SIDDC South Island Dairying Demonstration Centre

LUDF Tomorrow's farming, today

FOCUS DAY

LUDF – Wednesday 14 February 2024
10.15am to 1.00pm

INTRODUCTION & WELCOME
Antoinette Archer (SIDDC Demonstration Lead)

LUDF FARM REVIEW
Peter Hancox (LUDF Farm Manager) & Antoinette Archer

SCOPE THREE & LUDF's Environmental Journey
Virginia Serra DairyNZ

Sean Spence & Louise Cook Fonterra Dairy for life

WELLBEING – FARMSTRONG *Live Well Farm Well*
Jack Cocks FARMSTRONG

PLANTAIN – the LUDF Journey
Omar Al-Marashdeh Lincoln University

Venue: LUDF, Supply # 37581

Parking: Entrance off Ellesmere Junction Road *(look for the flag)*

Event followed by a light lunch

Event sponsor: Fonterra

Fonterra Dairy for life

Enquiries: T: 03 423 0022 E: office@siddc.org.nz W: www.ludf.org.nz

SIDDC South Island Dairying Demonstration Centre

Partners Networking To Advance South Island Dairying

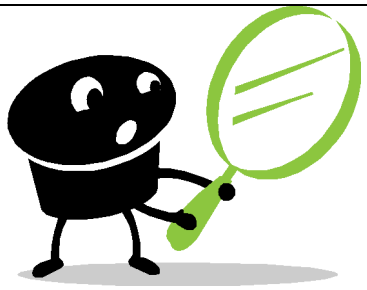
Lincoln University · DairyNZ · ravensdown · LIC · agresearch · Fonterra Dairy for life · SIDE

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 the 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.

Focus Day

LUDF Update

- **Production update**
- **Pasture & Plantain**
- **Mating & Health**
- **Fertiliser & Irrigation**
- **Financials: Budget vs Actual**

Wednesday 14th February 2024
10:15am – 1:00pm

Enquires: **Ph: 03 423 0022** www.siddc.org.nz www.ludf.org.nz

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LUDF Farm System Overview

SIDDC

Lincoln University Dairy Farm (LUDF) is a demonstration farm developed by the South Island Dairy Demonstration Centre (SIDDC). This industry-funded partnership of seven leading dairy sector organisations collaborate to promote the sustainable development of South Island dairying via demonstration activities, research, education, and training of farmers. The current partners of SIDDC are:

Strategic Objective at LUDF

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.

Focus for 2023/24 Season:

Nil-Infrastructure, low input, low N-loss, optimise profit.

Current farm system:

- 3.4 cows/ha (peak milked).
- Target use of up to 190kgN/ha synthetic nitrogen, not to exceed 190kgN/ha cap.
- 648 kg DM/cow imported supplement.
- Winter cows off farm.
- FWE budgeted at $5.69/kg MS.
- Target production 469 kg MS/cow (>100% liveweight in milk production less 5.7% with 10 in 7 milking).

Current research projects on the farm

Variable Milking Project

- 10 milkings in 7 days.
- Commenced from start of season, this is the third second season of the project.
- Predict 5.7% drop in MS production.
- Profitability should remain the same because of lower costs (drop a labour unit, less animal health and shed costs, better cow condition and higher mating results).
- First season made a loss due to high pay out, last season back on production.

Plantain Grazing Project

- Aim to get 30% of the diet in plantain via a mixed sward.
- To assess composition over time through direct drilling and broadcast with a spring and autumn sowing date.
- To result in decrease in N loss in OverseerFM from 26 kg N/ha/yr to 23 kg N/ha/yr for expected composition when direct drilled and 22 kg N/ha/yr for expected composition when broadcasted.

Mating Benchmarking Project

- Benchmarking project with top quartile local performing farmer, Liam Kelly. This project has improved mating results of 21% empty 2021/22 season, to 9% empty 2022/23 season and awaiting 2023/24 season results.

LUDF 2023/2024 Season Update

Herd

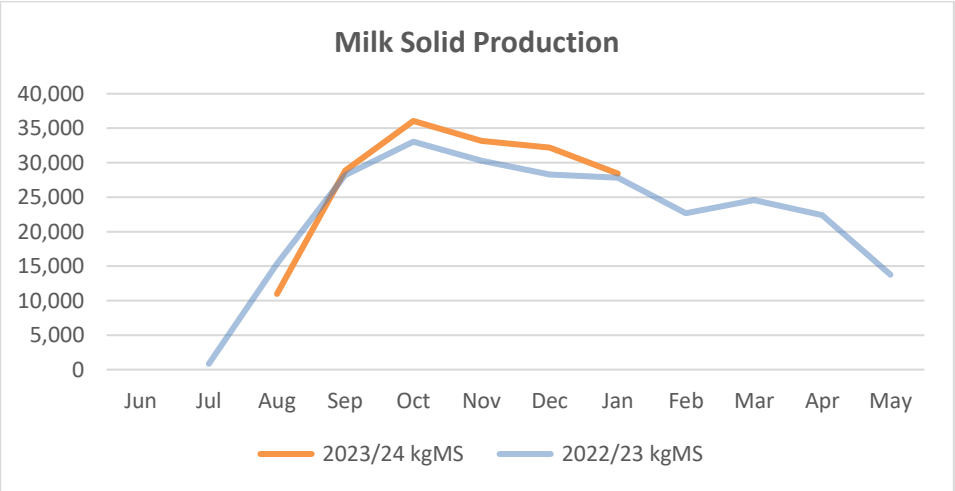
Stock Rec 1st Feb 2024

Milkers:	
Currently milking MA Cows	558
Peak Milk	560
Young stock:	
R2 heifers	139
R1 calves	114

- Targeting to peak milk 560 cows for 2024/25 season.
- All culls are to off farm by 20th April. This is a strategy to reduce N loss in Overseer.
- Aim to dry off at 1900 cover on 29th May. BCS done mid-May to determine winter mobs and feeding.
- Continue to herd test for Johne's disease via herd tests.
- Ability to further cull on SCC, Johnes, production, and lameness. Subject to February in calf scan Feb 20th. This have been achieved through the mating benchmarking project.

Milk Production

- Budget 265,221 kg MS from 565 cows at 469 kg MS/cow. If TAD, this would be 500 kg MS/cow. This is based on DairyNZ research that the farm will drop 5.7 % MS production going to 10-in-7.
- Production to the end of January is 141,196 kg MS, which is 53% of budget.
- We have revised our target to 264,079, which is 1,650 kg MS/ha.
- As at the of January, we were 4% up season to date, and 3% for January.
- We had a slow start as we had pushed our calving date back by 5 days.
- We have continued the 10-in-7 milking regime.
- We are currently sitting at 93% of the 3-season average, prior to implementing 10-in-7. It will be interesting to review this season as close to see how close we are to 5.7%.



Budget vs Actual - as at 31 January

- Currently tracking close to budget at 472 kg MS/cow.
- Goal is 500 kg MS/cow with TAD = 472 kg MS/cow with 10-in-7 (-5.7%).
- Feed harvested back to 14 t DM/ha.
- Supplement – budget 648 kg DM/cow, revised to 709 kg DM/cow.

FARMAX

Compare Physical Summary

Jun 21 - May 22

		23/24 Revised	202324 Plan	202223 A	202122A	
Farm	Effective Area	160	160	160	160	ha
	Stocking Rate	3.5	3.5	3.4	3.5	cows/ha
	Potential Pasture Growth	17.9	18.3	17.7	17.9	t DM/ha
	Nitrogen Use per farm ha	189	180	172	161	kg N/ha
	Feed Conversion Efficiency (eaten)	11.1	11.0	11.1	11.0	kg DM eaten/kg MS
Herd	Cow Numbers (1st July)	560	565	561	560	cows
	Peak Cows Milked	560	565	541	557	cows
	Days in Milk	278	280	274	285	days
	Avg. BCS at calving	4.9	5.0	5.0	5.1	BCS
	Liveweight per farm ha	1,754	1,695	1,618	1,663	kg/ha
Production	Milk Solids total	264,079	265,221	247,180	258,855	kg
(to Factory)	Milk Solids per farm ha	1,650	1,658	1,545	1,618	kg/ha
	Milk Solids per cow	472	469	457	465	kg/cow
	Peak Milk Solids production	2.19	2.05	2.04	2.10	kg/cow/day
	Milk Solids as % of live weight	94.1	97.8	95.5	97.3	%
Feeding	Pasture Eaten per cow *	4.0	4.0	3.9	3.8	t DM/cow
	Supplements Eaten per cow *	0.6	0.5	0.5	0.6	t DM/cow
	Off-farm Grazing Eaten per cow *	0.7	0.6	0.6	0.7	t DM/cow
	Total Feed Eaten per cow *	5.2	5.2	5.1	5.1	t DM/cow
	Pasture Eaten per farm ha	13.9	14.2	13.3	14.3	t DM/ha
	Supplements Eaten per farm ha	2.1	1.9	1.7	2.8	t DM/ha
	Off-farm Grazing Eaten per farm ha	5.0	4.8	4.8	4.5	t DM/ha
	Total Feed Eaten per farm ha	21.0	20.9	19.8	21.6	t DM/ha
	Supplements and Grazing / Feed Eaten *	23.9	22.1	22.2	25.7	%
	Bought Feed / Feed Eaten *	14.1	13.0	12.9	15.6	%

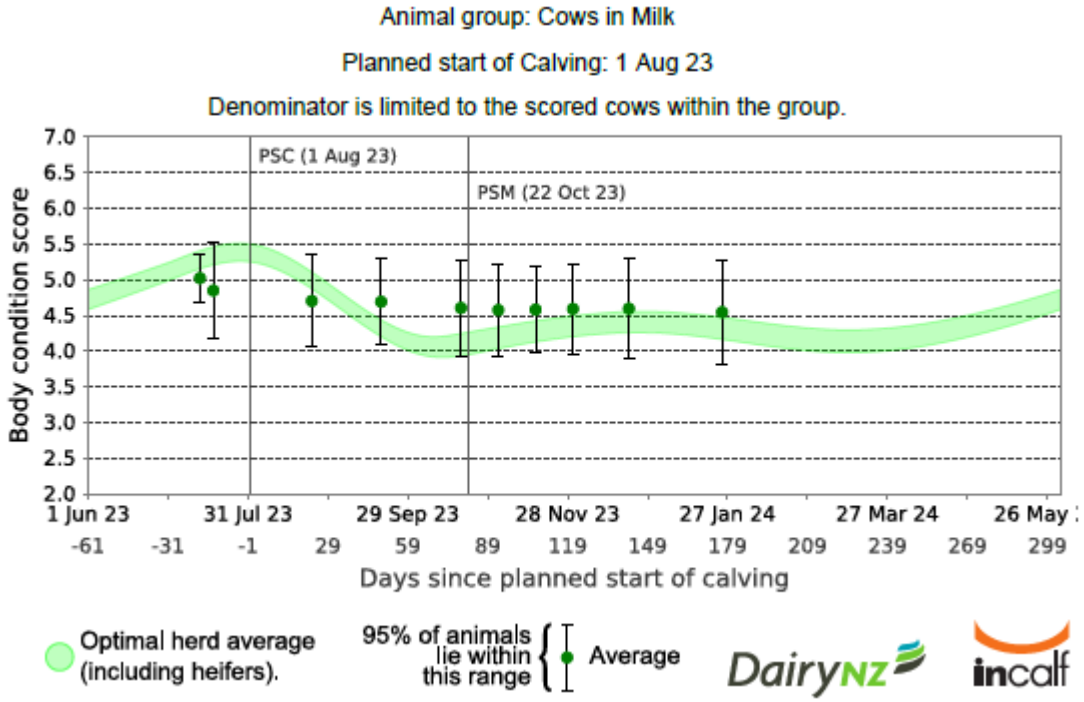
(*) feed eaten by females > 20 months old / peak cows milked

