SIDDC
South Island Dairying Development Centre

LUDF Focus Day
30th April 2019

10.15 am - 1.00 pm Followed by Light Lunch

The balancing act of increasing costs & sustainable farming

Focus on:

18-19 LUDF farm and financial performance

Farm operating expenditure

- Lifting faster than inflation – why?
- What is driving increased costs
- What can we do about it?
- The hidden costs of feeding, where are they?
- What is LUDF going to do after finding costs have risen.

Low footprint farming, impact on profit

- What can you learn from LUDF?
- Can you reduce your foot print and maintain profitability?
- What are the future opportunities in the environmental space

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Venue: LUDF farm, SN
Parking on Ellesmere Junction road

Lunch Sponsored by:

ravensdown

Email: office@siddc.org.nz Find us on Facebook.
Visit the website: www.siddc.org.nz for weekly updates on Farm Walk Notes

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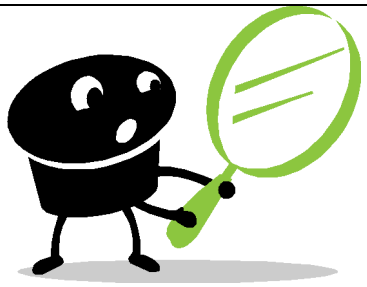
Welcome to Lincoln University Dairy Farm (LUDF).

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.

LUDF Strategic Objectives

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.*

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

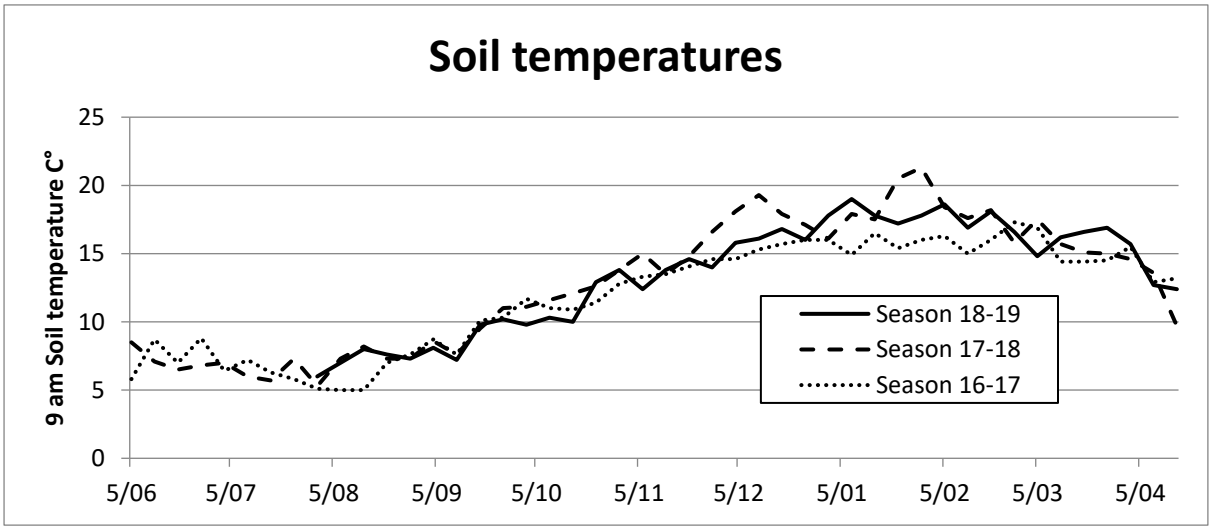
This Low Input, High Production, Highly Profitable, Low Nutrient Loss Farm System has been run at LUDF for 4 seasons already.

Season-to-date farm performance 2018-19

Weather and Environment

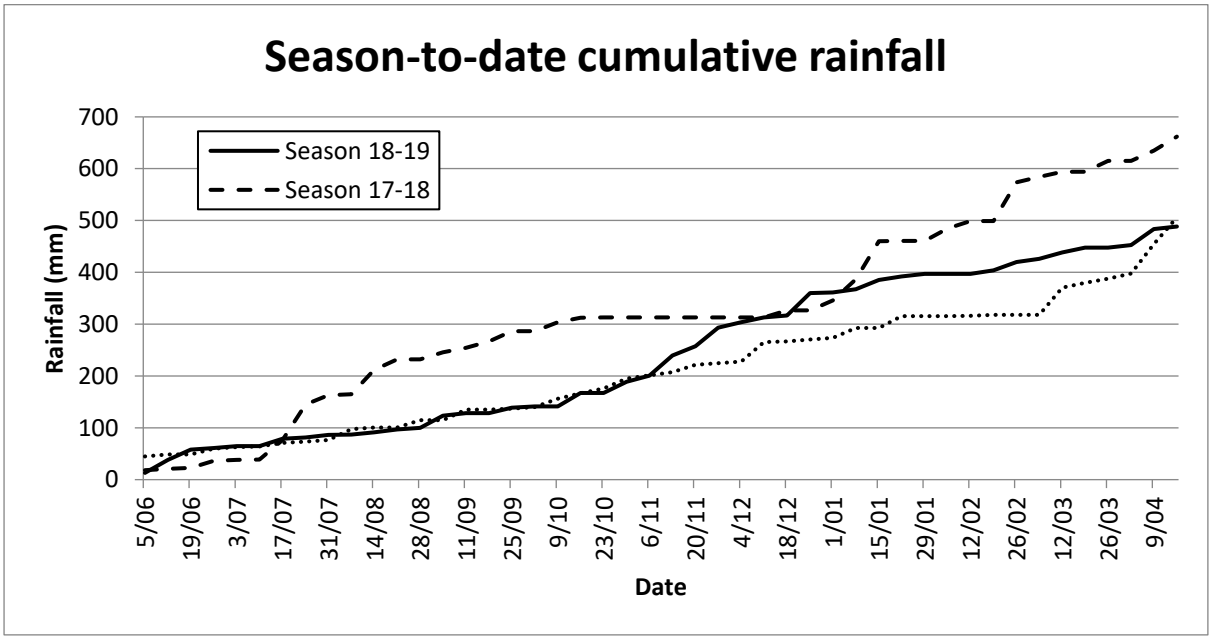
The 2018-19 season started with fantastic spring conditions, coming from a mild winter with great pasture growth. Weather and growing conditions remained good through to the start of mating, conditions which changed dramatically with a couple of strong southerlies at the start of week 4 of mating. The season continued moving into a fairly dry and hot January/February, with a return to good growing conditions through the autumn so far.

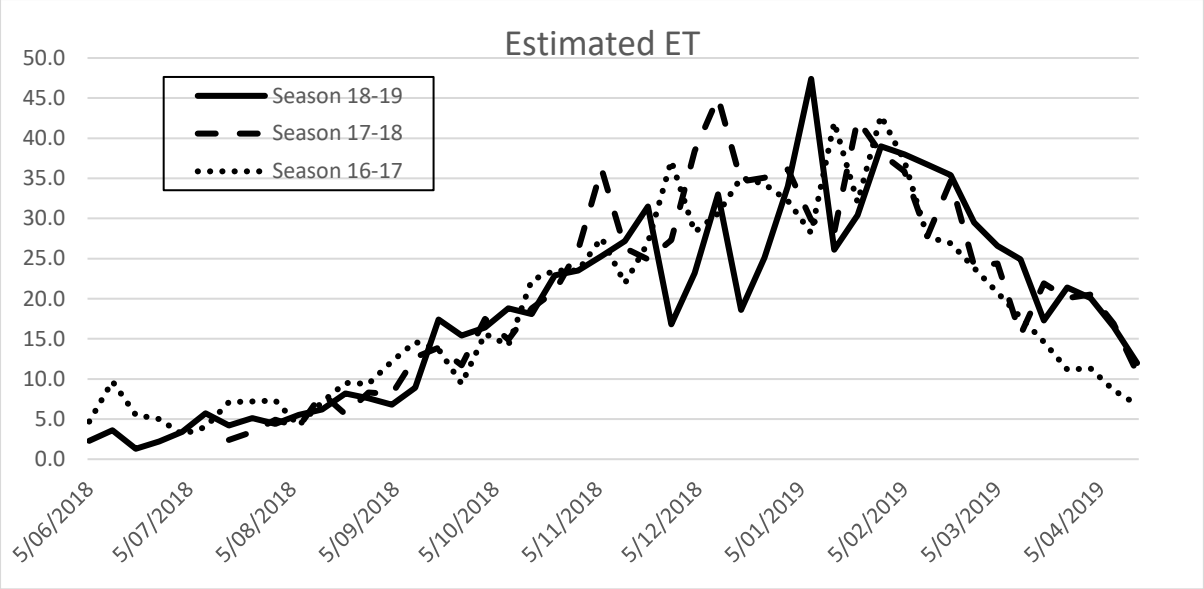
Soil temperatures (see graph below) remained either on par or below that of previous seasons all the way through, except during the early January period and then again in March.



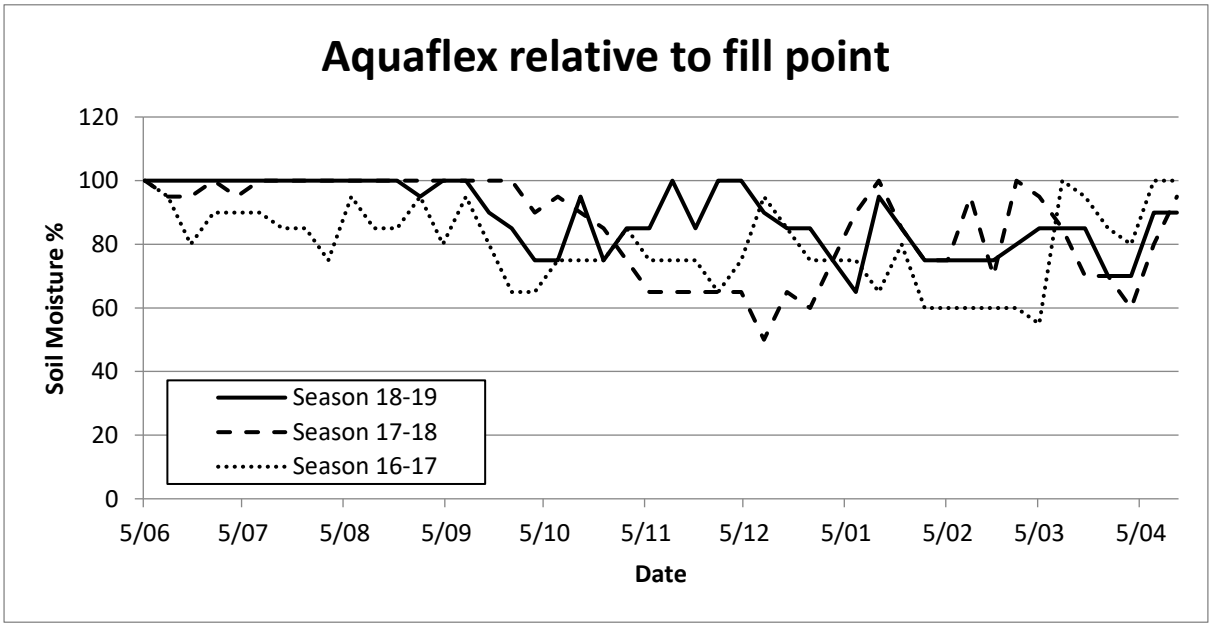
Rainfall remained below that of the previous season all the way through until mid-December, with only just below 50 mm of rain between early January and end February.

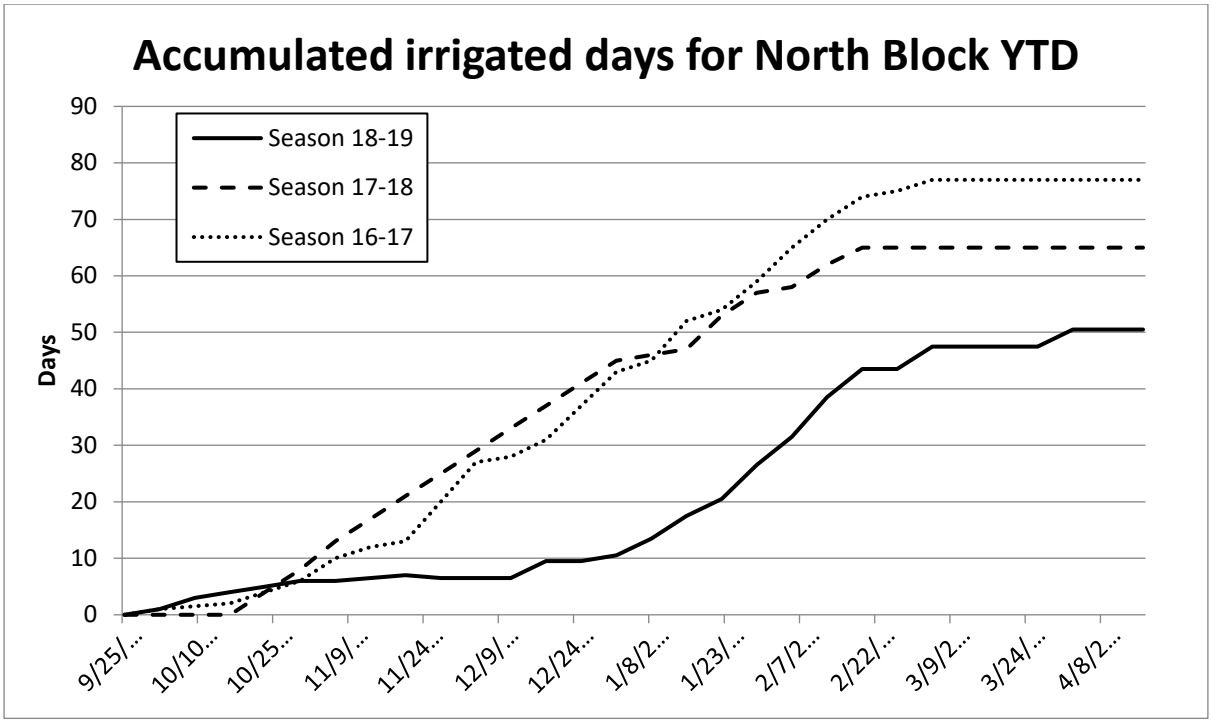
This combined with extremely high ET's through the same period, made for a challenging start of the 2019 calendar year in terms pasture quality and animal comfort.



