 months of rules becoming operative	**Controlled activity if (5.57C):** **1.** Have an FEP **2.** Nitrogen Loss Calculation does not exceed: a. Until 30/6/2020: Nitrogen Baseline **and** b. From 1/7/2020: Baseline GMP Loss Rate **3.** FEP prepared or reviewed by accredited farm consultant **If 2. or 3. above not meet then restricted discretionary activity (5.58A) if:** **1.** Have an FEP **2.** Nitrogen loss calculation exceedance of either: a. 5 kg N/ha above the Nitrogen Baseline until 30/6/2020 **or** b. 5 kg N/ha above the Baseline GMP Loss Rate from 1/7/2020 was undertaken lawfully prior to 13/2/2016. **In any case where an FEP is required if this is not supplied, or any other condition listed above is not met, this is a non-complying activity (5.59A).**

Relevant for most green zone dairy farms

Exceptions:

Irrigation Scheme or Principal Water Supplier: If land is subject to a resource consent held by an irrigation scheme or principal water supplier that contains a limit on the rate or amount of nitrogen loss that is allowed. (5.41A)

Water Permits: Land is subject to a water permit for irrigation granted prior to 18 January 2014 which specifies a maximum rate of nitrogen loss and requires the consent holder to hold a Plan to mitigate loss of nutrients. (5.41A)

Multiple NAZ's on one property: If the farm crosses a nutrient allocation zone (NAZ) boundary, rules on the NAZ apply to the respective land area in each NAZ. For consent requirements compliance with the earliest occurring consenting date is required. (5.42A)

Farming Enterprise: Properties managed collectively for nutrient management purposes within the same NAZ can apply for a consent as a 'farming enterprise' all the land must be covered with a farm environment plan and the nitrogen loss calculation must not exceed the nitrogen baseline prior to 30/6/2020 and from 1/7/2020 the Baseline GMP loss rate. This is a discretionary activity (5.58B)

LAKE ZONE

From the top of the table work your way down selecting the area statement that represents your farm and the requirements for your farm will be listed below.

Less than 10 ha	Greater than 10ha
Permitted activity (5.49A)	**Register in Farm Portal by 1/7/2016.** **Restricted discretionary activity (5.50A) if:** **1.** Have an FEP **2.** No nitrogen loss calculation exceedance of either: a. Nitrogen Baseline until 30/6/2020 **or** b. Baseline GMP Loss Rate from 1/7/2020 **In any case where an FEP is required if this is not supplied this is a non-complying activity (5.51A).** **Any nitrogen loss calculation above condition 2. 5.50A (above) is prohibited (5.52A).**

Exceptions:

Irrigation Scheme or Principal Water Supplier: If land is subject to a resource consent held by an irrigation scheme or principal water supplier that contains a limit on the rate or amount of nitrogen loss that is allowed. (5.41A)

Water Permits: Land is subject to a water permit for irrigation granted prior to 18 January 2014 which specifies a maximum rate of nitrogen loss and requires the consent holder to hold a Plan to mitigate loss of nutrients. (5.41A)

Multiple NAZ's on one property: If the farm crosses a nutrient allocation zone (NAZ) boundary, rules on the NAZ apply to the respective land area in each NAZ. For consent requirements compliance with the earliest occurring consenting date is required. (5.42A).

Focus Day Feedback – February 2016

1. What is your on farm role (please circle)?

- Farm Owner
- Farm Consultant
- Sharemilker
- Rural Professional
- Farm Manager
- Farm Staff
- Other - please specify _____

2. When was the last LUDF Focus Day you attended (please circle)?

- This is my first
- 2015 - I'm a regular attendee
- I attend when I can but not regularly
- Not for a year or so

3. Did you find the topics covered today useful?

	Very useful	Somewhat useful	Interesting but not useful	Not useful	Waste of time
Supply and Demand					
Financial Update					
Farm performance this season					
Technology – yield mapping / nutrient mapping					
Environmental changes					

4. Any other comments or suggestions for future Focus Days?

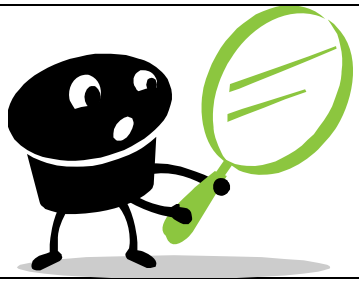
5. Name: (optional)

Welcome to Lincoln University Dairy Farm (LUDF).