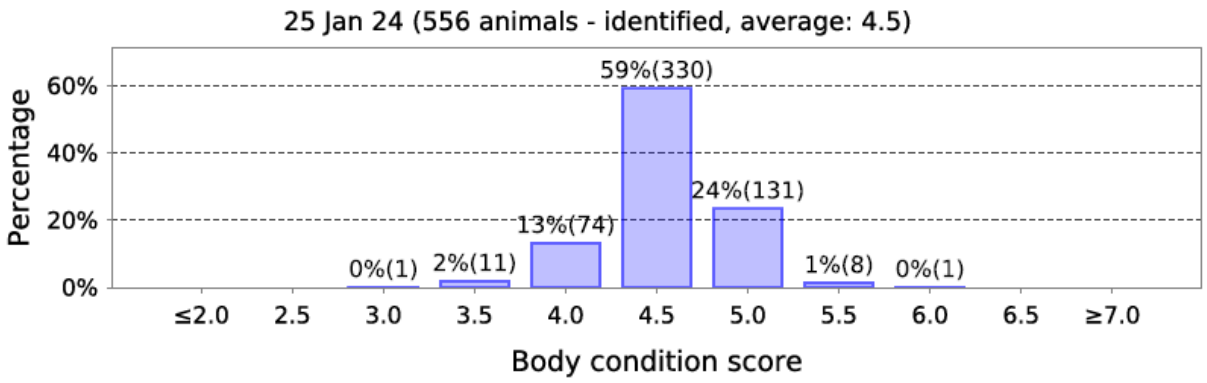
Farmax Dairy 8.3.2.12

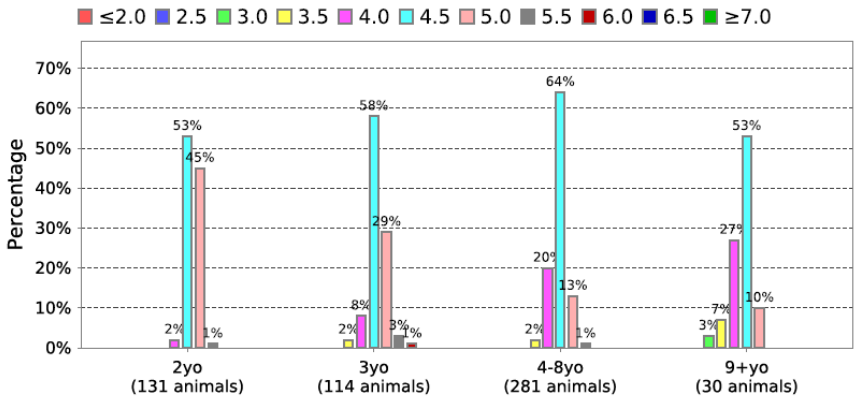
	Compare Pasture Growth kg DM/ha/day		Compare Milk Solids kg MS/cow/day	
Month	**23/24 Revised**	**23/24 Budget**	**23/24 Revised**	**23/24**
Jun	21.3	18.6		
Jul	15.5	21.8	0.13	0.93
Aug	24.2	32.1	1.35	1.55
Sep	29.9	52.6	1.93	1.89
Oct	59.9	64.6	2.09	2.00
Nov	76.4	76.7	1.97	1.90
Dec	69.8	66.5	1.86	1.74
Jan	67.9	65.5	1.64	1.70
Feb	65.0	65.0	1.59	1.60
Mar	59.8	59.8	1.52	1.54
Apr	45.9	45.9	1.50	1.52
May	31.1	31.1	1.26	1.28

Body Condition Score

- Current BCS is 4.5 at 25 January 2024.
- Body Condition Score has been a focus particularly with our mating benchmark project.
- We scored our herd fortnightly over mating, and monthly thereafter with results below.
- Our cows were lighter than the optimal range however within target (5.0) over winter but did drop pre calving (4.8) and at end of calving was 4.7. We have been able to hold body condition score over mating (4.6) and are now at 4.5.
- 96% of our herd are between 4.0 and 5.0.
- Age analysis completed. 2yo have tightest and highest range, with the 9+yo having the widest and lower range.
- We will use BCS to aid with drying off dates and winter mobs.







Body Condition Score by Age

Mating

MA Cows:

- We have continued to benchmark with Liam Kelly, following a similar strategy to last season.
- Rumination time was monitored. Cows were milked OAD until cows reached a rumination of 450 minutes/day.
- Early scans were performed to identify any phantom cows, which were subsequently treated with prostaglandin. Phantoms are cows that have been mated, and did not cycle again and not in calf at PD.

Scan Date	Number of phantoms found
14 December	10
29 December	9
5 January	13
9 January	7
Total	**39**

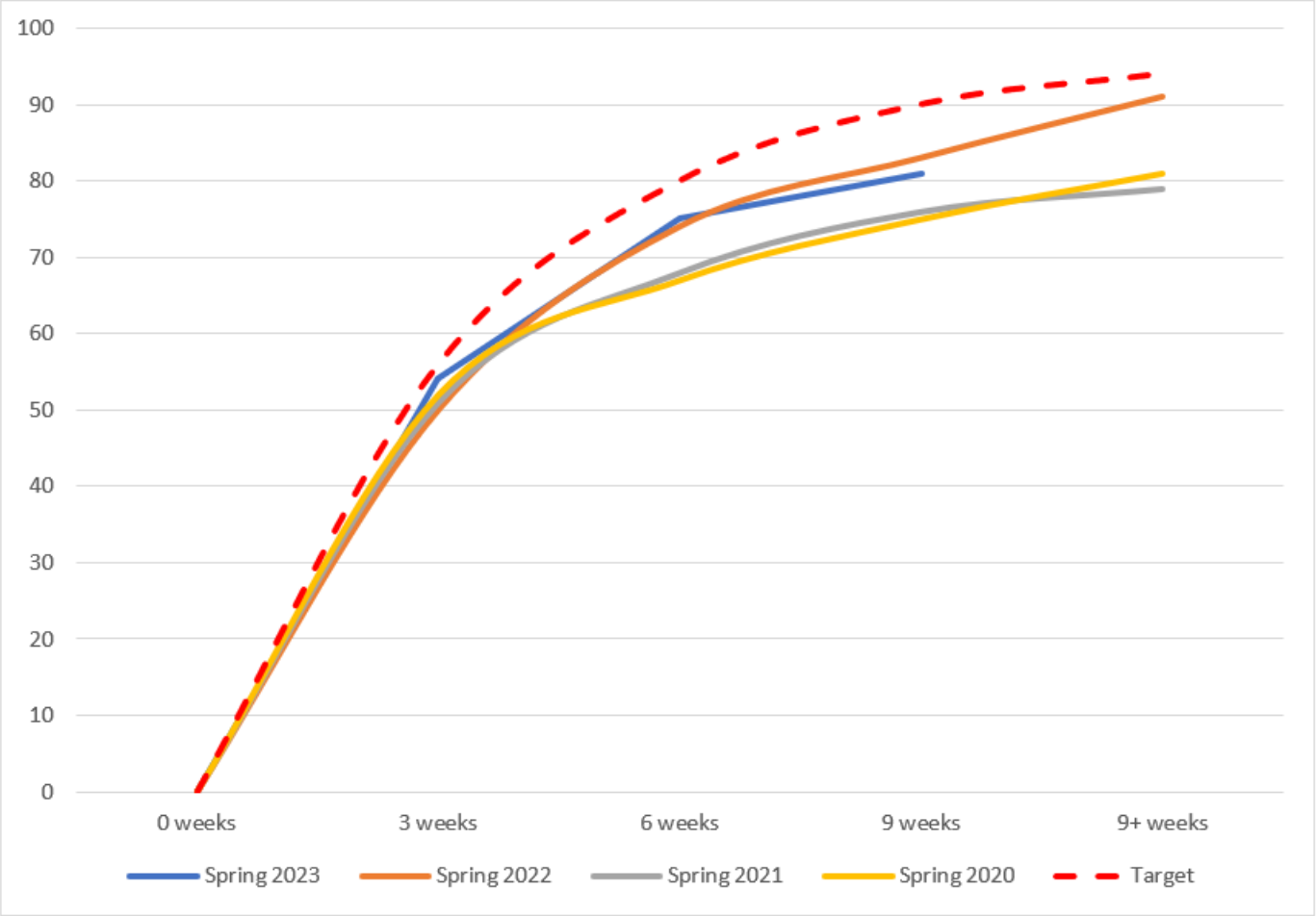
- Current scans have indicated a 75% in calf rate at 6 weeks, which is 2% behind target.
- This is slightly ahead of last season, but significantly up from previous seasons. This is primarily due to the mating benchmark project.