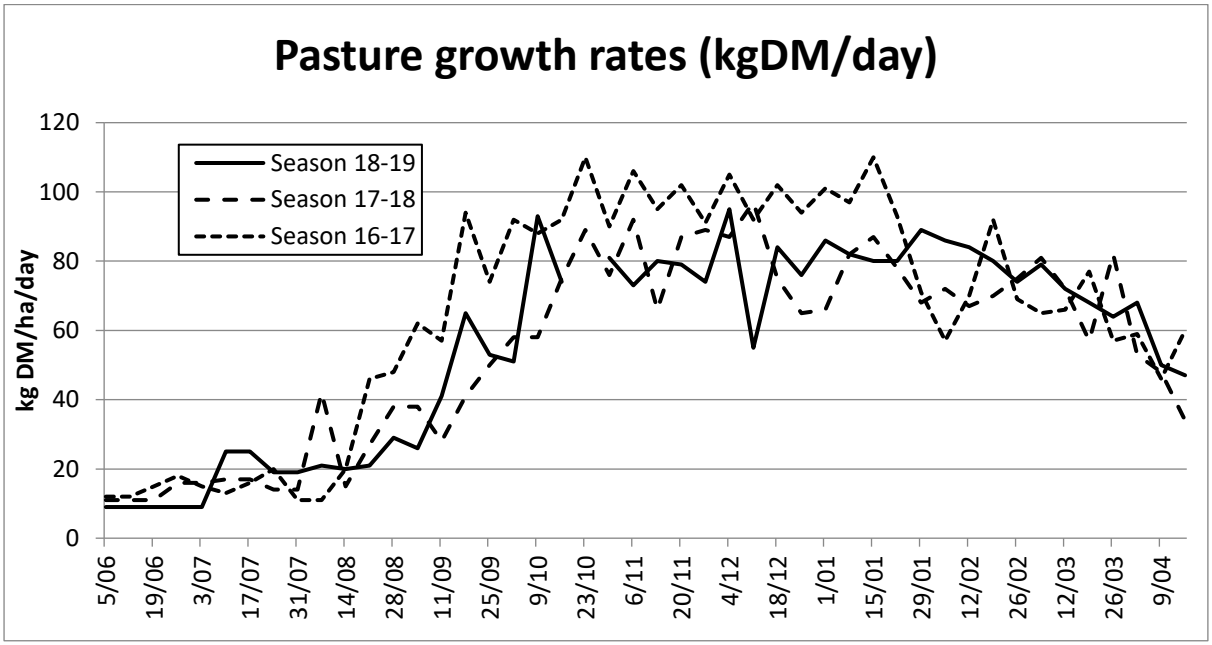


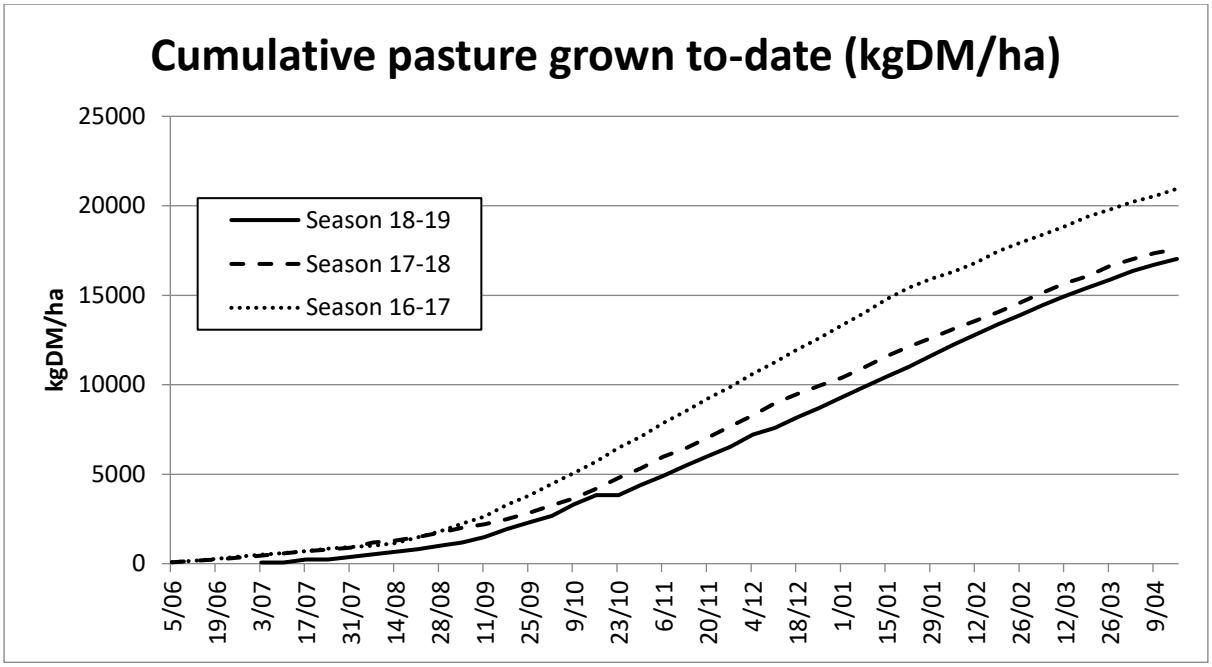
Irrigation commenced in early October this year (only in the north block so far), same as the 16-17 season and due to the high ET's experienced during September, which have been the highest of the last 3 seasons. The intermittent and timely rainfall events between late September and late December meant that the total requirement for irrigation on the farm has remained well below its usual utilization through the whole season. A dramatic increase in the use of irrigation can be seen from early January, required to counteract the dry, hot conditions.





LUDF dried off at the end season 17-18 at an average pasture cover of 1900 kgDM/ha, the lowest in the last 4 years. The warm dry winter allowed the farm to start calving with 2600 kgDM/ha average pasture cover. However, growth rates remained below that of previous seasons all the way through till end January.

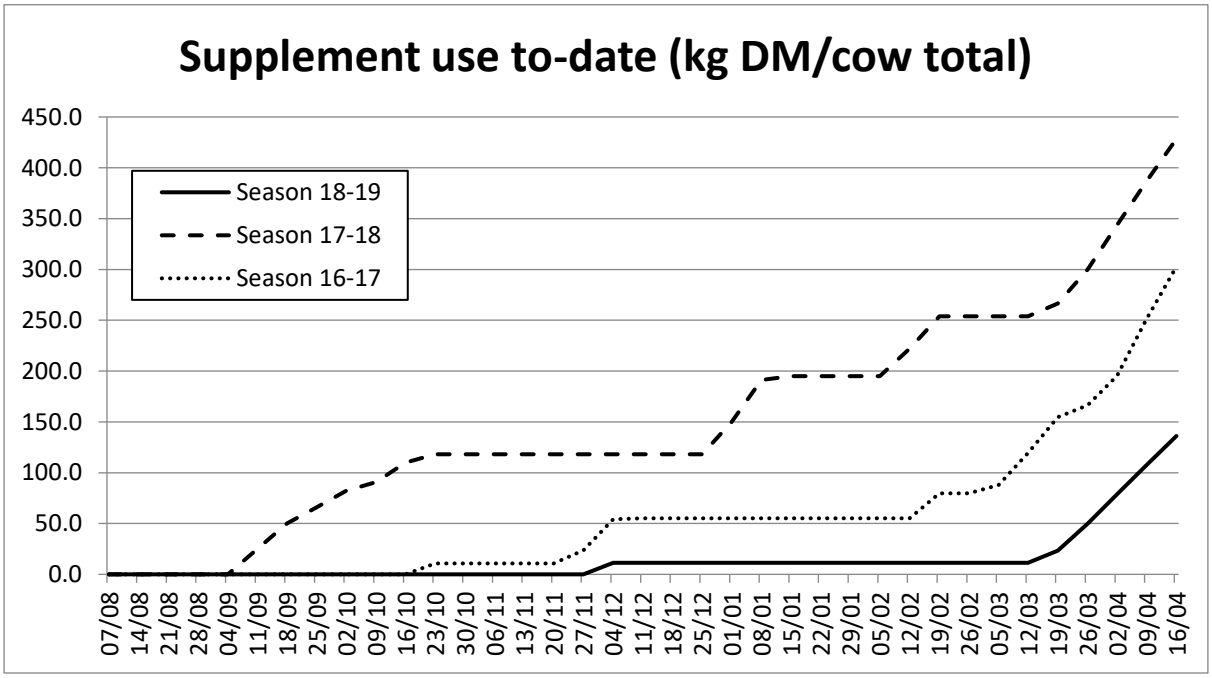




The good growth rates during winter allowed the farm to be able to adhere to the planned spring rotation planner rigorously in terms of the area grazed per day and finish the first round a few days ahead of the plan and without the need for any supplements (bearing in mind that LUDF brings cows onto the platform as calved animals and grazes no springer or dry mobs).

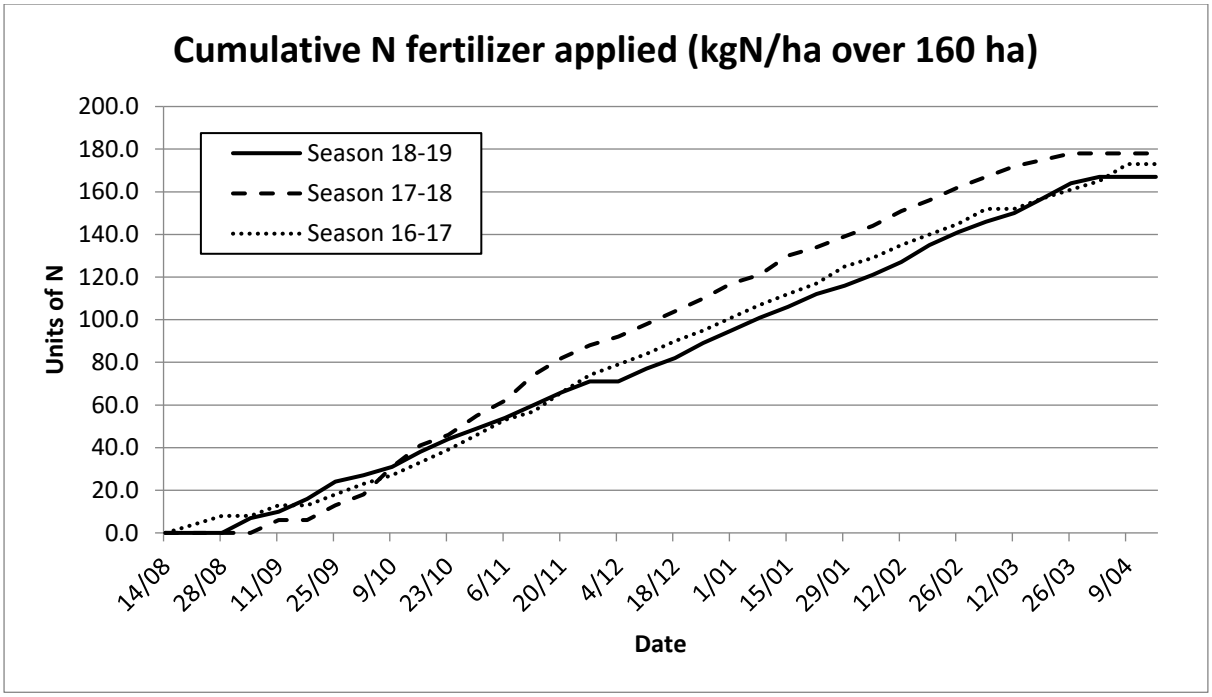
Cumulative pasture growth remains the lowest so far for the last 3 years.

In terms of supplements they have only been required for the first 4 days in December and then again used in mid-March to start extending the round length. This is the lowest use of supplements the farm has experienced in the last 3 seasons