The farm is a fully operational, commercial dairy farm with a number of potential hazards for both visitors and staff. Many of the potential hazards cannot be eliminated while also providing access to visitors therefore all staff and visitors MUST watch for potential hazards and act with caution.

Hazard Summary: Look, think, act.

The following chart provides a reminder of the types of hazards at LUDF. Watch for these and any other hazards that may be on farm today.

People: • Uninformed / ill prepared visitors may be the greatest risk	**Animals:** • **You are in their space**	**Milking shed:** • Moving rotary platform • Confined animals • Chemicals
Eyes / Ears: • Water / oil / milk / chemical splashes • Welding flashes • Loud machinery		**Touch:** • Hot / cold surfaces, hot water, chemical burns • Electric fences – treat them as high voltage power sources
On farm machinery and tools • Chainsaws, hand tools etc. generate noise, fragments	**Potential slips / trips:** • Uneven surfaces occur across the farm • Fences • Drains • Underpass • Effluent pond	**Vehicles:** • Contractors and farm equipment – **act as though they can't see you** – keep out of their way • Centre Pivot takes precedence over your plan

ARE YOU TRAINED FOR WHAT YOU ARE ABOUT TO DO? If not, STOP.

If you are uncertain how you should act or proceed, stop and contact the farm manager, other farm staff or your host.

By entering this farm, you are acknowledging your receipt of this hazard summary, and your agreement to take personal responsibility to watch out for potential hazards, and act in such a manner as to protect yourself and any others also on-farm.

Lowest urea price since 2007

Farmers stand to benefit from a $50 per tonne saving for urea as of the 1st February, when Ravensdown dropped its prices.

Chief Executive Greg Campbell says he is pleased that Ravensdown is again leading on a price reduction for farmers who are facing increasing costs in many aspects of their business whilst their returns are under pressure.

"We said it not long ago, with our recent superphosphate cap," Greg says, "that we are about delivering all-year value to our shareholders, and we're demonstrating it again with urea and other products."

The drop from $575 per tonne to $525 represents a potential $37.5M saving to the sector on an annualised basis. Urea now sits at just 61% of the peak price in 2012, which Greg says will be welcome news for Ravensdown's customers.

In addition to urea, DAP has been reduced by $25 per tonne, granular ammonium sulphate by $15, and Potash by $10, with a flow-on effect to related products.

"For a large dairy farmer in the grip of a pay-out downturn or a sheep and beef farmer dealing with drought or weaker returns, these price differences could mean thousands of dollars staying in their bank account. This is far more useful to our shareholders at this time than a large rebate cheque later in the year."

The commitment to pass on the benefits to shareholders, Greg says, is made possible because of Ravensdown's strong longstanding relationships with global suppliers and managing the fluctuation in the exchange rate.

"Thanks to an amazing team of staff and loyal shareholders we're going from strength to strength in improving our balance sheet and financial returns, which we can share with shareholders, providing further value. It's rewarding to see that loyalty being repaid in these tight times.

"We've been told consistently by our customers that they would prefer competitive pricing, money in their pocket, all-year value and a sensible annual rebate, and that's precisely what we are delivering.

"Farmers are resilient and adaptable people, but it's not just up to them to manage their way through these tough times. We all play our part in the rural sector, and that is about challenging the status quo and asking how things can be done better," says Greg.

Value you can bank on every day.

Value doesn't just come in a rebate cheque. It comes 7 days a week, 365 days a year.

That's because real prosperity is achieved by adding value to every product, every service and every conversation, every day.

At Ravensdown, we're driven to achieve greater efficiencies, insights, and sustainable growth for your farm through science, innovation and exceptional customer service.

As demonstrated through our variable rate technology, our own lab-based testing facilities, constant new product development like N-Protect, and environmental consultancy.

And that's value you can bank on.

LUDF-FEB16

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