Season	6 week in calf rate	3 week submission rate	Not in calf rate	Conception Rate	Duration of Mating
2023/24	75% (75-76%)	91%	*	*	85 days
2022/23	75% (74-75%)	87%	9%	50%	93 days
2021/22	68%	94%	21%	46%	75 days
Target	78%	90%	9%	60%	

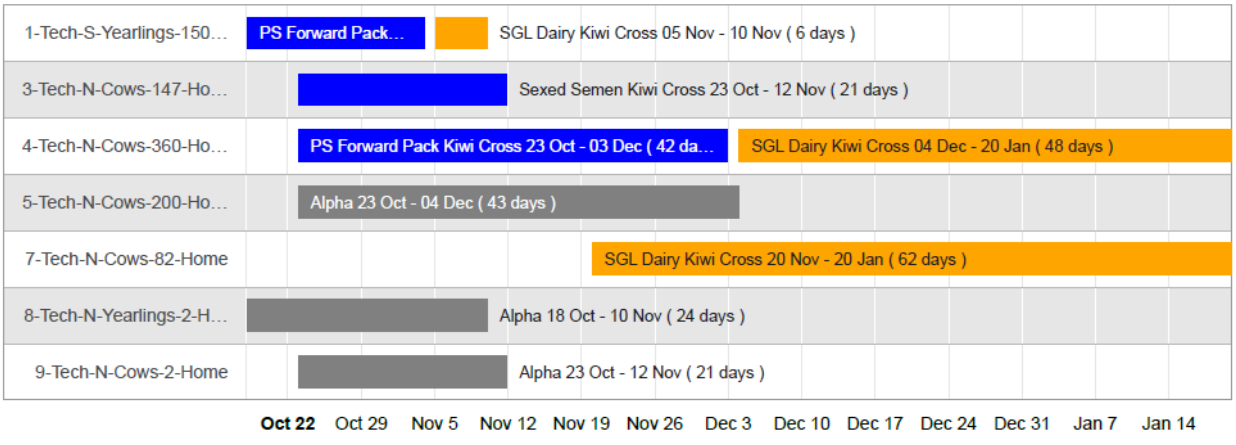
* to be confirmed.

	3 weeks	6 weeks	9 weeks	9+ weeks
Target				
Spring 2023	54	75	81	
Spring 2022	50	74	83	91
Spring 2021	51	68	76	79
Spring 2020	52	67	75	81

In Calf Rates



Mating Plan Details

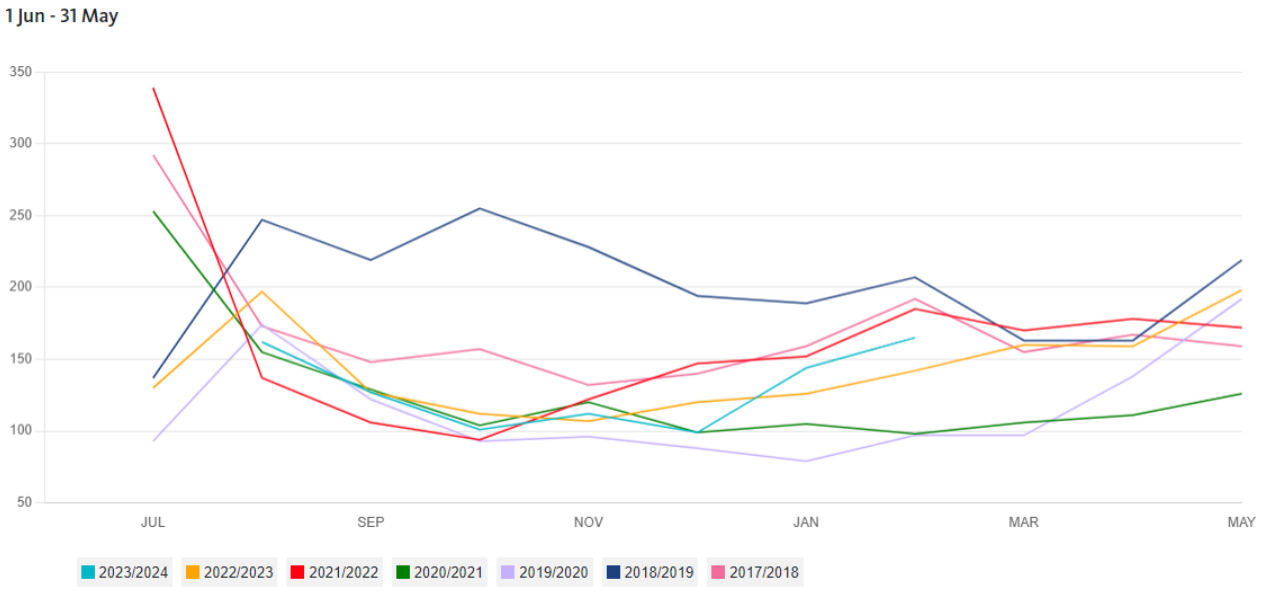


R2 Heifers:

- The yearlings underwent a CIDR* synchrony programme so that we could blanket AI.
- AI was done on 18 October.
- We followed up with Jersey yearling bulls 24 hours later.
- Final scan will be 16th February.
- We will retain 115 IC heifer replacements.

Animal Health

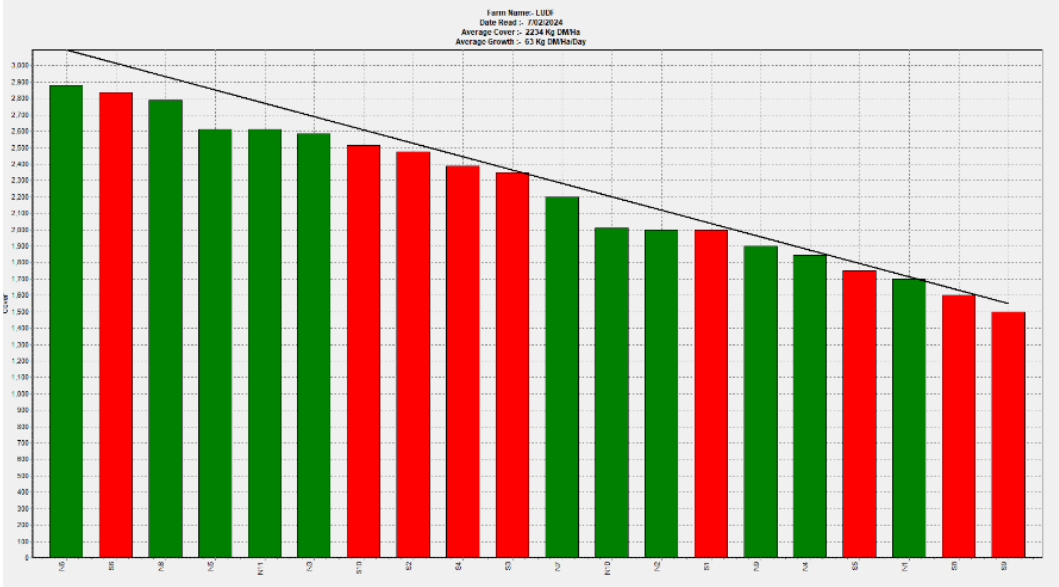
- Lame cows: there are currently 15 lame cows which are being milked OAD in separate herd.
- Somatic Cell Count: Our STD average is 130,000 compared to last season's STD of 143,000. We have seen a lift in January which a life it clinical mastitis which we are monitoring.



Somatic Cell Count '000s

Pasture & Plantain

- Have had seedhead through December and January and have topped post grazing to keep quality.
- 16 hectares were taken for silage in mid-January and has resulted in good quality.
- APC is currently sitting at 2,224 kg DM/ha – see below.
- Currently on 21 day round; did get down to 19 days.



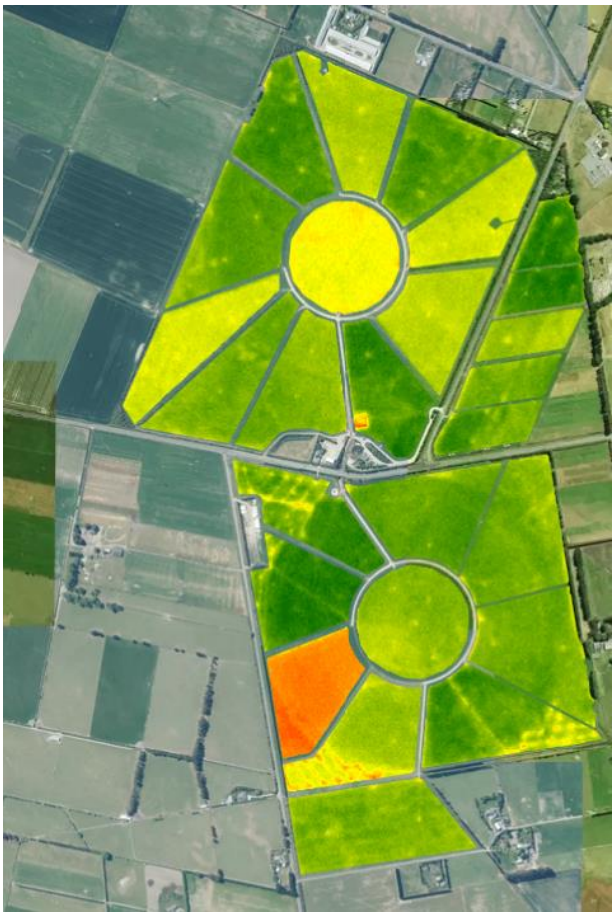
Feed Wedge

- Our current demand is 17.4 kg DM/cow/day. Based on 12 MJME. Currently feeding up to 7kgs baleage.
- Growth rates are 63 kg DM/ha and have been last 3 weeks. This is at a demand of 64 kg DM/day.
- Irrigation development has resulted in irrigation being paused for 2 weeks while development completed.
- SPACE^{TM} visibly shows the reduction in growth from irrigation being turned off during this period.
- **Back calculation is important!**

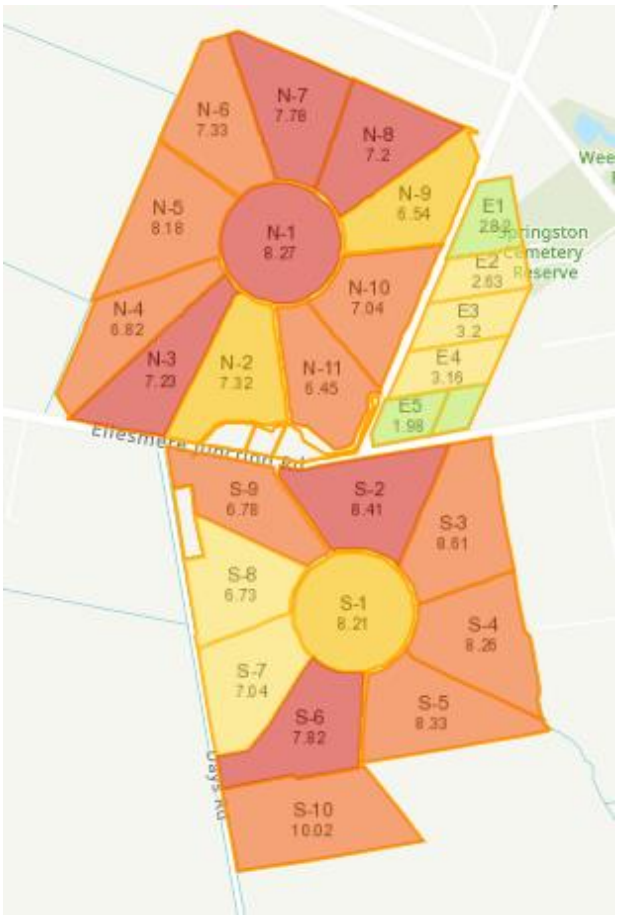
  Based on available feed we should be in balance and not supplementing. However, silage made has dropped our APC and irrigation development has reduced growth rate on 25 ha (fixed grid and k-line) which is 16% of available area. We have 8 ha out for regrassing, which has now been sown. These have created a deficit we have needed to fill with baleage.