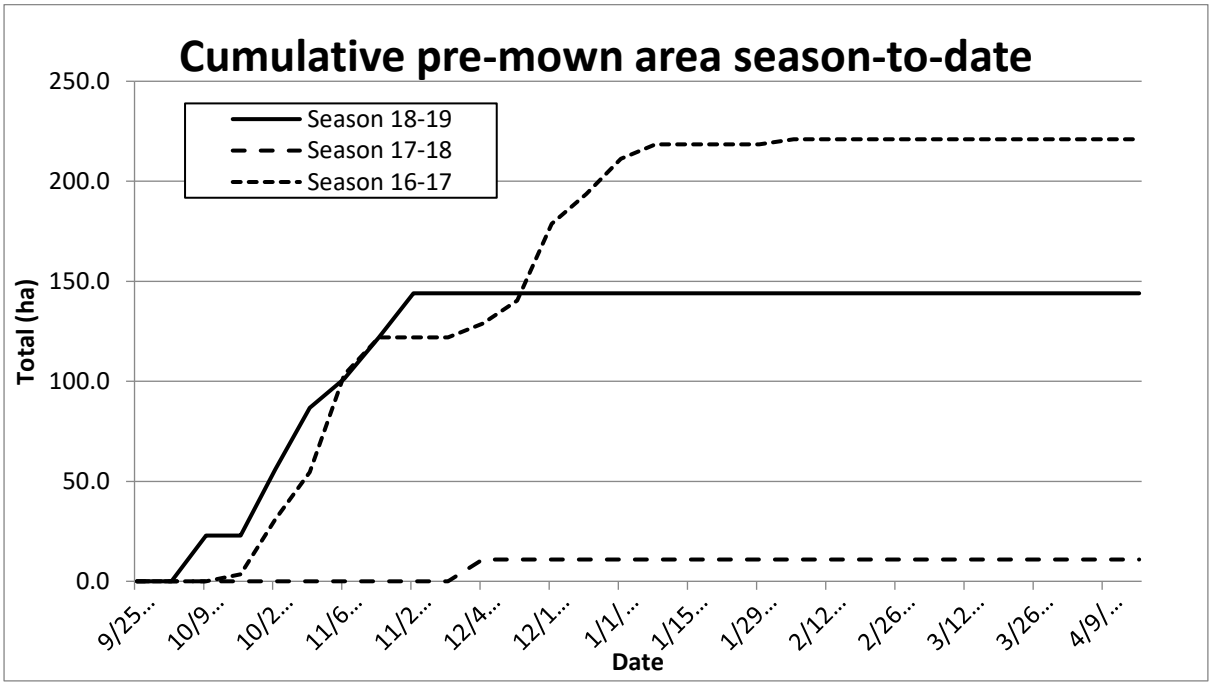


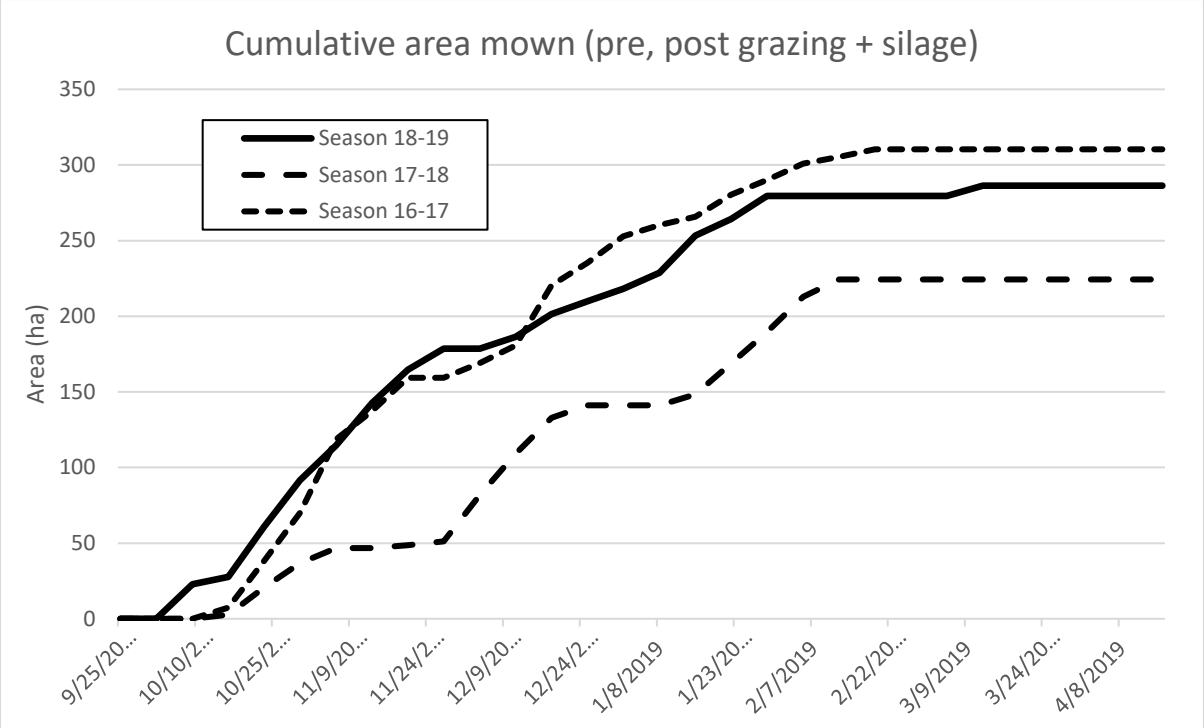
The good conditions have allowed for AMMO 36 to be applied across the whole farm starting in late August and capital fertilizer was applied by the end of September. Nitrogen fertilizer continued to be used as of the start of the second round.

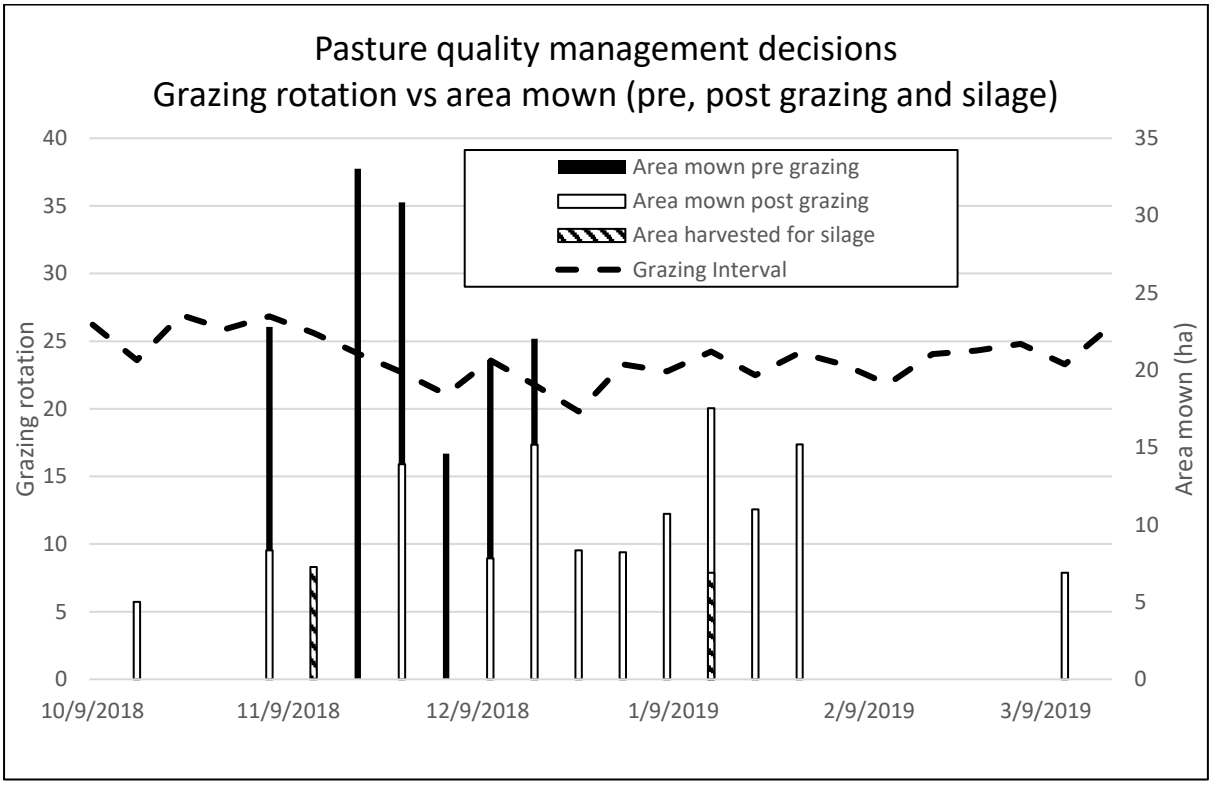
The total amount to-date, though, remains stable through the last 3 seasons. There has been no more N applied for the last 3 weeks with a total of 163 kgN/ha applied season-to-date.



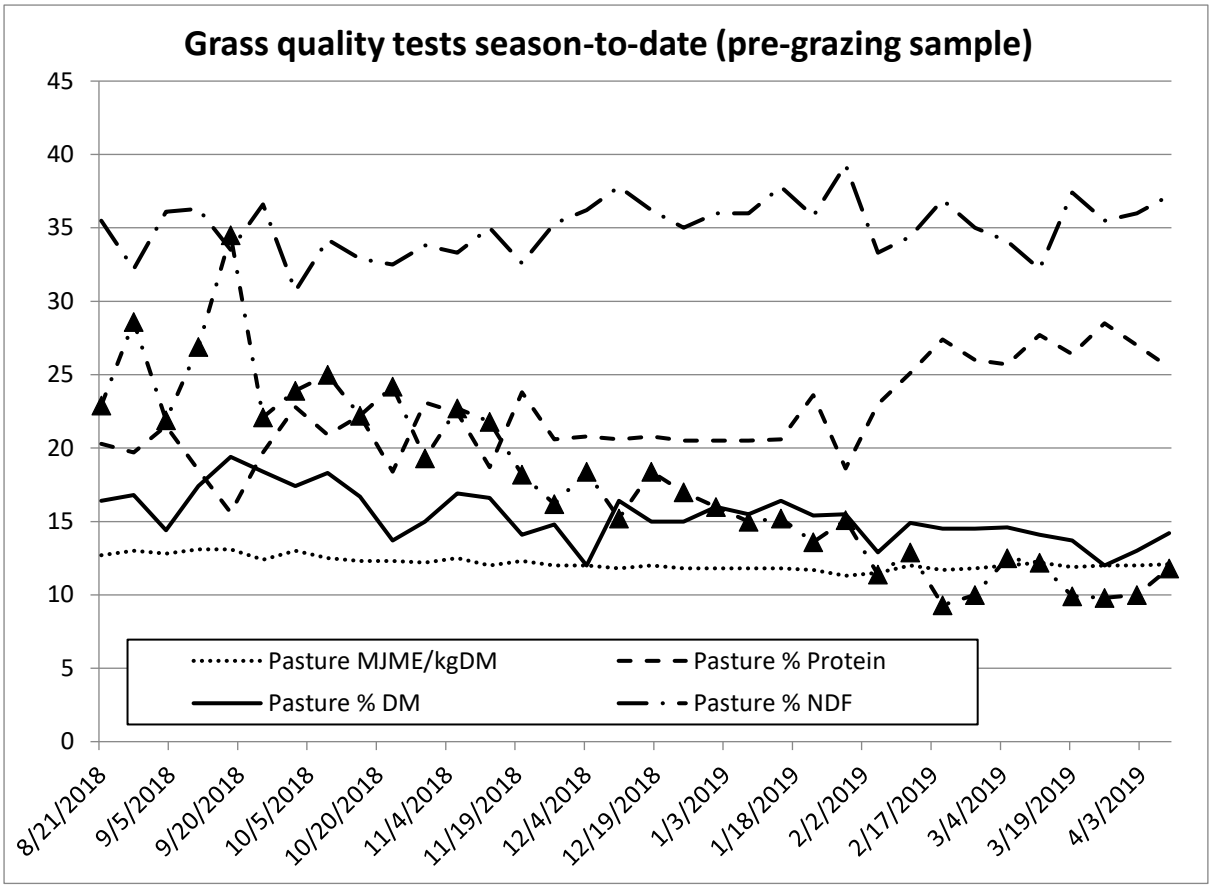
Both pre-graze and post grazing mowing have been used this season to help keep quality grass growing for the cows. A total of around 120 ha have been topped after grazing vs 144 pre-graze mown.




Cumulative area mown (pre, post grazing + silage)
Season 18-19
Season 17-18
Season 16-17
Area (ha)
350
300
250
200
150
100
50
0
9/25/20...
10/10/2...
10/25/2...
11/9/20...
11/24/2...
12/9/20...
12/24/2...
1/8/2019
1/23/20...
2/7/2019
2/22/20...
3/9/2019
3/24/20...
4/8/2019

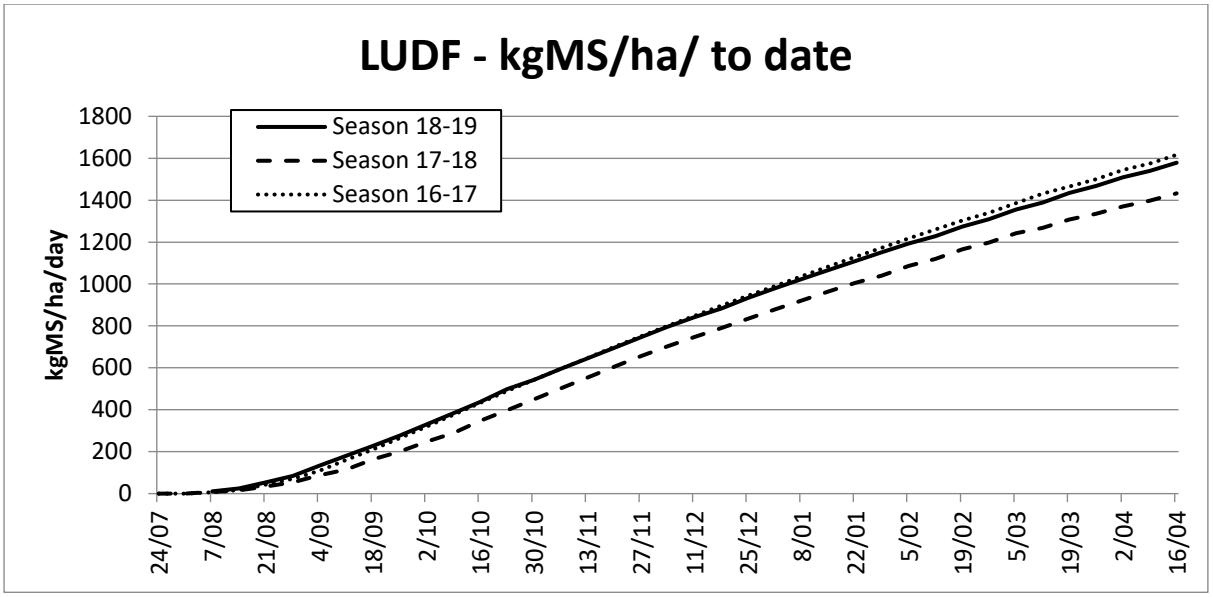

Pasture quality management decisions
Grazing rotation vs area mown (pre, post grazing and silage)
Area mown pre grazing
Area mown post grazing
Area harvested for silage
Grazing Interval
Grazing rotation
Area mown (ha)
40
35
30
25
20
15
10
5
0
10/9/2018
11/9/2018
12/9/2018
1/9/2019
2/9/2019
3/9/2019