Supplements this season

- Supplements fed in the 2022/23 season was 641 kg/cow and our feed budget allowed for the same supplement.
- 2023/24 feed budget was 648kg DM/cow, now revised to 409 kg DM/cow.



SPACE^{TM} Map



Nitrogen Heat Map

Fertiliser / Nitrogen

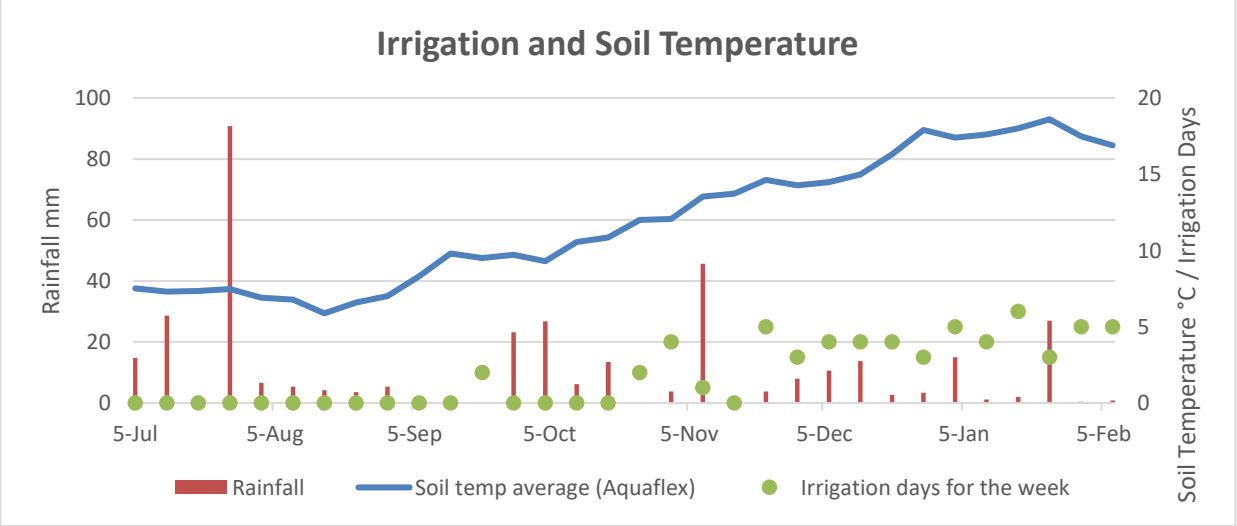
- Nitrogen spread to date: 137 kg N/ha.
- Highest rate to date is 163 kg N/ha and lowest is 88 kg N/ha.
- Effluent and non-effluent area is treated the same.
- Effluent is now applied to 60.9 ha and can be applied at a rate of 1.5mm/day.
- On target to use 190 kg N/ha/yr.
- Super applied in spring. Rates based on Olsen P results.

Re grassing program

- 10% regrassing strategy, 16 ha - 8 ha early November and 8 ha late January.
- Next season will select Italian Ryegrass (annual in S5) which was selected as the next pure plantain paddock and will assess ex pure plantain paddocks for weeds and productivity, otherwise will select a

Irrigation

- Irrigation days for the season is 60 days.
- Rainfall season Jul-Jan to date is 368.2 mm.
- Irrigation development – have extended the fixed grid to the west of South Block (was longlines) 9.2ha.
- Pivot – 125.7 ha; fixed grid – 22.1 ha; K-line 9.5 ha.
- Soil temperature has averaged 16.9°C for Dec/Jan.



Lincoln University Demonstration Farm Irrigation & Effluent Plan January 2024

WaterForce
wise with water

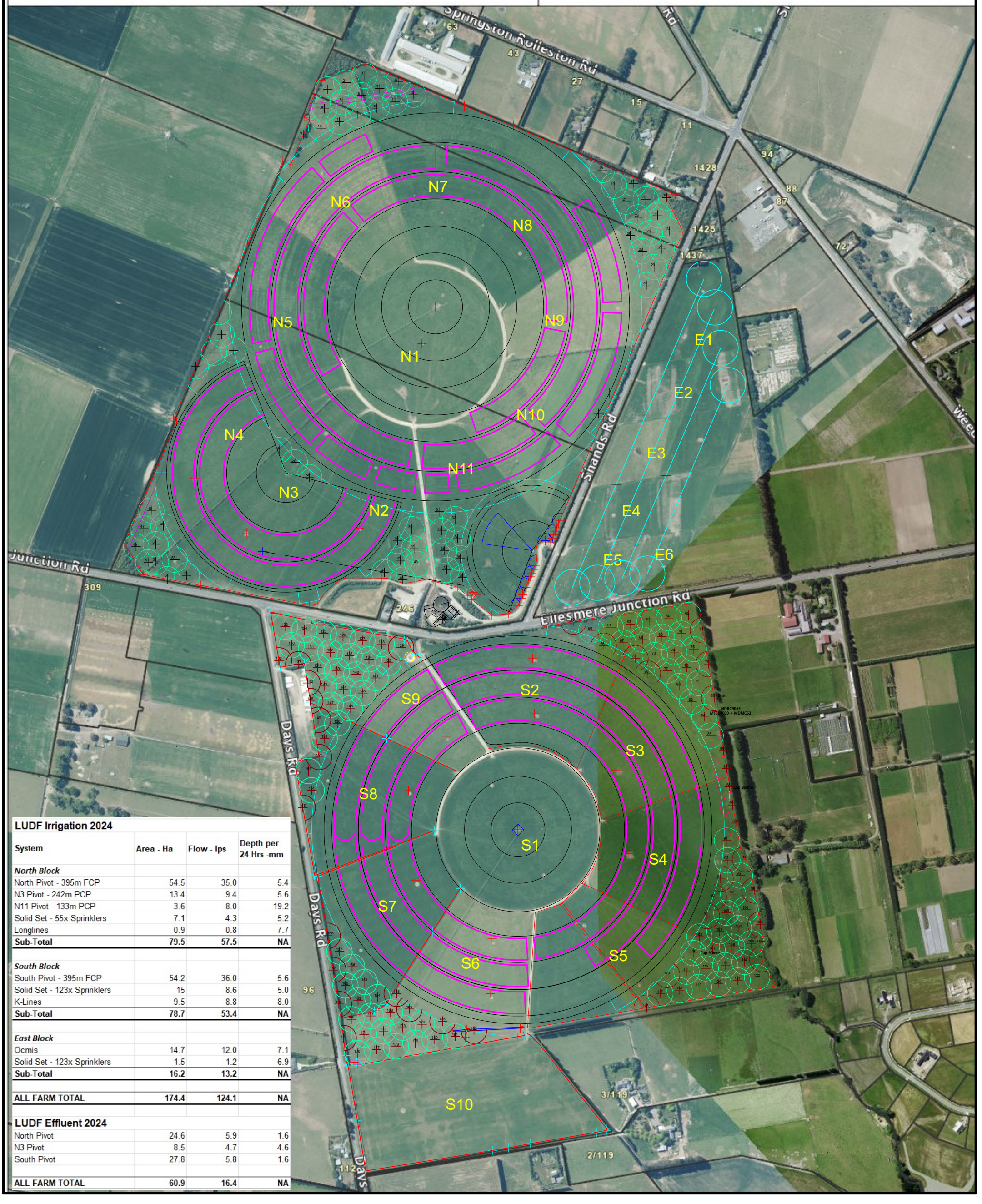
IRRIGATION DESIGN ACCREDITED

N

0 0.1 0.2 0.3 0.4 Kilometres

Scale: 1:7,000 @A3

Map Created by Canterbury Maps on 30/03/2022 at 8:51 AM

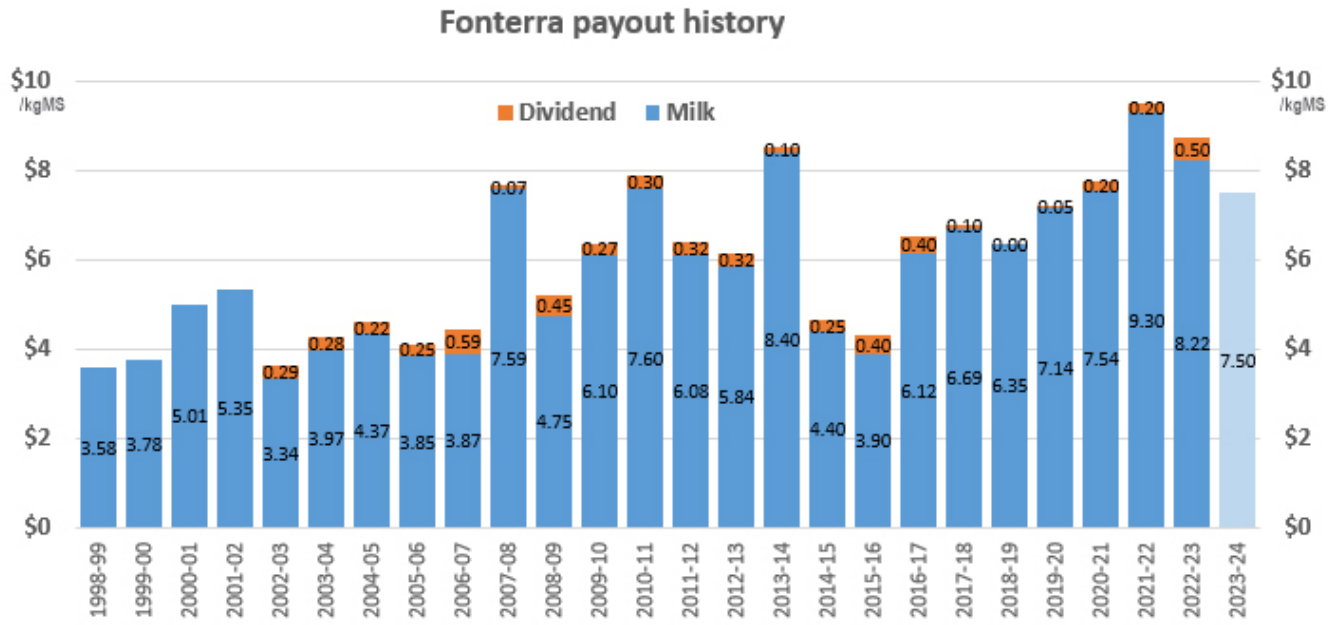


LUDF Irrigation 2024			
System	**Area - Ha**	**Flow - lps**	**Depth per 24 Hrs -mm**
North Block			
North Pivot - 395m FCP	54.5	35.0	5.4
N3 Pivot - 242m PCP	13.4	9.4	5.6
N11 Pivot - 133m PCP	3.6	8.0	19.2
Solid Set - 55x Sprinklers	7.1	4.3	5.2
Longlines	0.9	0.8	7.7
Sub-Total	**79.5**	**57.5**	**NA**
South Block			
South Pivot - 395m FCP	54.2	36.0	5.6
Solid Set - 123x Sprinklers	15	8.6	5.0
K-Lines	9.5	8.8	8.0
Sub-Total	**78.7**	**53.4**	**NA**
East Block			
Ocmis	14.7	12.0	7.1
Solid Set - 123x Sprinklers	1.5	1.2	6.9
Sub-Total	**16.2**	**13.2**	**NA**
ALL FARM TOTAL	**174.4**	**124.1**	**NA**

LUDF Effluent 2024			
North Pivot	24.6	5.9	1.6
N3 Pivot	8.5	4.7	4.6
South Pivot	27.8	5.8	1.6
ALL FARM TOTAL	**60.9**	**16.4**	**NA**

Financials

- 2023/24 budget at 264,479 kg MS at $7.50/kg MS.
- 2023/24 budgeted FWE is $5.69/kg MS compared to 2022/23 of $5.46/kg MS.
- STD FWE is $7.32/kg MS or $3.91/kg MS over budgeted production.
- Forecasted EBIT is $2.58/kg MS; compared to $3.51/kg MS for 2022/23.
- Forecasted EBIT/ha is $4,163.65/ha compared to $5,324.46/ha for 2022/23.
- Season to date variances:
  - Breeding – synchronized heifers (decision made prior to mating – unbudgeted)
  - Dairy Shed – inventory on hand – timing.
  - Feed made/purchased – under budget but still forecasted to be on budget.
  - Winter grazing and youngstock grazing – adjustment due to time and final numbers.
  - Calf rearing – additional calves reared.
  - Fertiliser – price decrease.
- To do: set farm plan and budget for 2024/25.
- 2024/25 budgeted milk price - $7.50/kg MS.



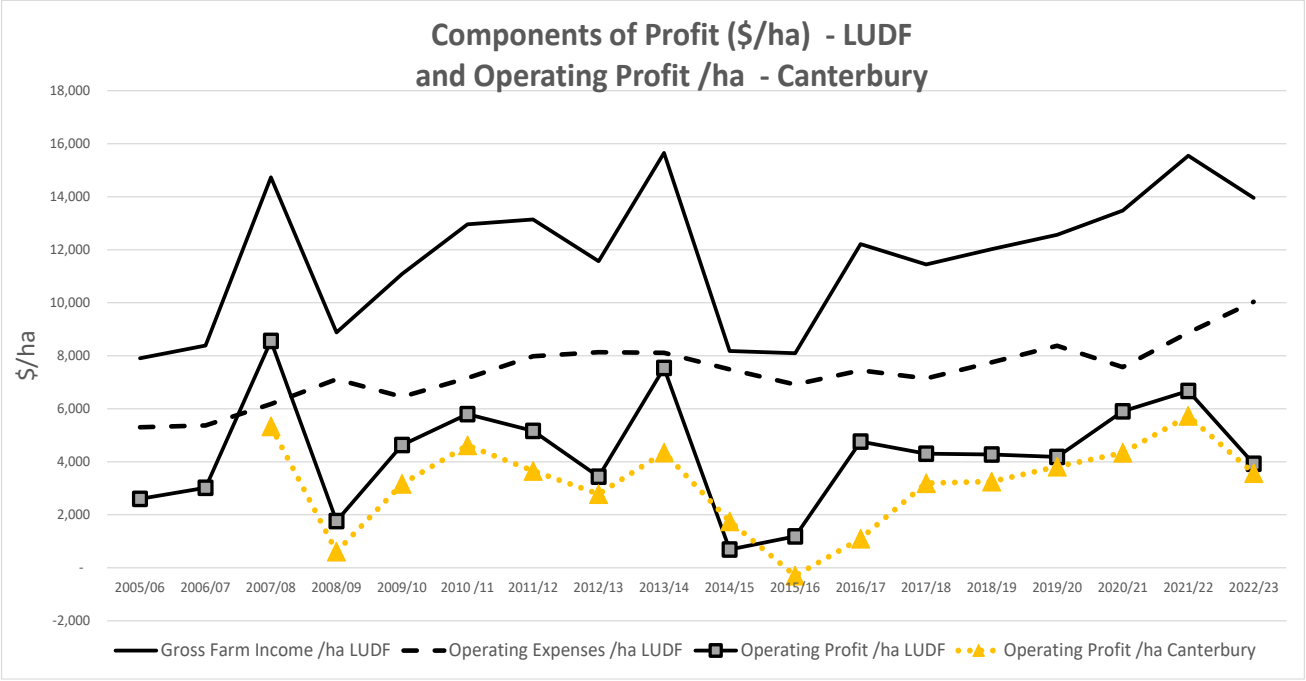
LUDF Financial Analysis - June to December

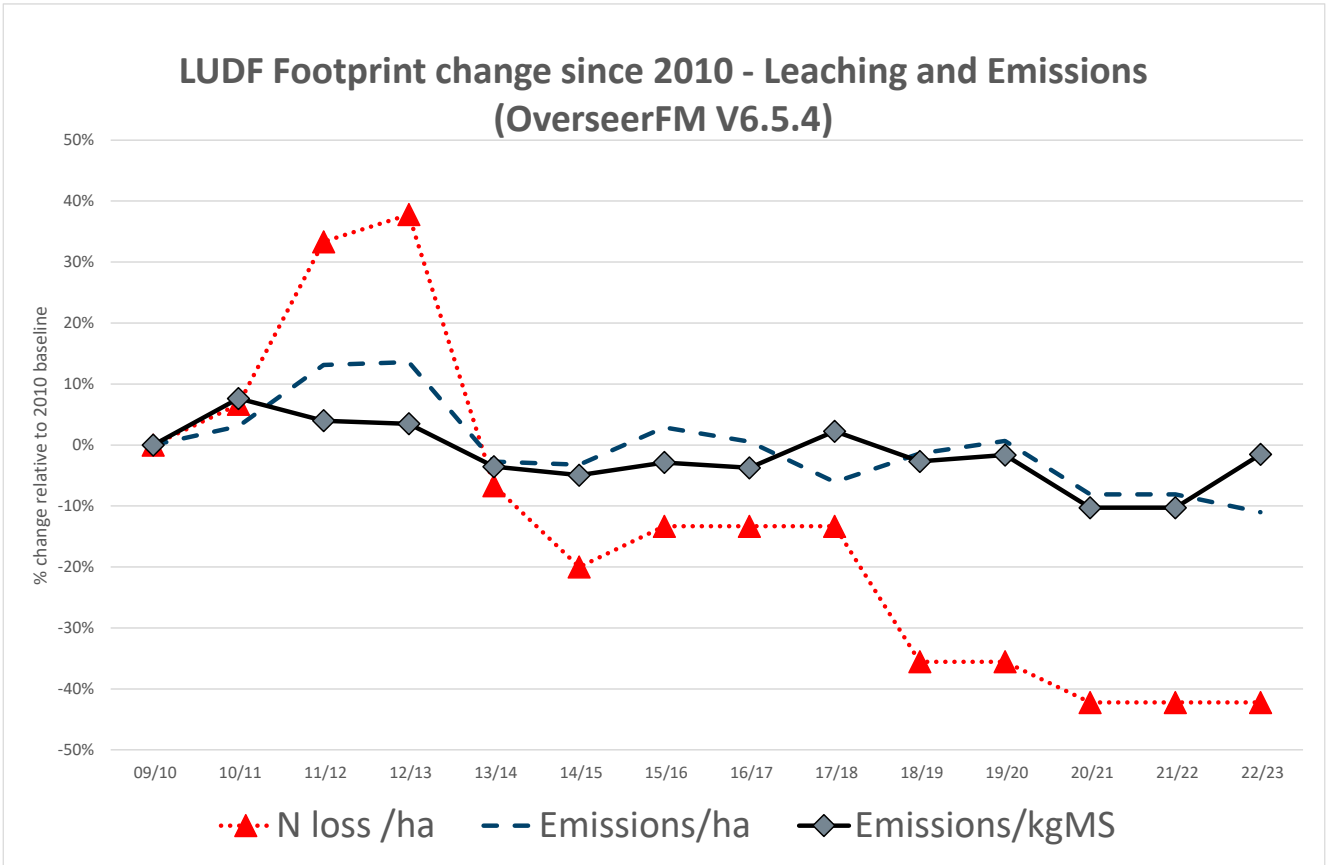
STD Comparison Actual to Budget and 2022/23 (Actual) & 23/24 (Budget)