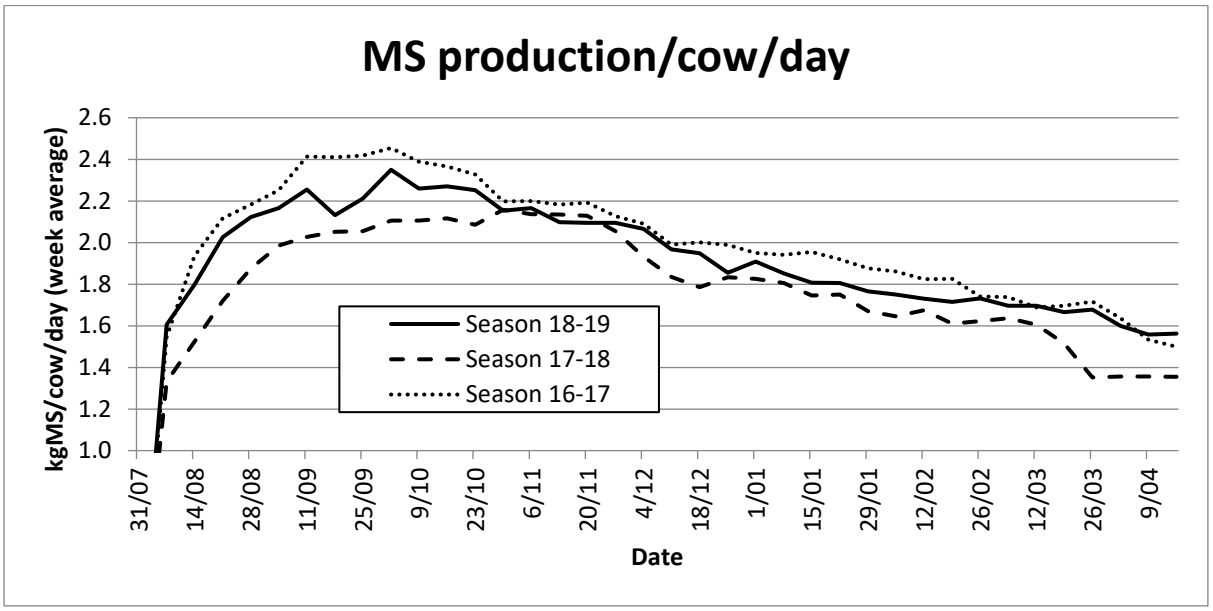
Pasture quality information



Herd production and health

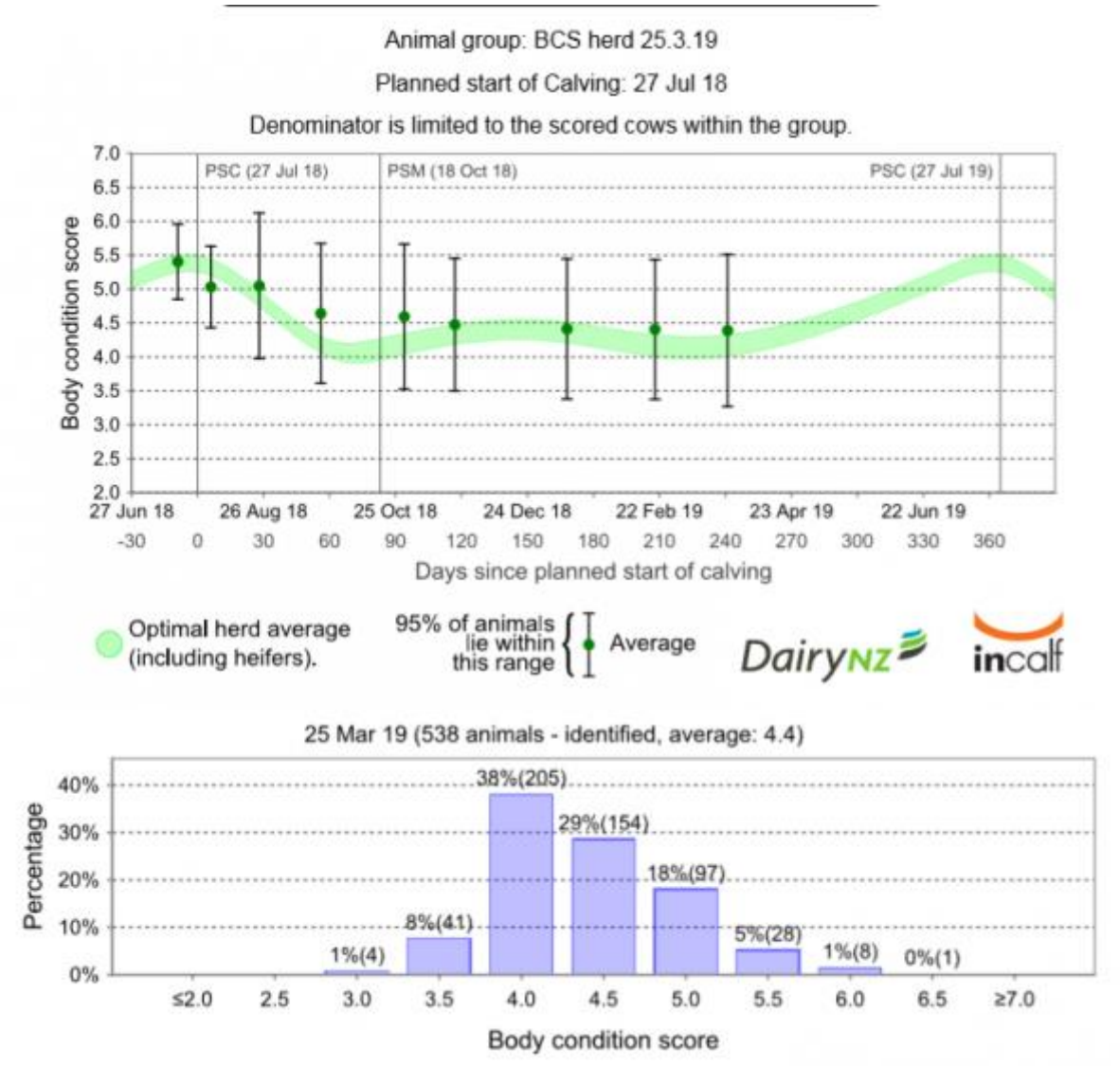
With the main herd starting to calve slightly earlier than in previous seasons, and with the exceptional winter and spring conditions, pasture quality and growth, the herd was able to produce to the same levels of the 16-17 season in terms of milk production until mid December when the weather turned hot and dry. Prduction has remained well above 17-18 season's levels. It is estimated that the herd will finish the season just below the 500kgMS/cow target, although, so far, autumn production has now moved ahead of either of the last 2 seaons.


LUDF - kgMS/ha/ to date
kgMS/ha/day
1800
1600
1400
1200
1000
800
600
400
200
0
Season 18-19
Season 17-18
Season 16-17
24/07
7/08
21/08
4/09
18/09
2/10
16/10
30/10
13/11
27/11
11/12
25/12
8/01
22/01
5/02
19/02
5/03
19/03
2/04
16/04


MS production/cow/day
kgMS/cow/day (week average)
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
Season 18-19
Season 17-18
Season 16-17
31/07
14/08
28/08
11/09
25/09
9/10
23/10
6/11
20/11
4/12
18/12
1/01
15/01
29/01
12/02
26/02
12/03
26/03
9/04
Date

Body Condition Scores and Walk-over-weighing

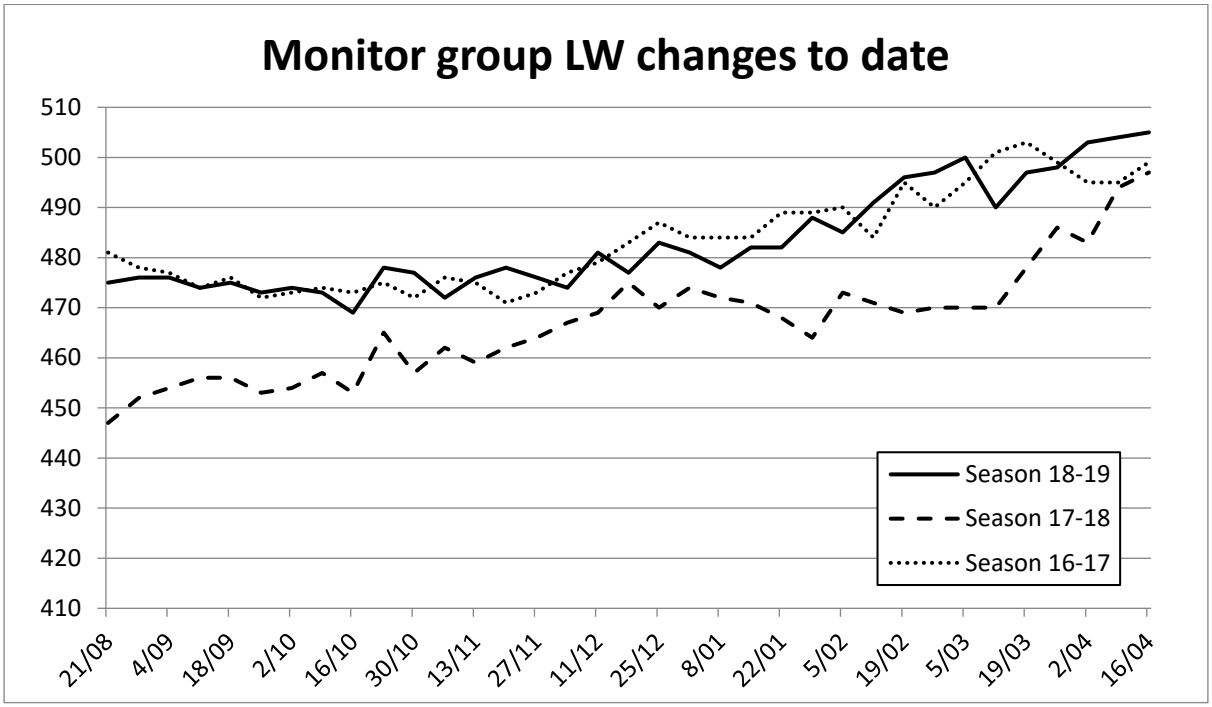
The last BCS event at LUDF was on the 25th March 2019.
The graph below shows the BCS trends for the past couple months:



LUDF runs a 2 herd system. The small herd is milked first and will get the front of every paddock, without being pushed to achieve residuals, effectively providing them with the best chances of an increased grazing time and lower grazing pressure.

The composition of the small herd changes through the season. It is made of all heifers and low BCS cows after the BCS in August in preparation for mating. In January, the small herd becomes all early calving lowest BCS cows and any other animal requiring special attention.

The management of the small herd as described above allows the team on farm to better manage weight gains and look after at-risk cows during the whole season, whether the focus is preparedness for mating or preparedness for dry-off.

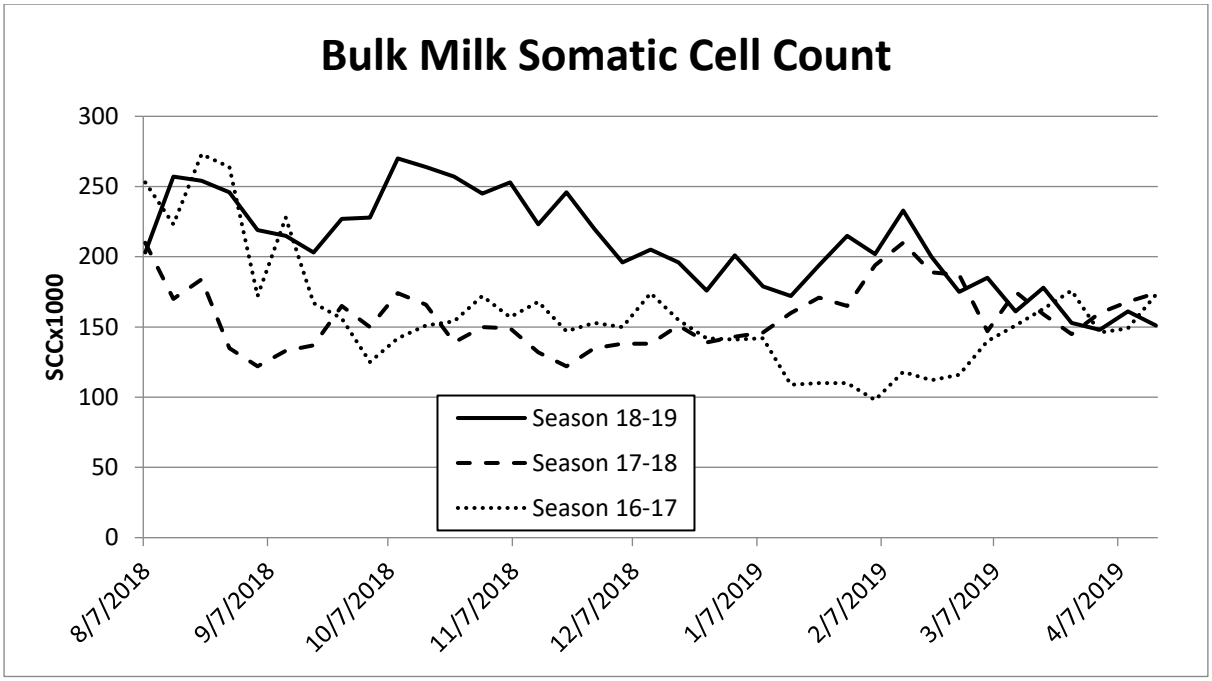


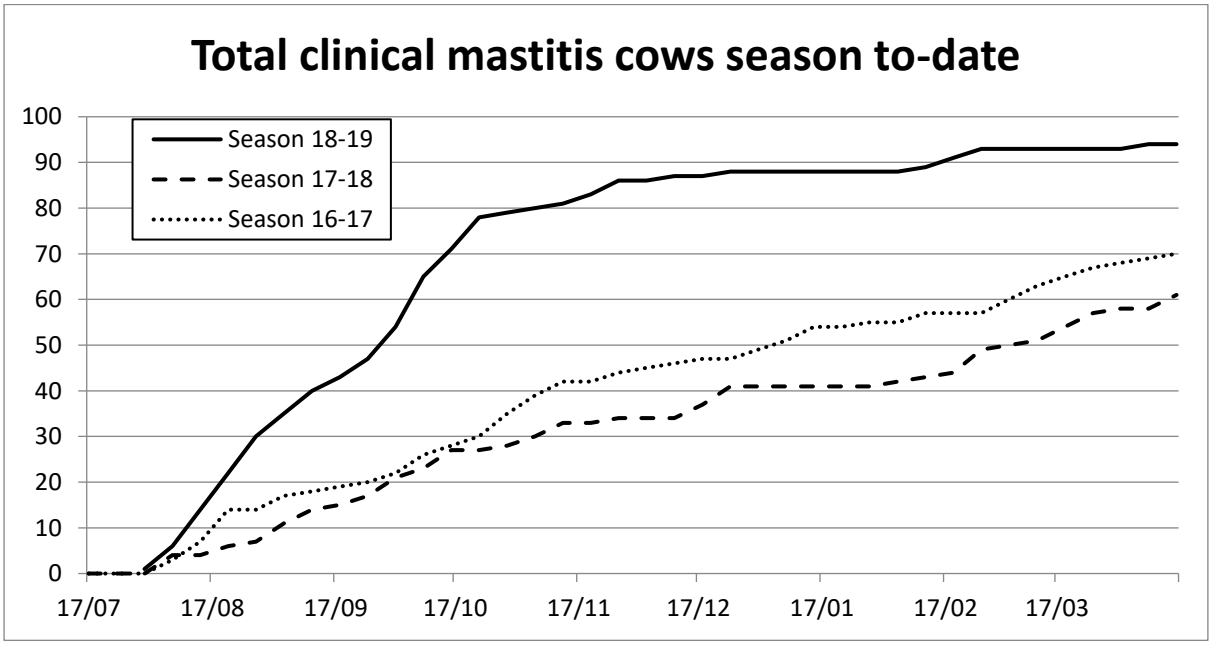
Cow Health

In general spring has been relaxed when it comes to metabolic issues and retained foetal membranes.