Actual 2022/23		Budget 2023/24		Description	STD Actual 2023/24		STD Budget 2023/24		STD Variance
$/kg MS	$	$/kg MS	$		$/kg MS	$	$/kg MS	$	$
247,921		264,479		Milk Production kgMS	141,195		140,468		727
$8.20		$7.80		Milk Price kgMS	$7.80		$7.80		
				Income					
0.05	12,288	0.04	9,321	Sales - Bobby Calves	0.07	9,321	0.07	9,321	0
0.02	4,294			Sales - R2 Heifers					
				Sales - Steers					
0.49	121,896	0.47	123,709	Sales - Cows	0.07	9,847	0.08	11,694	-1,847
		0.06	16,000	Sales - Bulls					
0.14	35,000	0.15	38,500	Sales - Calf Sales	0.31	43,306	0.27	38,500	4,806
0.70	**173,478**	**0.71**	**187,530**	**Total Stock Sales**	**0.44**	**62,474**	**0.42**	**59,515**	**2,959**
				Sales - Feed, Silage, Other Crops					
8.20	2,032,952	7.80	2,062,936	Sales - Milk Solids Current Season	7.80	1,101,320	7.80	1,095,650	5,670
				Income - Rent					
				Income - Other					
8.90	**2,206,430**	**8.51**	**2,250,467**	**TOTAL REVENUE**	8.24	**1,163,794**	8.22	**1,155,165**	**8,629**
				Expenses					
0.93	231,009	0.93	246,065	Labour - Perm & Fixed Term	1.12	158,628	1.11	155,429	-3,199
0.03	8,316	0.02	6,607	Other labour: ACC, Super, H&S, Clothing	0.05	7,551	0.01	1,680	-5,871
0.97	**239,325**	**0.96**	**252,672**	**Total Labour Expenses**	**1.18**	**166,179**	**1.12**	**157,109**	**-9,070**
0.31	76,429	0.33	86,955	Animal Health	0.38	53,406	0.41	57,528	4,122
0.26	63,643	0.20	53,321	Breeding	0.39	55,321	0.30	41,456	-13,865
0.03	8,053	0.06	15,080	Dairy Shed Operating Expenses	0.02	2,995	0.05	7,500	4,505
0.11	27,056	0.08	22,102	Electricity - Other	0.09	12,068	0.10	14,000	1,932
0.79	196,420	0.89	236,026	Feed Made/Purchased	1.15	161,689	1.61	226,101	64,412
0.67	166,021	0.67	178,000	Grazing - Winter	1.21	170,593	1.14	160,000	-10,593
0.47	115,321	0.47	125,000	Youngstock Grazing	0.47	66,043	0.50	70,000	3,957
0.23	57,899	0.23	60,000	Calf Rearing	0.34	47,834	0.39	55,000	7,166
0.39	96,685	0.29	77,000	Fertiliser -Nitrogen	0.32	45,071	0.34	48,000	2,929
0.17	42,980	0.13	34,176	Fertiliser - Other	0.22	30,700	0.24	34,000	3,300
0.09	23,171	0.07	18,000	Fertiliser - Spreading	0.09	12,478	0.09	13,176	698
0.16	39,456	0.16	41,046	Electricity - Irrigation	0.21	28,996	0.19	27,000	-1,996
0.00		0.04	10,583	Seed	0.08	10,609	0.07	10,000	-609
0.18	45,325	0.08	21,428	Contractors - Cropping	0.10	14,668	0.10	14,000	-668
0.01	1,463	0.04	11,673	Weed & Pest Control	0.00	697	0.01	2,000	1,303
0.05	11,596	0.07	17,362	Vehicle Expenses	0.08	10,873	0.08	11,000	127
0.05	12,477	0.06	16,000	Vehicle - Fuel	0.08	11,453	0.08	11,000	-453
0.07	17,868	0.11	30,000	R&M - Land & Buildings	0.13	18,524	0.18	25,000	6,476
0.06	15,797	0.14	38,000	R & M - Irrigation	0.11	15,554	0.23	33,000	17,446
0.13	32,846	0.35	91,577	R & M - Plant, Machinery, Other	0.36	50,263	0.43	60,000	9,737
		0.01	3,688	R & M - Farm Houses	0.02	2,429	0.01	2,000	-429
0.06	14,685	0.06	15,008	Freight	0.10	13,928	0.10	14,000	72
				EcoPond	0.01	833			-833
0.05	13,135	0.05	13,170	Administration	0.05	7,183	0.05	7,000	-183
0.04	9,953	0.05	12,931	Fixed Charges - Rates	0.05	7,643	0.04	5,035	-2,608
0.04	9,600	0.03	7,800	Fixed Charges - Land Rent	0.04	5,600	0.04	5,300	-300
0.07	17,310	0.06	16,340	Milk Levy as above deducted	0.07	9,884	0.06	9,082	-802
5.46	**1,354,515**	**5.69**	**1,504,939**	**TOTAL FARM WORKING EXPENSES**	**7.32**	**1,033,514**	**7.97**	**1,119,287**	**85,773**
3.44	**851,915**	**2.82**	**745,527**	**CONTRIBUTION PROFIT**	**0.92**	**130,280**	**0.26**	**35,878**	**94,402**
0.07	19,600	0.07	19,600	East Block Adjustment	0.08	11,433	0.08	11,433	0.00
	1,374,115	**5.76**	**1,524,539**	**Total Operating Expeneses inc East Block**	**7.40**	**1,044,948**	**8.01**	**1,130,720**	**85,773**
				Financial Ratios					
$8.20	$2,032,951	$7.80	$2,062,936	Milk Gross income	$7.80	$1,101,320	$7.80	$1,095,650	
$0.66	$173,478	$0.71	$187,530	Stock Gross income	$0.24	$62,474	$0.23	$59,515	
$8.34	$2,206,429	$8.51	$2,250,467	Total Gross income	$4.40	$1,163,794	$4.37	$1,155,165	
$5.54	$1,374,115	$5.76	$1,524,539	*Less* Farm Operating Expenditure	$7.40	$1,044,948	$8.05	$1,130,720	
$3.44	**$832,314**	**$2.82**	**$725,927**	**EBIT**	**$0.92**	**$118,847**	**$0.26**	**$24,445**	
	$5,201.96		**$4,537.05**	**EBIT/ha**		**$742.79**		**$152.78**	

LUDF – ENVIRONMENTAL JOURNEY (Virginia Serra)

- LUDF was converted to Dairy in 2001 from the Lincoln University sheep farm.
- In the early days LUDF led the way in applying and demonstrating relevant and well-researched principles of profitable pastoral dairy to irrigated Canterbury systems.
- Later with the increase of environmental pressures the farm has led the way demonstrating low footprint/high profit systems.





Performance Overview

	Average for the Period		
	2003/04 to 2009/10	2010/11 to 2013/14	2014/15 to 2022/23
Kg liveweight /ha	1,978	1,901	1,709
Cows/ha	4.1	4.0	3.5
kg Milksolids /ha	1,711	1,778	1,701
kg Milksolids /cow	413	445	492
Imported suppl. eaten (kg DM/cow)	306	445	295
Imported suppl. eaten (T DM/ha	1.27	1.78	1.02
Winter Grazing (T DM/ha)	2.24	3.23	2.91
Pasture & Crop Eaten (TDM/ha)	18.1	16.5	15.7
Kg N fert per ha	192	300	166
PNS (Kg N/ha)	109	227	77

Stage 1: The original System 2003-2004 to 2009/2010

The farm achieved consistently high performance following well-researched principles of successful pastoral dairy. It was a simple system including:

- One herd - 24-hour grazing
- Low and consistent residuals. No pre-grazing mowing
- Focus on simple and replicable systems
- Cows were off the milking platform over winter as well as young stock
- Silage was cut proactively to control any surpluses and protect pasture quality
- N fertiliser was applied after each grazing with clear decision rules
- No induction policy from the start before it was compulsory to do so.

Stage 2: High Input/High Output system (2010/2011 to 2014/2015)

- The profitability comparison of LUDF with highly profitable farms prompted changes to the system.
- Higher production per cow with higher N fertiliser and imported supplements
- Higher N fertiliser used to compensate for less Clover N (Clover root weevil Impact)
- Stronger focus on young stock management and cow condition throughout the season.
- Regulation on the environmental impact of dairy in Canterbury started
- In the 2013/14 season cows dried off in early autumn with a significant impact in profit ($84,000) to avoid going over the N leaching baseline
- Suspension of Eco-N (DCD) impacted on N loss from this higher input system.

Stage 3: Nil-infrastructure/low- input system (2015/2016 to now)

- Increased focus on reducing the environmental footprint of the farm prompted the next set of changes
- Pastoral 21 research programme: low input highly efficient system was implemented
- Lower stocking rate, lower Nitrogen fertiliser and less Imported supplements.
- Targeting higher production per cow with an Increased focus on feeding cows the required energy every day.
- Better quality herd – allowed by the extra culling
- Pre and post-grazing mowing to maintain pasture quality used. LUDF now mows post grazing only
- Split herd to preferentially feed young/light animals. Back to one herd now with 10-in-7 milking.
- More recent changes of this period include the incorporation of plantain, improvements in irrigation, 10/7 milking, an increase in effluent area and Ecopond.
- The next set of environmental considerations will include a focus on reducing GHG emissions further.

Supporting Efficiency gains to improve emissions

Why it matters

New Zealand farmers have been proud leaders in sustainability for generations, and we want to continue to maintain that leadership position.

Access to markets and customers

At current momentum, ~30% of Fonterra's 2030 business-to-business gross margin will come from sustainability-focused customers.

Access to future funding

Banks, insurers and financial institutes are beginning to request details on the steps the Co-op is taking to reduce its emissions footprint. This means both the Co-operative's and farmers' access to funding will likely include emissions targets.

Increased legal and reporting obligations

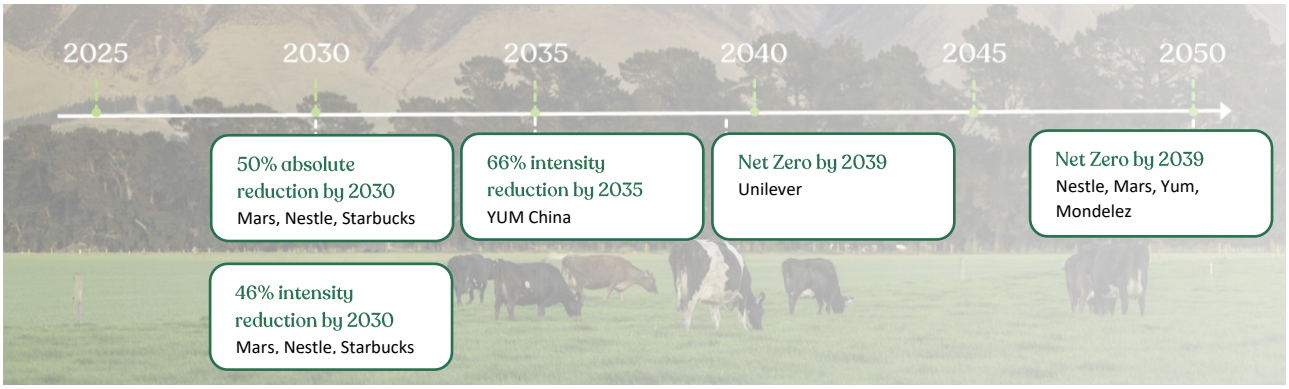
In 2024, Fonterra will be one of 200 businesses in New Zealand required to disclose climate risks and opportunities, performance and status on climate-related metrics and targets against new mandatory Climate Standards issued by the External Reporting Board (XRB).

Our strategic choice to be a leader in sustainability

In 2021, Fonterra identified three strategic choices for its long term strategy: to focus on New Zealand milk, to be a leader in sustainability, and to be a leader in dairy science and innovation.
We have also lifted our existing 2030 Scope 1 and 2 target ambition from 30% absolute reduction to 50% absolute reduction from a 2018 baseline

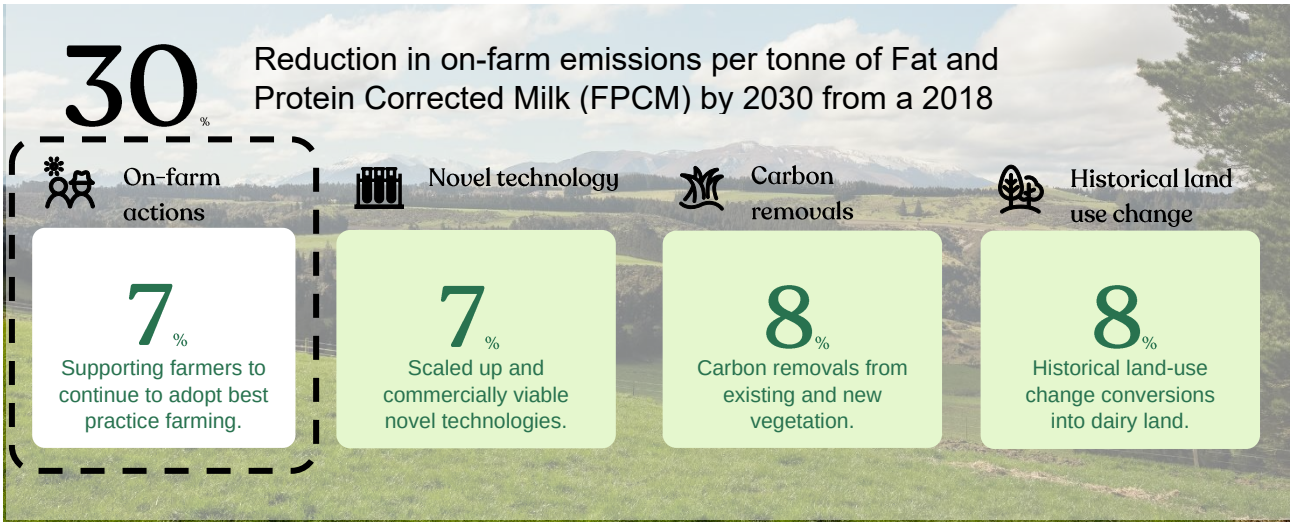
Our customer ambitions

In many cases customers are looking to Fonterra to help with meeting their targets by having a clear emissions reduction plan. By leveraging our existing low GHG emissions footprint and accelerating our emissions approach to meet these expectations, we can remain competitive relative to other dairy producers.
These businesses have their own emissions reductions targets through to 2050 to achieve reductions in the short term, and some are targeting Net Zero emissions by 2050



Our emissions reduction pathway

The emissions intensity reduction we're looking to achieve will partly be realised as a result of efficiency gains on-farm and is a collective target across the Co-op.
We see a pathway based on a Co-op wide approach to deliver against this target that is credible and meets the needs of our customers and consumers.



LUDF Emissions and efficiency

Consistently in the best 10% of farms in the region for emission/kgMS

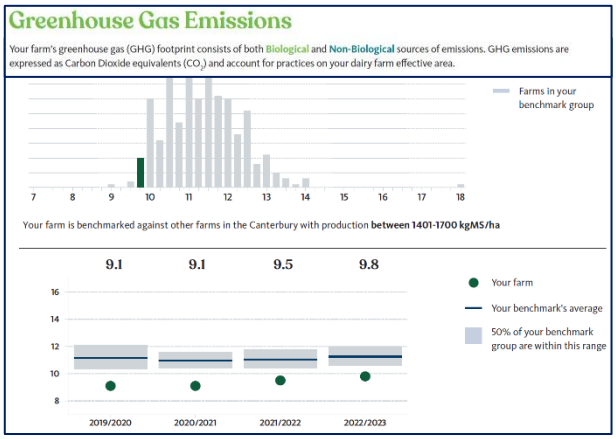
2022-23 milk production decrease has caused emissions/kgMS to increase by around 10%.

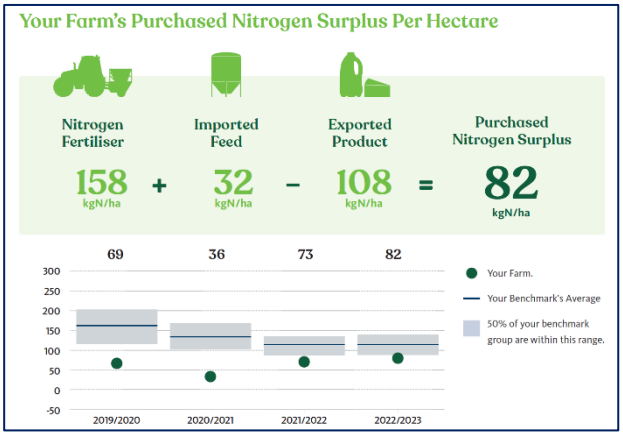
LUDF GHG Emissions

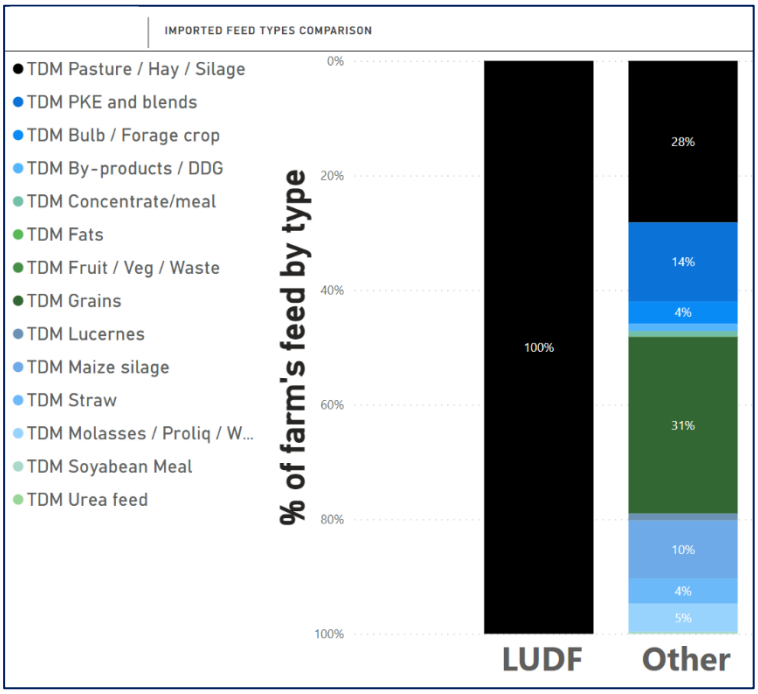
The embedded emissions from supplementary feed at LUDF are around 85% lower than the region

Nitrogen fertiliser efficiency on the farm has decreased slightly. Still in the leading group, but closer to the majority.

Relative performance of LUDF to a Canterbury production cohort:
GHG emissions/kgMS (Left), Insights Report p10, **Purchased Nitrogen Surplus** (Right) Insights report

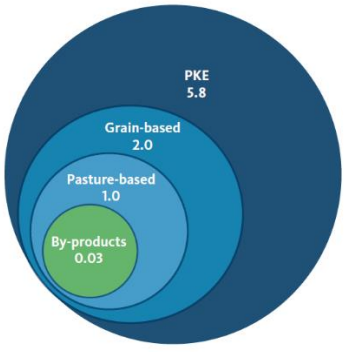






Imported Supplement types (left)

LUDF compared to other system 4 properties in the central Canterbury region. Embedded Emissions vary by supplement type, so for the same Tonnes imported there can be a large variance in the quantity of emissions added to the farm footprint.



On-farm changes, and potential gains available.

Looking at the LUDF ambition to improve production in the 10-in-7 milking frequency closer to previous levels, we have estimated the potential emissions gains that may occur for the farm.

LUDF	22-23 season	Initial Gains
Peak Number Cows	**547**	**547**
Production kgMS	**247,291**	**262,443**
kgMS/cow	**452**	**480**
kgMS/ha	**1546**	**1640**
kgs N/ha/year	**158**	**142**
% Change, CO2e/kgMS		**-4.3%**
% Change, total emissions		+1.6%

From the Farm Insights report, if the farm could further improve the in-calf rate while diminishing some animal health metrics there is 9kgMS/cow available from improved animal performance.

With more usual-for-Canterbury climatic conditions this season and by lifting home grown feed eaten/ha by 0.5TDM/ha there is potential to offer enough feed to the herd for a further 18kgMS/cow per season.

Reducing Nitrogen applied to levels at an average between the 20-21 and 21-22 season would also offer emissions decrease to the farm.

The next outcome is a 4.3% decrease in emissions intensity CO2e/kgMS, and a smaller increase in total emissions, from the increase in total feed eaten/ha.

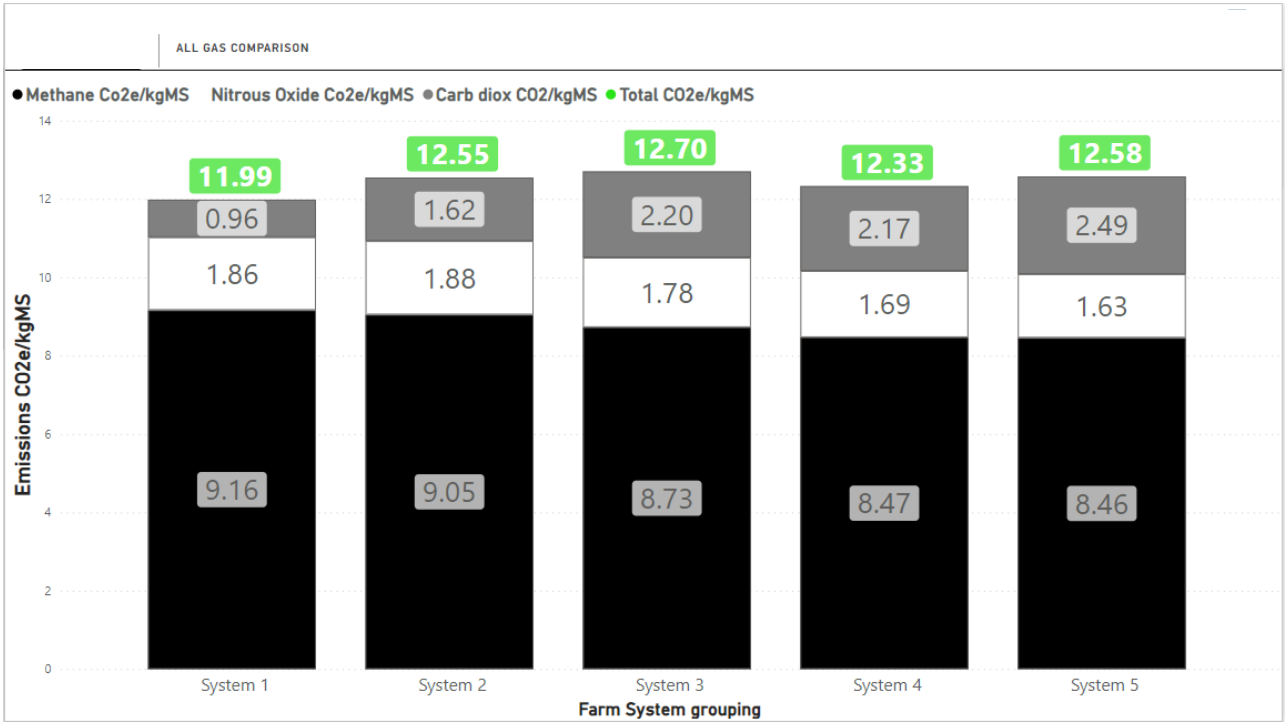
For no more inputs, there is potential for 15,000kgMS to be produced, alongside some other favourable changes in expenditure.