Cows that came down with milk fever, did so as they calved during their first day in the colostrum mob. Treatment was easy, with cows reacting positively to one down cow treatment and not repeating.

BMSCC and mastitis have been the challenge this season. However, BMSCC levels have dropped to those of previous seasons since March.

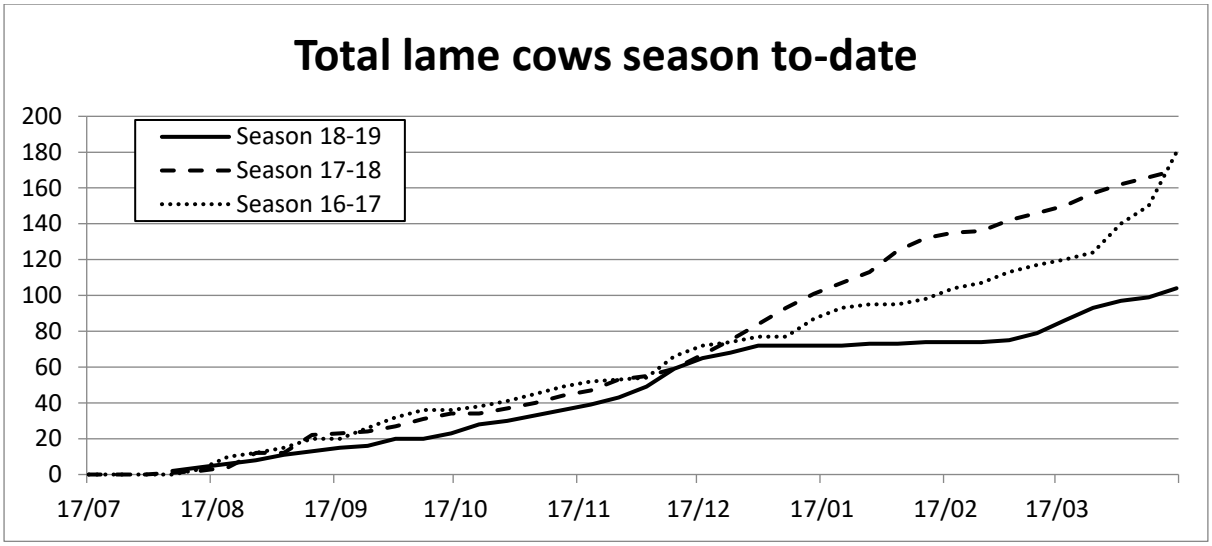




The *Staphylococcus aureus* challenge that the herd has suffered this season has meant a much larger incidence of clinical mastitis than previous seasons.

One aspect that is thought to be the cause of this outbreak is the fact that the teat spray stopped functioning properly for a period of time. This was due to some work done on farm in the water pipes, which resulted in a drop in pressure of the water going through the teat spray, and teat spraying not being achieved properly. This was fixed as soon it was identified and together with specific treatment and management of the affected animals, it would seem to have resulted in reduction in the number of new cases from mid-December onwards.

Lameness



With the dry winter and summer conditions, lameness has not been an issue

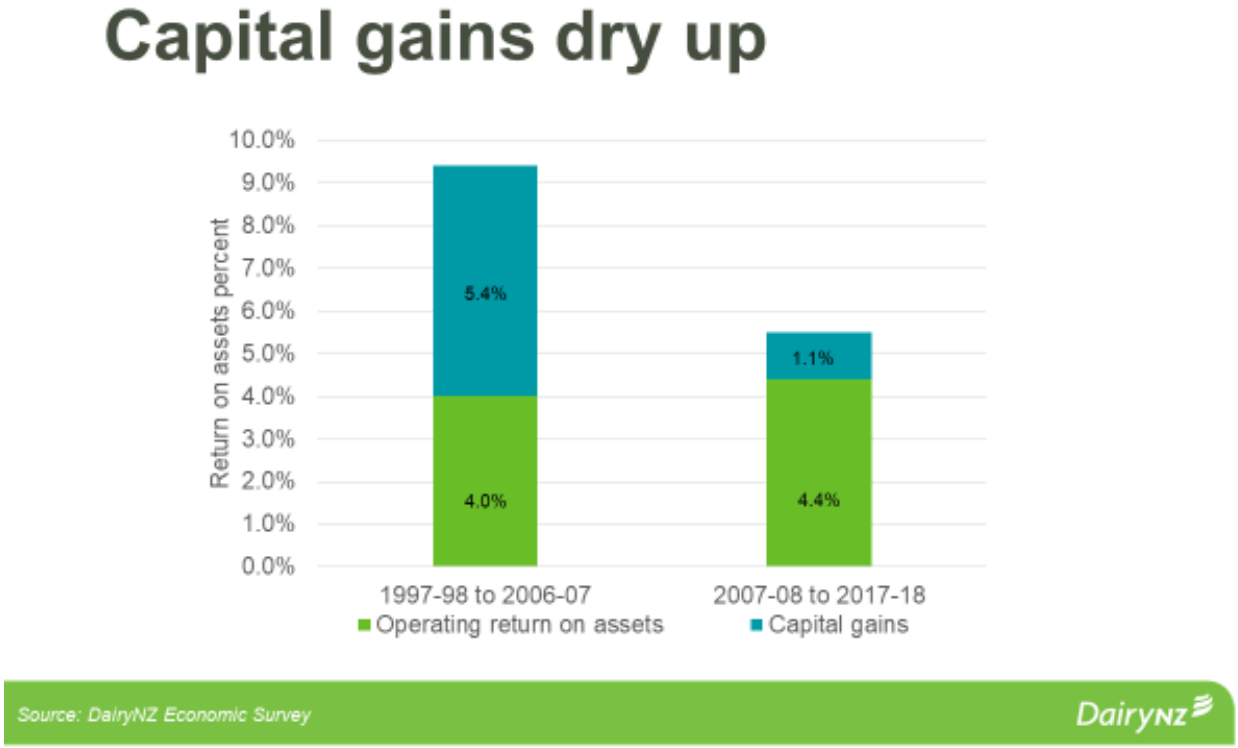
Mark Neal: Drivers for High Operating Return Systems

Mark Neal

DairyNZ

Dairy Systems Specialist, DairyNZ

Mark Neal is a Dairy Systems Specialist with DairyNZ. He trained as an Agricultural Economist at the University of Sydney. He has worked with economic modelling and optimisation of farm systems, farm systems design, and quantifying the impact of environmental regulation on farm profit. He has also worked with the University of Sydney and University of Melbourne on research projects. His family has two dairy farms in New South Wales, Australia, with 1100 milking cows in total, where he has previously managed operations. Mark has also managed operations of grazing-based dairy farms in Chile and the United States.

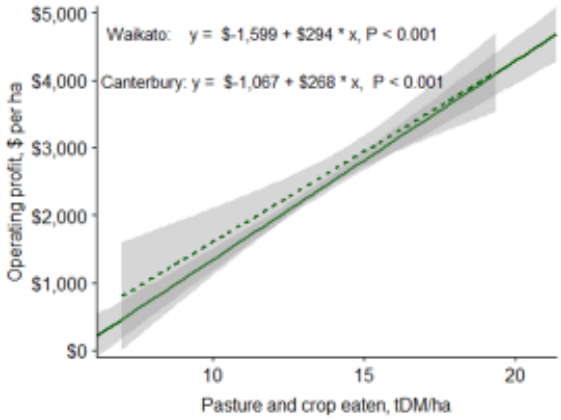


Canterbury

2005/06 to 2016/17	Top 25%	Others	Signif.
Operating Return on Assets	7%	4%	****
Pasture and Crop eaten	15.2	14.1	****
Stocking rate	3.7	3.6	**
MS per cow	430	420	*
Import & Grazing, kg/cow	1 220	1 290	n.s.
MS per ha	1 600	1 500	***
Opex per ha	$6 500	$7 200	**
Opex per kg MS	$4.10	$4.90	****
Gross farm revenue/kgMS	$6.40	$6.47	n.s.
Operating profit/kgMS	$2.40	$1.60	****
Asset value, $/ha	$51 000	$57 300	**

DairyNZ

What makes more profit?

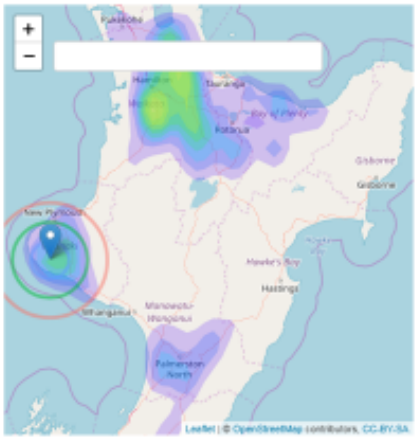


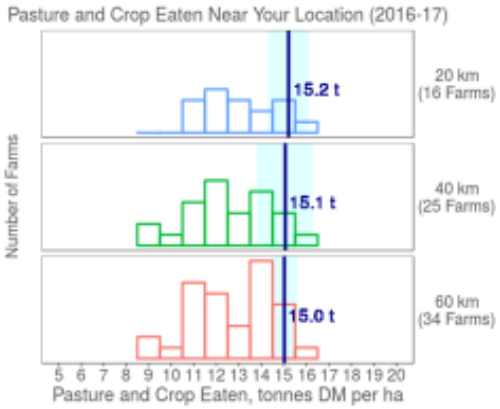
~$300 per tDM pasture and crop eaten

DairyNZ

Am I meeting my pasture potential?

Google: Pasture Potential DairyNZ





December Tech Series; February Inside Dairy DairyNZ

Supplement should increase profit

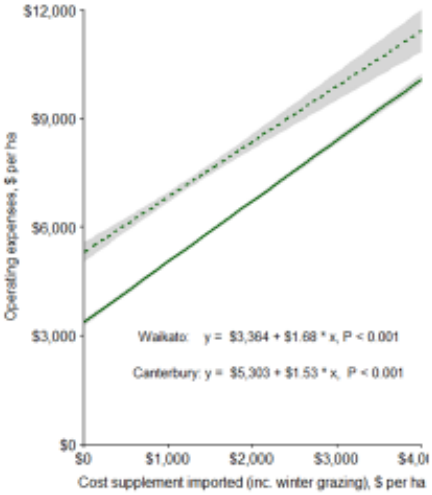
- Marginal Revenue = $6.25 /kgMS
- Marginal Cost = $\frac{\$365 \text{ /tDM supplement}}{80 \text{ kgMS/tDM}}$
  = $4.55 /kgMS
- Marginal Profit = Marginal Revenue - Marginal Cost
  = $6.25 – $4.55
  = $1.70 /kgMS

DairyNZ

Why doesn't it?

- Waikato: $1.68
- Canterbury: $1.53
- Ireland: $1.53
- UK: $1.62

1.5* rule of thumb



DairyNZ

Supplement making a loss

- Marginal Revenue = $6.25 /kgMS
- Marginal Cost = $\frac{\$365 \text{ /tDM supplement}}{80 \text{ kgMS/tDM}} * 1.5$

  = $6.80 /kgMS
- Marginal Profit = Marginal Revenue - Marginal Cost

  = $6.25 – $6.80

  = -$0.55 /kgMS

DairyNZ

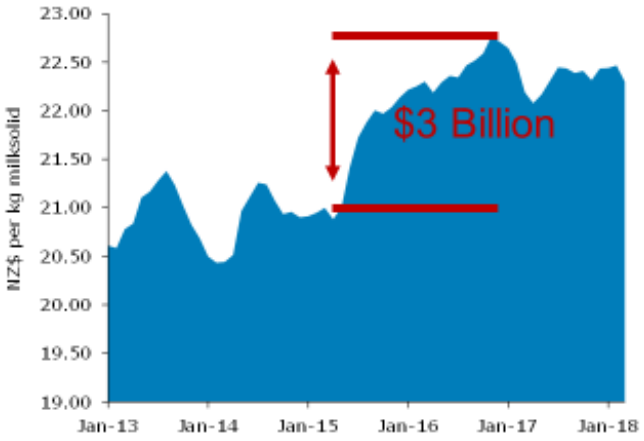
Robust to major risks?

- Two likely candidates
  - Climate/pasture production risk
    - So bring in feed (or reduce demand)
  - Milk price risk
    - So have a low cost

-> Milk price causes twice as much variation in profit as climate risk

DairyNZ

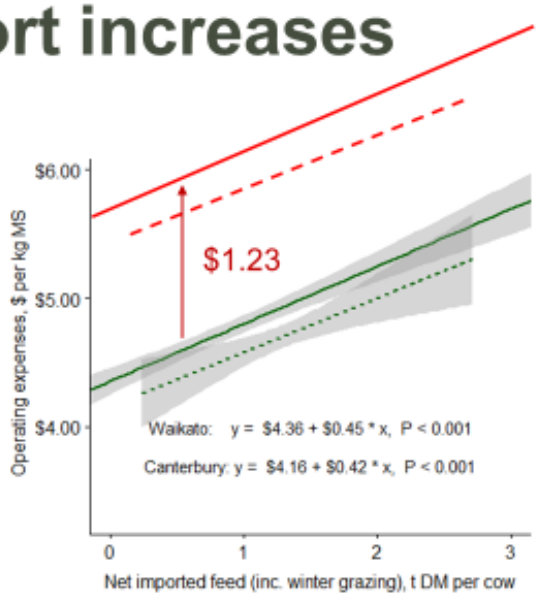
Recent history: More debt



DairyNZ

Increasing import increases cost structure

- $0.40+ per tDM import per cow
- Add in $1.23 of interest



DairyNZ

Summary

- Refocus on operating profit
  - Doesn't need radical change
- Opportunities:
  - Pasture,
  - Cost control
  - Low interest rates

DairyNZ

Forward Focussed

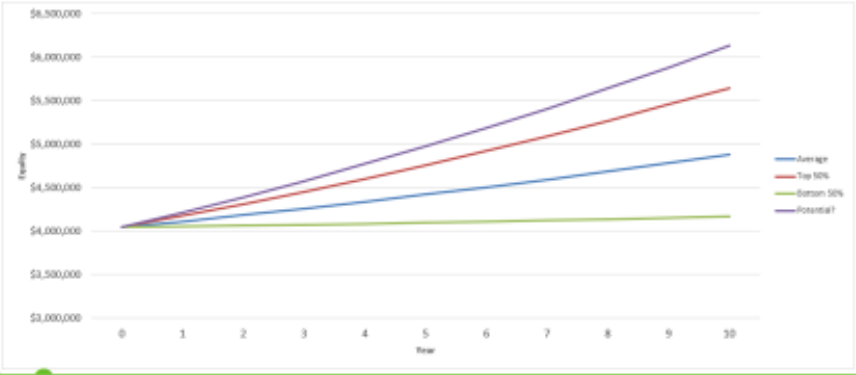
- What could the future look like?
- If you changed one component of your business performance…

  …what could the impact be?

DairyNZ

Equity Growth Predictor tool

- Uses some basic information to project forwards 10 years to predict equity growth



DairyNZ

10-year equity forecast tool

- Google: DairyNZ Equity Forecast tool

- Key aspects
  - High level analysis of equity growth
  - Forward looking – 10 yrs
  - Allows 'what if'
  - Requires limited information

DairyNZ

Data used (DairyBase)

- Effective hectares
- Cow numbers
- Production
- Stock income
- Milk and dividend payment
- Other income
- Asset and Debt levels
- Farm Working expenses
- Interest rates
- Depreciation/asset replacement
- Tax rate
- Drawings
- Lease

DairyNZ

Jeremy Savage: Finding the Hidden Costs in Feeding

Why the Focus on Farm Working Expenditure?

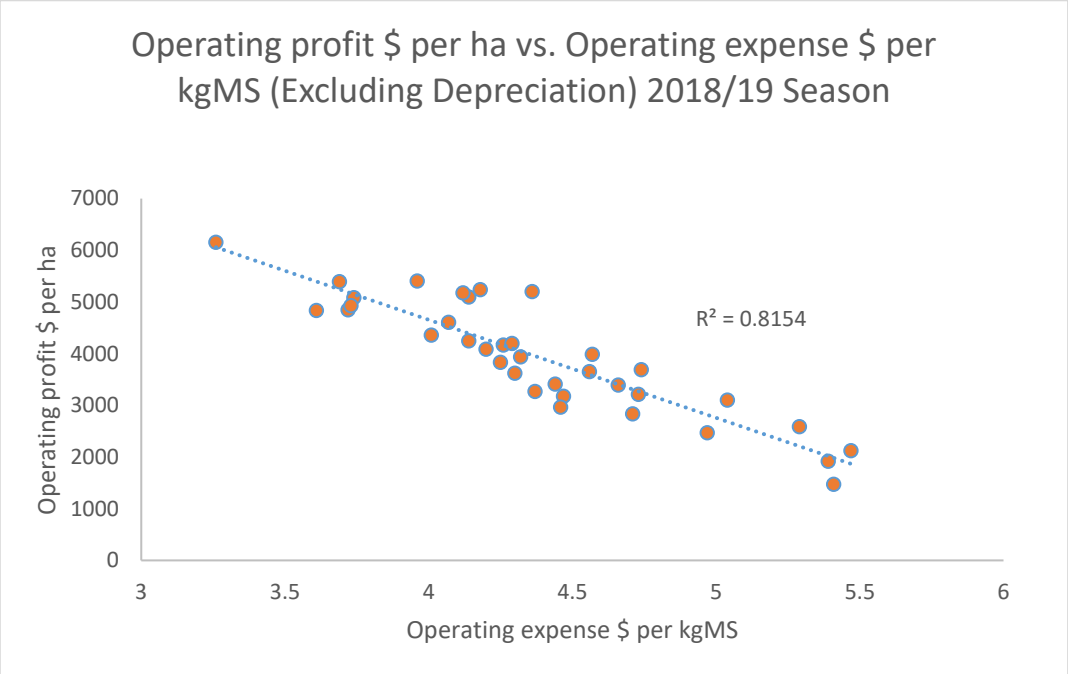


Figure. The strong relationship between farm operating expenditure and profitability. MRB Client base 2018/19 revised data March 19.

Farm operating costs include all items of expenditure from Wages to rates and insurance. It does not include interest. Dairy base also includes depreciation. Adjustments may need to be made to ensure all costs are included. This may include wages of management for owner operators, a lease if a runoff is owned, changes in feed on hand.

Feed costs include the costs for feeding supplements and grazing. We have not been able to capture this accurately for all clients. Some farms have runoffs. When analyzing these costs, you may find feed and grazing is low, as the costs are in fertilizer, cropping costs etc.

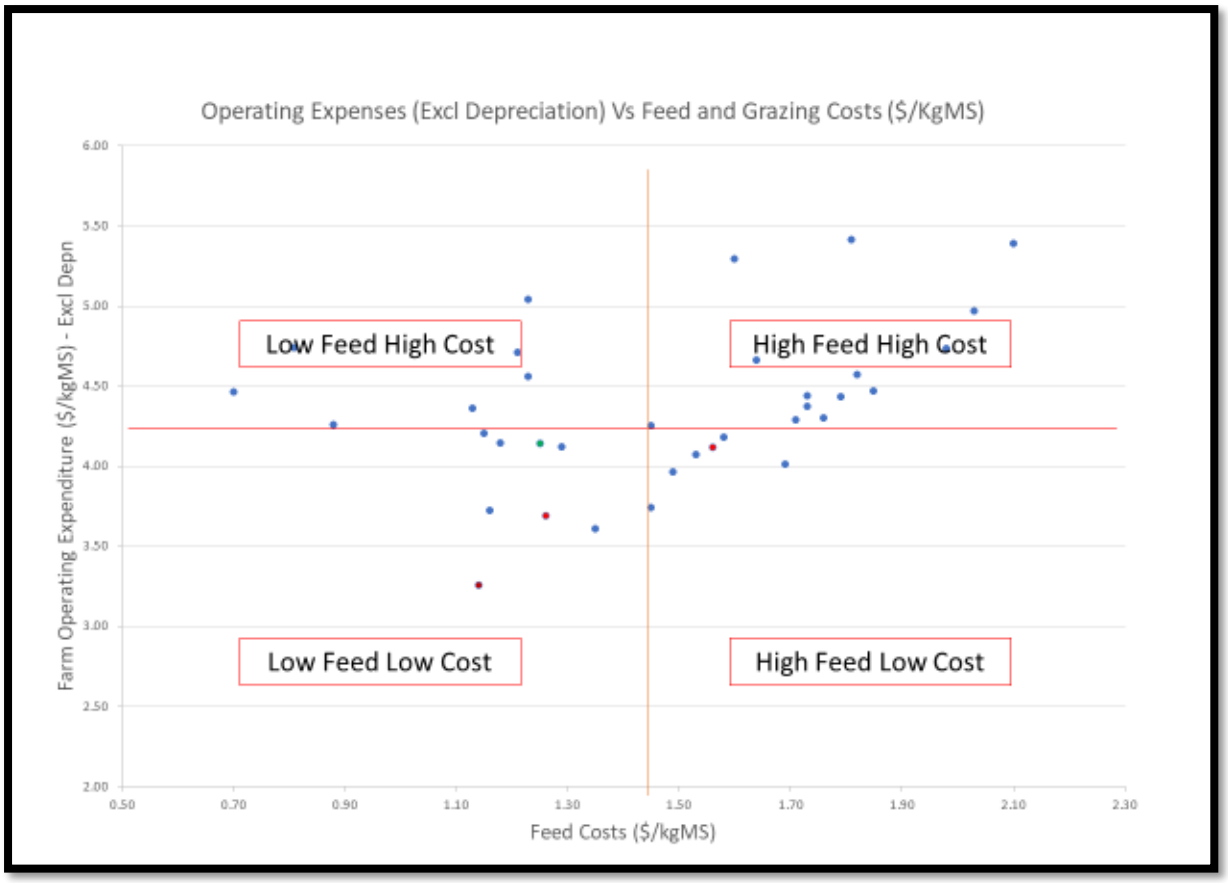


Figure. The relationship between Feed Costs, $/kgMS (X Axis) and Farm operating Costs ($/kgMS). Three highest EBIT ($/Ha) Farms also Noted In Red, LUDF in Green.

The Costs of Feeding

For every $1 / kgMS spent on Feed and Grazing, we have noted a $0.51 / kgMS lift in operating expenditure. This is similar to the DairyNZ results presented at Pasture Summit, which was a lift of $0.58 / kgMS. There is an extra sneaky, hidden cost of $0.51 / kgMS (average). We are really struggling to drill in and quantify exactly where these costs come from.

Low Farm Operating Cost, Low Feed Cost. Typically this group are our most profitable clients. They have low cost simple systems that are easy to replicate. Per cow production is not always compromised, but is often slightly lower than their higher cost neighbours with earlier culling etc. Production per hectare is normally lower than high cost farms.

Low Farm Operating Cost, High Feed Cost. It is possible to have a higher feed cost and still be profitable, as noted with one farm in our client base. However the number of clients who can do this are limited. Typically, they are owner operators (including equity partners). They are achieving pretty high per cow production (480+ kgMS/cow).

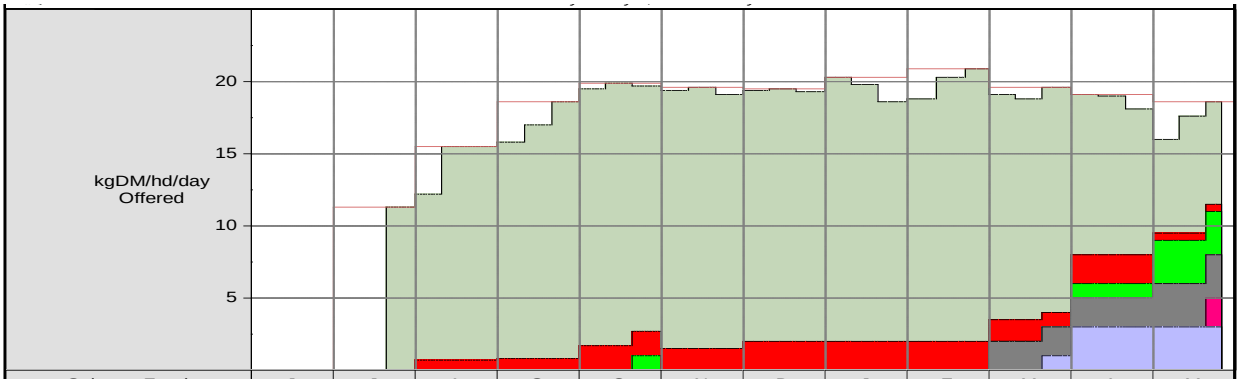
High Farm Operating Cost, High Feed Cost. The challenge for many high cost farmers with high feed costs is they think they can achieve high production with high feed use, and with the "watering down effect" achieve low cost per kgMS. Unfortunately for most, this is not the case; the execution is not there. It is the rare few farmers who can do it. If you are in this category of high costs and high feed costs, the odds are you have a farm program not suited to your team's skills and farm's capacity. If there are no genuine reasons (such as high R&M), then we need to be having a good look at your farm program as there may be something genuinely amiss with your farm program and policy.

High Farm Operating Cost, Low Feed Cost. The drivers to the high costs need to be confirmed. For some farms it is irrigation charges, or the high cost of running runoffs. Costs of high repairs associated with irrigation developments can blow this out. We note some Tasman farms in this category for 2018/19 which experienced a shocker of a drought. The costs of drought impairing production increasing the costs per kgMS is common, with 3 farms on the graph in this category.

Where Are the Hidden Costs:

1. Cost of Running High Stocking Rates on supplement

Many farms are running a high stocking rate and carrying the top end of the stocking rate on pure supplement:



Select a Feed	J	J	A	S	O	N	D	J	F	M	A	M
Pasture		11.8	13.7	16.3	17.7	17.9	17.4	17.6	18.0	15.5	10.7	7.2
F1 Meal and Grains bought			0.7	0.8	1.7	1.5	2.0	2.0	2.0	1.3	2.0	0.5
F2 Pasture Silage bought					0.4						1.0	3.0
F3 Maize/barley Silage bought												
F5 Palm Kernel										2.0	2.0	3.0
F6 Molasses												0.7
F4 Hay/Straw bought												
C2 Fodder Beet										0.4	3.0	3.0

For this farm, the summer intake was 19.6 kgDM/cow, the stocking rate was supported by 2 kgDM of grain all summer. There was no silage made. Residuals were tidy. Based on the feeding levels, (2 kgDM out of 19.6 kgDM) 10.2% of the cows were supported by the use of supplements, 70 cows out of the 700 in the herd.

Where does the extra costs come from in this case:

- With current grain prices @ $380 / T, $0.44 / kgDM.
- Response rate for this herd was high, 9.7 kgDM per 1 kgMS.
- The cost of feed in theory to make 1 kgMS $4.26 / kgMS

PLUS:

The cost of running the extra cows:

The Costs in Running a Cow		
Value of heifer calf (25%)	$	150
Heifer Grazing (25%)	$	245
Winter Grazing	$	250

Animal Health and Breeding	$	174
Shed costs + Power	$	46
Labour (50 % of full cost)	$	180
Sum	$	1,045

For milk production of 470 kgMS/cow, the cost of running a cow = $2.20 / kgMS = 52 % extra costs over and above feed.

The combined costs for supporting a higher stocking rate with the continual use of feed is $6.46 / kgMS (less culls @ $0.40/kgMS). Analysis of our client base suggests that the cost of marginal milk may be as high as $8.00 / kgMS.

2. Additional Farm Working Costs with Feeding

Vehicle cost of feeding.

- Running costs, fuel etc on running tractors and machinery. Fuel prices have lifted. A major tractor service often costs $3,000 ($10/hour).

Machinery Repairs and Maintenance.

- Silage wagons have many moving parts and are prone to wear out.
- Feed mills seem to be perishable items, and do not like stones etc.

Costs from Autumn Feeding of Supplements, Higher Stocking Rate, Higher Milking Demand

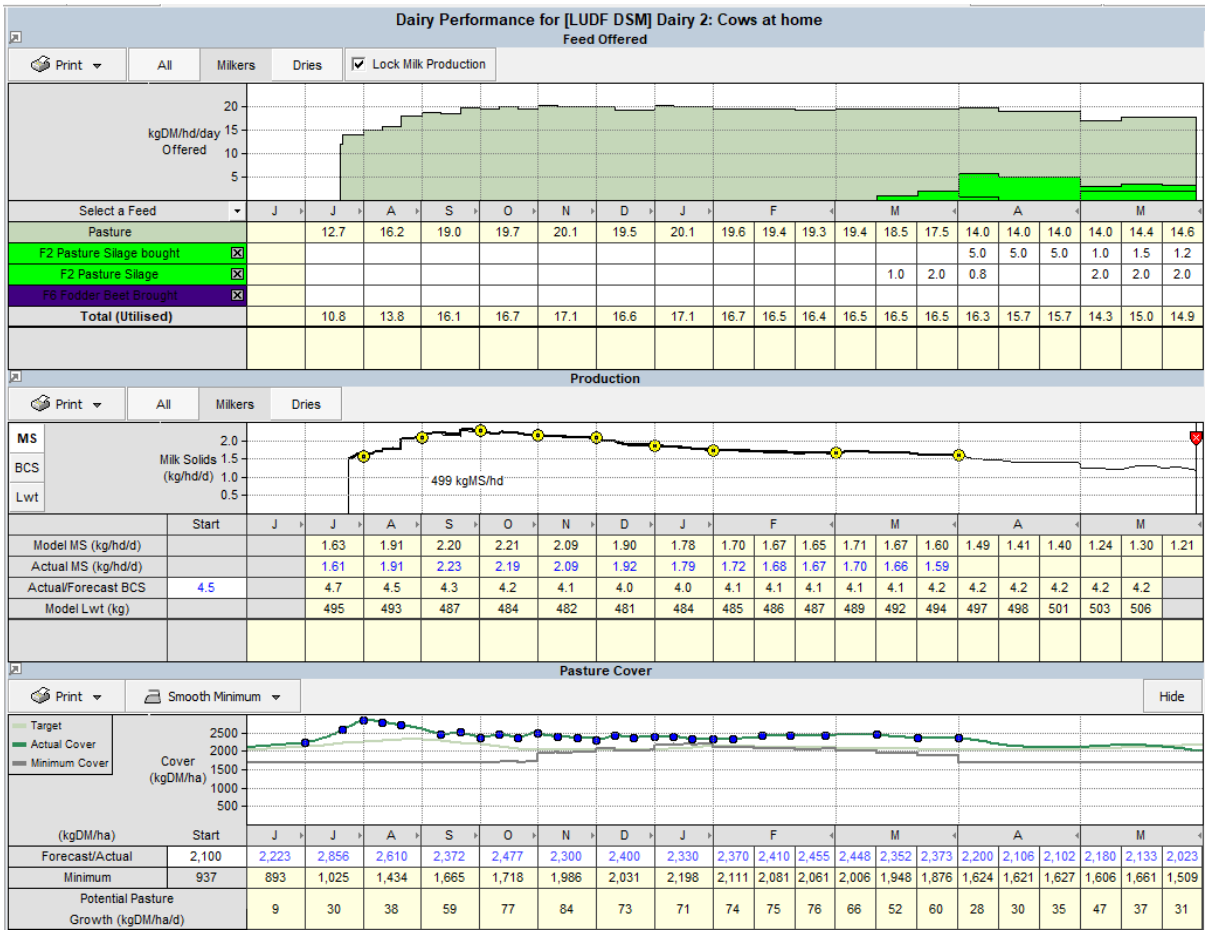
- Pasture damage feeding silage on paddocks.
- Track wear and tear, can it be eased with OAD milking in a wet autumn.
- Running the shed TAD VS OAD.
- Lame cows and cow condition.

Can you drop demand for supplements with autumn management of feed?

Jeremy Savage
NZIPIM (Reg)
MACFARLANE RURAL BUSINESS LTD
0274 331 069
jeremy@mrb.co.nz

Julian Gaffaney: LUDF Farmax Modelling

The LUDF farm system has been modelled in Farmax Dairy software for several years now, the software provides the ability to physically and financially model the dairy farm system, record actual production, pastures, feeding levels and feed types, nitrogen inputs etc into the model and calibrate inputs and feeding levels against milk production.



Dairy Performance for [LUDF DSM] Dairy 2: Cows at home

Feed Offered

Print | All | Milkers | Dries | Lock Milk Production

kgDM/hd/day Offered

Select a Feed	J	J	A	S	O	N	D	J	F			M			A			M		
Pasture		12.7	16.2	19.0	19.7	20.1	19.5	20.1	19.6	19.4	19.3	19.4	18.5	17.5	14.0	14.0	14.0	14.0	14.4	14.6
F2 Pasture Silage bought															5.0	5.0	5.0	1.0	1.5	1.2
F2 Pasture Silage													1.0	2.0	0.8			2.0	2.0	2.0
F6 Fodder Beet Brought																				
Total (Utilised)		10.8	13.8	16.1	16.7	17.1	16.6	17.1	16.7	16.5	16.4	16.5	16.5	16.5	16.3	15.7	15.7	14.3	15.0	14.9

Production

Print | All | Milkers | Dries

MS | BCS | Lwt — Milk Solids (kg/hd/d) — 499 kgMS/hd

	Start	J	J	A	S	O	N	D	J	F			M			A			M		
Model MS (kg/hd/d)			1.63	1.91	2.20	2.21	2.09	1.90	1.78	1.70	1.67	1.65	1.71	1.67	1.60	1.49	1.41	1.40	1.24	1.30	1.21
Actual MS (kg/hd/d)			1.61	1.91	2.23	2.19	2.09	1.92	1.79	1.72	1.68	1.67	1.70	1.66	1.59						
Actual/Forecast BCS	4.5		4.7	4.5	4.3	4.2	4.1	4.0	4.0	4.1	4.1	4.1	4.1	4.1	4.2	4.2	4.2	4.2	4.2	4.2	
Model Lwt (kg)			495	493	487	484	482	481	484	485	486	487	489	492	494	497	498	501	503	506	

Pasture Cover

Print | Smooth Minimum | Hide

Target | Actual Cover | Minimum Cover — Cover (kgDM/ha)

(kgDM/ha)	Start	J	J	A	S	O	N	D	J	F			M			A			M		
Forecast/Actual	2,100	2,223	2,856	2,610	2,372	2,477	2,300	2,400	2,330	2,370	2,410	2,455	2,448	2,352	2,373	2,200	2,106	2,102	2,180	2,133	2,023
Minimum	937	893	1,025	1,434	1,665	1,718	1,986	2,031	2,198	2,111	2,081	2,061	2,006	1,948	1,876	1,624	1,621	1,627	1,606	1,661	1,509
Potential Pasture Growth (kgDM/ha/d)		9	30	38	59	77	84	73	71	74	75	76	66	52	60	28	30	35	47	37	31

The result is a robust physical performance model for the farm system which can be used as a base to test differing management practices and tweaks and see the differing outcomes on physical and financial performance.

The Farmax models are populated with an expense sub-model which generates a theoretical profitability for the various scenario's tested.

Scenario Modelling

We have investigated the impact of farm program end of season tweaks from the current Revised model, and lined these models up against the baseline farm system as well as a higher N & stocking rate / lower per-cow production system.

These scenarios create validated / realistic physical data that can be inputted into Overseer to test the Environmental impacts alongside the physical and financial impacts.

Current (201819 Rev Apr)

- Modelled with Actuals YTD.
- 3.45 cows/ha stocking rate.
- Feeding feed made on platform + purchased supplement (144 TDM)
- Budgeted with cull dates as per plan.
- Milking to 30th May. Trucks booked 31st May for winter feed.
- Subject to autumn conditions – especially feed utilisation / pasture damage risk.

Low Autumn Supplement

- Feeding only feed made on platform (38 TDM)
- Culling pulled forward from 15th April to 20th March.
- Dry off 3 days earlier (27th Vs 30th May).
- Send cows off 3 days earlier (28th Vs 31st).

Note: The value of the lost milk production is very similar to the cost of feed.

High Autumn Supplement

- Feed additional supplement to gain days in milk (205TDM =+61 TDM)
- Culling delayed to 10th May.
- Dry off 30th May.
- Milking to 30th May. Trucks booked 31st May for winter feed.
- Feed Costs $0.34 / kgDM fed.

Note: The value of the increased milk production is very similar to the cost of feed.

Higher Stocking Rate – Moderate per cow production

- Peak Milk 624 cows
- 3.9 cows/ha stocking rate
- 450 kgMS/cow
- Nitrogen use 240 kgN/Ha
- Representative of some Canterbury systems

Base Line

- Farmax model constructed to represent baseline (2009 – 2013 period) farm system.
- Uses the average production and inputs for the base line period.
- Farmax modelling worked well with similar growth curve / higher stocking / more Nitrogen.

FARMAX YOUR ADVANTAGE Dairy 7.1.2.41

Compare Physical Summary

Jun 18 - May 19

Category	Description	LUDF DSM 201819 Rev Apr	LUDF DSM 201819 No Aut Suppl	LUDF DSM 201819 Hi Suppl	LUDF DSM 201819 High Stock Mid Cow	LUDF DSM Baseline	Units
Farm	Effective Area	160	160	160	160	160	ha
	Stocking Rate	3.5	3.5	3.5	3.9	4.1	cows/ha
	Potential Pasture Growth	19.6	19.6	19.6	18.3	18.3	t DM/ha
	Nitrogen Use	166	166	166	240	285	kg N/ha
	Feed Conversion Efficiency (eaten)	10.6	10.5	10.7	11.0	11.2	kg DM eaten/kg MS
Herd	Cow Numbers (1st July)	565	565	565	640	674	cows
	Peak Cows Milked	552	552	552	624	648	cows
	Days in Milk	271	264	277	270	267	days
	Avg. BCS at calving	4.9	4.9	4.9	4.9	4.9	BCS
	Liveweight	1,663	1,663	1,663	1,780	1,847	kg/ha
Production	Milk Solids total	274,130	268,087	278,084	279,169	283,511	kg
(to Factory)	Milk Solids per ha	1,713	1,676	1,738	1,745	1,772	kg/ha
	Milk Solids per cow	497	486	504	447	438	kg/cow
	Peak Milk Solids production	2.23	2.23	2.23	2.05	2.03	kg/cow/day
	Milk Solids as % of live weight	103.0	100.7	104.5	98.0	95.9	%
Feeding	Pasture Eaten per cow *	4.4	4.4	4.4	4.0	3.9	t DM/cow
	Supplements Eaten per cow *	0.2	0.1	0.3	0.2	0.3	t DM/cow
	Off-farm Grazing Eaten per cow *	0.7	0.7	0.7	0.7	0.7	t DM/cow
	Total Feed Eaten per cow *	5.3	5.1	5.4	4.9	4.9	t DM/cow
Diagnostics	Pasture Eaten per ha	15.2	15.1	15.2	15.8	16.2	t DM/ha
	Supplements Eaten per ha	1.0	0.5	1.3	1.3	1.5	t DM/ha
	Off-farm Grazing Eaten per ha	4.3	4.3	4.3	4.8	4.9	t DM/ha
	Total Feed Eaten per ha	20.5	19.9	20.8	21.9	22.5	t DM/ha
	Supplements and Grazing / Feed Eaten *	17.1	14.7	18.3	18.6	19.4	%
	Bought Feed / Feed Eaten *	6.0	3.9	7.5	7.6	8.8	%

(*) feed eaten by females > 20 months old / peak cows milked

- Reducing Autumn supplement and earlier culling reduced production
- Increasing Autumn supplement and delaying culling increased production
- Similar total production from the higher stocked / lower per-cow model but more Nitrogen required to achieve this with similar per-cow supplement feeding

FARMAX YOUR ADVANTAGE
Dairy 7.1.2.41

Compare Forecast Profit and Loss

Jun 18 - May 19

			LUDF DSM 201819 Rev Apr	LUDF DSM 201819 No Aut Suppl	LUDF DSM 201819 Hi Suppl	LUDF DSM 201819 High Stock Mid Cow	LUDF DSM Baseline
Revenue	Stock	Net Milk Sales - this season	1,580,633	1,545,790	1,603,431	1,609,689	1,634,726
		Net Milk Sales - last season	0	0	0	0	0
		Net Milk Sales - dividend	0	0	0	0	0
		Net Livestock Sales	89,167	89,129	88,138	75,920	75,161
		Contract Grazing	0	0	0	0	0
		Change in Livestock Value	0	0	0	0	0
		Total	**1,669,801**	**1,634,919**	**1,691,568**	**1,685,608**	**1,709,887**
	Crop & Feed	Capital Value Change	835	7,400	1,494	0	533
		Total	835	7,400	1,494	0	533
	Total Revenue		**1,670,636**	**1,642,320**	**1,693,062**	**1,685,608**	**1,710,420**
Expenses	Wages	Wages	156,216	156,216	156,216	156,216	156,216
		Management Wage	30,912	30,912	30,912	30,912	30,912
	Stock	Animal Health	66,240	66,240	66,240	74,880	77,760
		Breeding	28,152	28,152	28,152	31,824	33,048
		Farm Dairy	13,800	13,800	13,800	15,600	16,200
		Electricity	20,976	20,976	20,976	23,712	24,624
	Feed/Crop	Pasture Conserved	2,880	2,880	2,880	4,320	2,592
		Feed Crop	3,780	3,780	3,780	3,780	3,780
		Bought Feed	33,435	3,983	54,972	57,579	75,675
		Calf Feed	3,514	3,514	3,514	4,263	4,267
	Grazing	Grazing	258,779	258,779	258,779	285,517	292,789
	Other Farm Working	Fertiliser (Excl. N)	30,880	30,880	30,880	30,880	30,880
		Nitrogen	38,209	38,209	38,209	55,244	65,597
		Irrigation	64,000	64,000	64,000	64,000	64,000
		Weed & Pest Control	3,840	3,840	3,840	3,840	3,840
		Vehicle Expenses	27,048	27,048	27,048	30,576	31,752
		R&M Land/Buildings	52,800	52,800	52,800	52,800	52,800
		Freight & Cartage	1,600	1,600	1,600	1,600	1,600
	Overheads	Administration Expenses	22,400	22,400	22,400	22,400	22,400
		Insurance	16,000	16,000	16,000	16,000	16,000
		ACC Levies	4,800	4,800	4,800	4,800	4,800
		Rates	9,600	9,600	9,600	9,600	9,600
	Total Farm Working Expenses		**889,861**	**860,409**	**911,398**	**980,343**	**1,021,131**
	Depreciation		0	0	0	0	0
	Total Farm Expenses		**889,861**	**860,409**	**911,398**	**980,343**	**1,021,131**
Economic Farm Surplus (EFS)			**780,775**	**781,911**	**781,664**	**705,265**	**689,289**
Farm Profit before Tax			**780,775**	**781,911**	**781,664**	**705,265**	**689,289**
Farm Profit per ha before Tax			**4,880**	**4,887**	**4,885**	**4,408**	**4,308**

EFS is a measure of farm business profitability independent of ownership or funding, used to compare performance between farms.

EFS should include an adjustment for unpaid family labour and management. This can be added to the expense database as management wage.

- Virtually no difference in profitability for current versus revised management tweaks
  - - assuming total livestock sales are the same (schedule changes could alter slightly)
- But what is the Environmental impact – kg N leached per hectare??

Julian Gaffaney
Farm Management Consultant, MNZIPIM
MACFARLANE RURAL BUSINESS LTD
julian@mrb.co.nz

The N Challenge: Implementing Practical Solutions Successfully

Virginia Serra and Phillipa Hedley, DairyNZ

Introduction

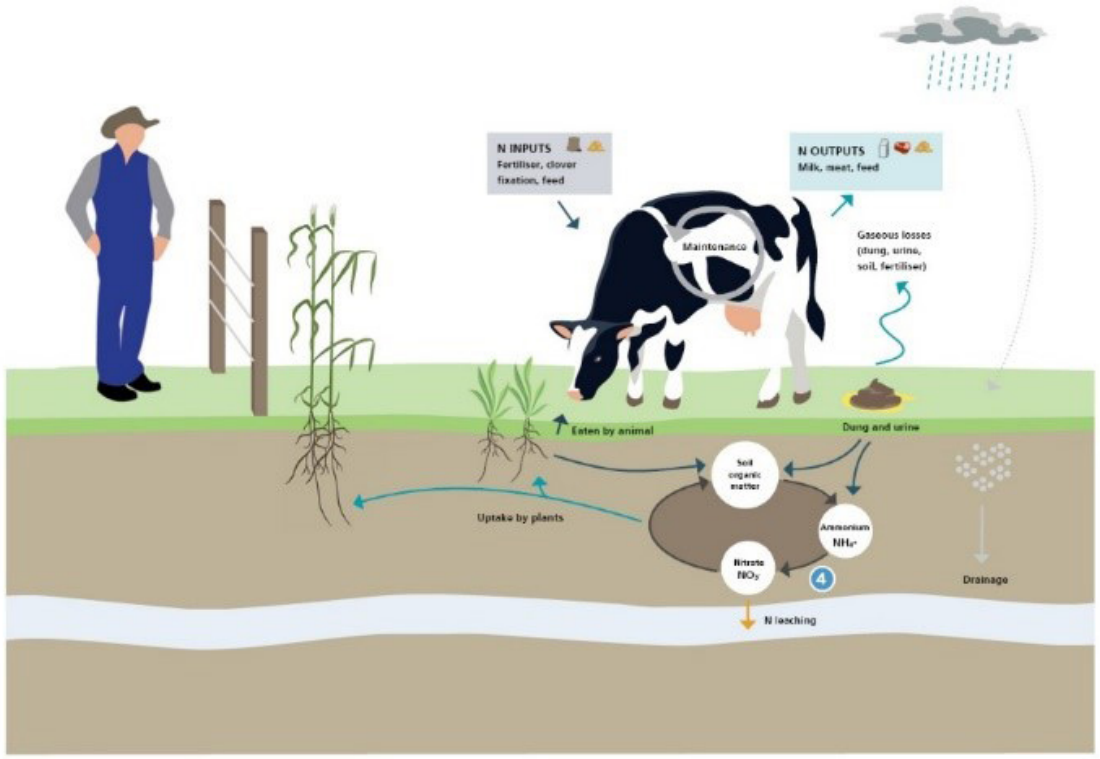
Reducing the environmental footprint of our farms is important for the future success of dairying as well as having profitable, repeatable farm systems that are attractive for staff to work in and to the wider community.

Protecting and nurturing the environment is Commitment 1 in the industry, Dairy Tomorrow strategy. It includes the four main water quality issues (N, P, sediment and e coli), methane and nitrous oxide and biodiversity. This paper focuses on N loss as this is a priority in many Catchments in Canterbury and Otago.

What Drives N Leaching

Nitrogen circulates through the soil, plant and animal as shown in Figure 1. N enters the N cycle (N inputs) from fertiliser N, supplement N, clover fixation and N in irrigation water. The cow does not create N but eats N when it consumes pasture and supplements. Part of the N entering the cycle ends up in products (e.g. milk and sold animals). The difference between N inputs and N outputs is called N surplus. When there is a surplus of N and there is drainage out of the root zone, N is leached.

Figure 1: *N cycle*



Reducing N Leached

Nitrogen (N) is leached when there is a surplus of N in the soil at a time when drainage out of the root zone occurs. Therefore, to reduce the amount of N leaching need to:

1. Reduce drainage out of the root zone (0-60cm) and/or
2. Reduce Surplus N, especially in the autumn and winter

Drainage

Soil type and rainfall are key factors that drive drainage, both out of the farmer's control. On irrigated farms, farmers can influence drainage by managing irrigation and ensuring that when applying irrigation water, it does not lead to drainage out of the root zone (defined as 0-60cm in OVERSEER).

Soil type, specifically Plant Available Water (PAW) will determine how much water will drain from a soil given the same irrigation system and management. Therefore, soil type needs to be taken into consideration to decide irrigation.

Surplus N

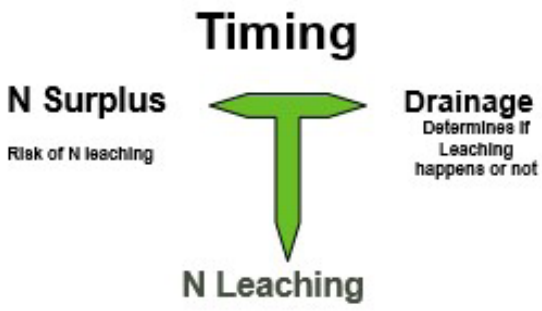
The difference between N inputs (Supplement, Fertiliser, Clover fixation) and N outputs (meat and milk) is called N surplus. When there is a surplus of N and there is drainage out of the root zone, N is leached. N Surplus is a good Indicator of the risk of N leaching and is driven by N inputs and N use efficiency, both under management control.

The N surplus can only end up either:

1. Immobilised into the soil organic matter (Carbon) or
2. Lost to the atmosphere as Nitrogen (N2) or
3. Lost as gas to the atmosphere as Nitrous oxide or ammonium
4. Lost to water (leached)

There is a limit to how much N can be immobilised into soil organic matter. As soils develop, the soil organic matter "tank" gets full and N is released (mobilised) back into the N cycle. Therefore, in the long term the focus needs to be on reducing N surplus to reduce the losses of N to water and as gases nitrous oxide and ammonium.

Figure 2: Main Factors driving N leaching



Some strategies to minimise drainage:

- Irrigation methods that enable high water utilisation and no drainage from the root zone. Pivots and linear > Rotorainer, K-line > Border dyke
- Monitoring when to apply water to prevent drainage
- Variable rate irrigation to avoid irrigating non-productive areas – laneways etc and ensure high water utilisation

Some strategies to reduce N surplus:

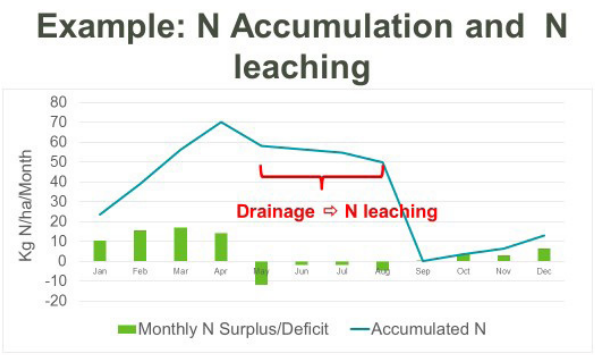
- Reduce N Fertiliser use
- Reduce N in bought in feed (supplement and crops)
- Increase outputs (e.g. milk production) with the same level of inputs
- Plantain has the potential to reduce the amount of N in the urine patch

Timing

Figure 3 presents monthly N surplus/ deficit and accumulated N over a year for an example dairy farm.

There is a high risk of leaching when there is Surplus N in nitrate form in the soil at a time where the chances of drainage are high and plant uptake is low. As it is N in the urine patch that is vulnerable to leaching, N in urine in the spring is less likely to be leached as plant demand for N is high and drainage low. The opposite is likely to happen in the autumn/winter as N has accumulated in the system as plant demand decreasing in autumn or minimal over the cold winter months and there is a higher risk of leaching as the likelihood of drainage is higher. Therefore, reducing N eaten and N fertiliser applied in autumn have a bigger impact on reducing N leaching than in the spring.

Figure 3: *N Accumulation and N Leaching*



Some examples to reduce the risk of N Leaching:

- Avoid leaving ground fallow. Grow catch crops – active winter growing e.g. oats, Italian ryegrass
- Stand-off in autumn/winter to catch surplus N, spread when pasture growth able to utilise
- Rotation length – optimise pasture grown by grazing ryegrass at 2 ½ - 3 leaf stage; need less N fertiliser for same pasture grown

Summary Points

- There are options available that can reduce footprint with a variable effect in profit
- Options are farm specific and need to consider the impact on the whole farm system.
- To reduce N leaching, need to minimise drainage (on irrigated systems), reduce N surplus and manage the risky times of the year e.g. autumn/winter.

For more information:

For more information go to the DairyNZ website

https://www.dairynz.co.nz/environment/nutrient-management/

https://www.dairynz.co.nz/environment/water-use/

https://www.dairynz.co.nz/environment/in-your-region/

https://www.dairynz.co.nz/about-us/research/

https://www.dairynz.co.nz/news/latest-news/solutions-to-reduce-n-leaching-and-maintain-profit//

Meeting a Sustainable Future

Selwyn and Hinds | Inspiring High Performance, Low Footprint Farms

Meeting a Sustainable Future is a new five year DairyNZ project in which Canterbury dairy farmers will lead the way to showcase how nitrogen (N) losses can continue to be reduced in order to protect local waterways.

The project will focus on how farmers in Hinds and Selwyn can meet N loss limits and maintain profitable businesses under the Canterbury Land & Water Regional Plan (LWRP). It builds on sustainable farming initiatives many farmers have already begun.

"THIS PROJECT BUILDS ON PREVIOUS N LOSS RESEARCH. IT AIMS TO GIVE FARMERS CONFIDENCE THE LIMITS ARE ACHIEVABLE. MANY FARMERS HAVE BEEN MAKING CHANGES TO REDUCE N LOSS FOR SOME TIME AND THIS WILL CONTINUE TO BUILD ON THAT."

Virginia Serra: Project leader

A key aspect of this project is working alongside partner farms/farmers to identify the most appropriate solutions for them, considering their chosen production systems, goals, and aspirations. The information generated from these partner farms will be shared with other farmers and will provide a good range of examples and options. So the project will benefit all farmers nationwide.

What does success look like?

- Farmers will have confidence in the options available to reduce N leaching and an understanding of the implications of these options on the overall performance of their production systems.
- The options will be demonstrated to other farmers as they are implemented.
- Farmers will have clarity on the most profitable options to reduce their environmental footprint in different conditions and farm systems.

How can you get involved?

If you are a farmer, you could become one of the supported farmers or engage with the range of extension activities.
If you are a rural professional, you can work with the project team to provide research questions and find the most appropriate solutions for your client farmers.

Ashburton farmer Campbell Tait is one of the farmers involved in the Meeting a Sustainable Future project.

Campbell says DairyNZ modelling provided invaluable information to reduce nitrogen (N) loss.

"IT SHOWED US WHERE WE COULD GET THE BIGGEST IMPACT, SOMETIMES BY MAKING RELATIVELY SMALL CHANGES."

Campbell hopes his learnings and those of the other project farmers will help others identify the best ways to reduce N loss on their farms.

For more information about the project please contact:

Virginia Serra – Project Lead
021932515 | virginia.serra@dairynz.co.nz