Opportunities to improve	On-farm improvement	Increase in production	Change in emissions
Improve 6 week in calf rate	75 --> 78%	2.0 kgMS/cow	-0.3%
Reduced Bulk Milk SCC	142K --> 100K	4.5 kgMS/cow	-6.0%
Fewer Mastitis cases	50% fewer cases	0.5 kgMS/cow	-0.1%
Fewer lame cows	50% fewer cases	2.7 kgMS/cow	-0.4%
Increase homegrown feed eaten	+ 0.5TDM/ha eaten	18.0 kgMS/cow	-2.5%
Nitrogen applied -Kgs N/ha		**-16kg N/ha/year**	**-0.4%**
% Change, CO2e/kgMS			**-4.3%**

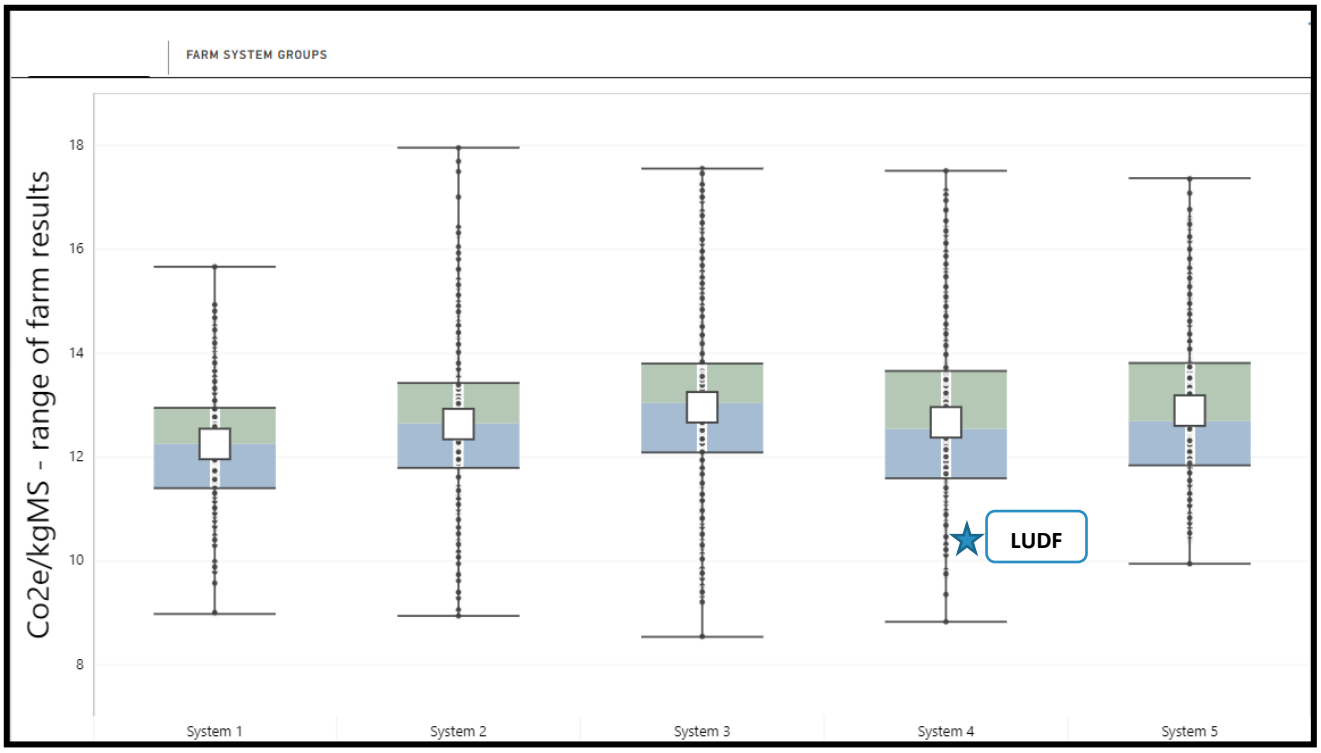
The emissions results shown use the AIM calculator methodology from 2021. This is designed as an indication of the likely size of change in a farm's footprint based on the simple input changes that have been made.
It is recommended that any farm follow up with a comprehensive feed budget and financial analysis on these scenario results to assess all potential farm system impacts.

Some emissions trends that have become apparent

GHG emissions/kgMS compared by DairyNZ Farm System type. More intensive systems dilute methane and nitrous oxide with increased production. This is largely offset by additional emissions imported with greater volumes of fertiliser and supplementary feed.



Within any system type (or region, milking frequency, breed etc) there is a very large range of individual farm emissions/kgMS results. This means there is no right or wrong system, and each farm is likely to have opportunities for efficiency gain within their current system.



Plantain as a nitrate leaching mitigation tool

Dr. Omar Al-Marashdeh, Senior lecturer, Lincoln University

Funding partners

Ministry for Primary Industries
Manatū Ahu Matua

DairyNZ

Fonterra
Dairy for life

PGG Wrightson Seeds

Delivery partners

agresearch
AGRICOM
Massey University
Manaaki Whenua Landcare Research
Lincoln Agritech
Lincoln University
Plant & Food Research

Why plantain?

Attractive option for dairy farmers to reduce their environmental footprint because:

- Does not require major changes in the farm system.
- Cheap mitigation tool compared to other strategies (i.e. does not require significant capital investment or infrastructure).
- Plantain is currently recognised as a nitrate leaching mitigation option by regional councils in Canterbury, Horizons, Southland and Bay of Plenty, where nitrate leaching limits are in place.

How it works?

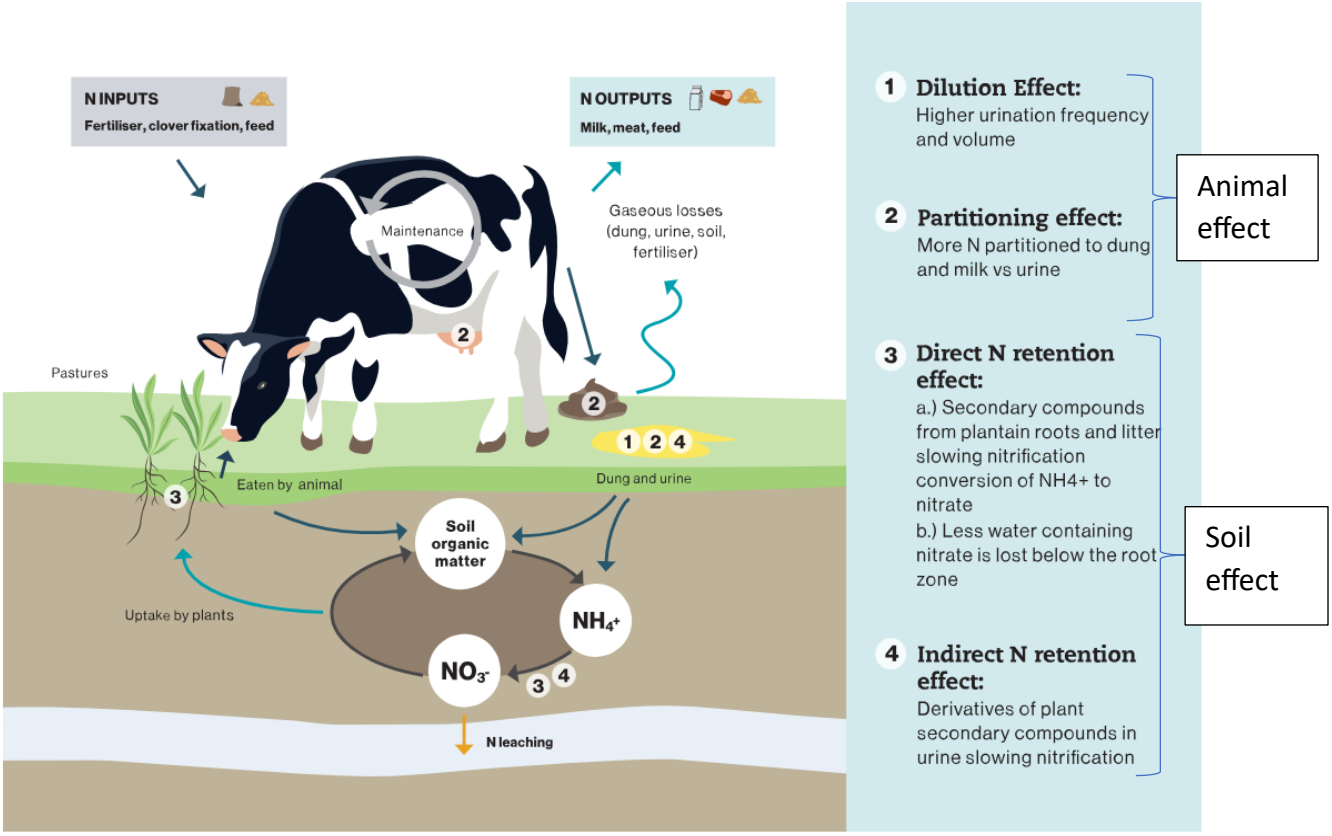


Figure 2. Nitrogen cycle and the four modes of action of Ecotain™ plantain.

Figure 1 https://www.dairynz.co.nz/feed/crops/plantain/environmental-benefits-of-plantain/

LURDF Farm system study

HERATH, H.M.G.P. et al. (2023), Journal of New Zealand Grasslands 85:321-329

Lincoln University Research Dairy Farm (LURDF) system study: effect of increasing level of plantain in pasture on dairy farm productivity and N leaching (*Plantain Potency and Practice project*).

- Nine herds of 12 cows were allocated into one of three pasture treatments:
    1. Mixed sward of perennial ryegrass-white clover without plantain
    2. Mixed sward of perennial ryegrass-white clover plus **med level of plantain** (aimed for 30% plantain in the sward DM)
    3. Mixed sward of perennial ryegrass-white clover plus **high level of plantain** (aimed for 50% plantain in the sward DM)
- Each herd has been managed individually on a farmlet consisting of 3.6 ha divided into twelve 0.3-ha paddocks.
- Pasture was established in March 2021, and study commenced at the start of 2021/22 production for 4 production seasons (2021/22 - 2024-25).
- Seed mixtures included: 18 kg Perennial RG, 2 kg WC and **3 kg Ecotain plantain** for MPL, 16 kg Perennial RG, 2 kg WC and **6 kg Ecotain plantain**.

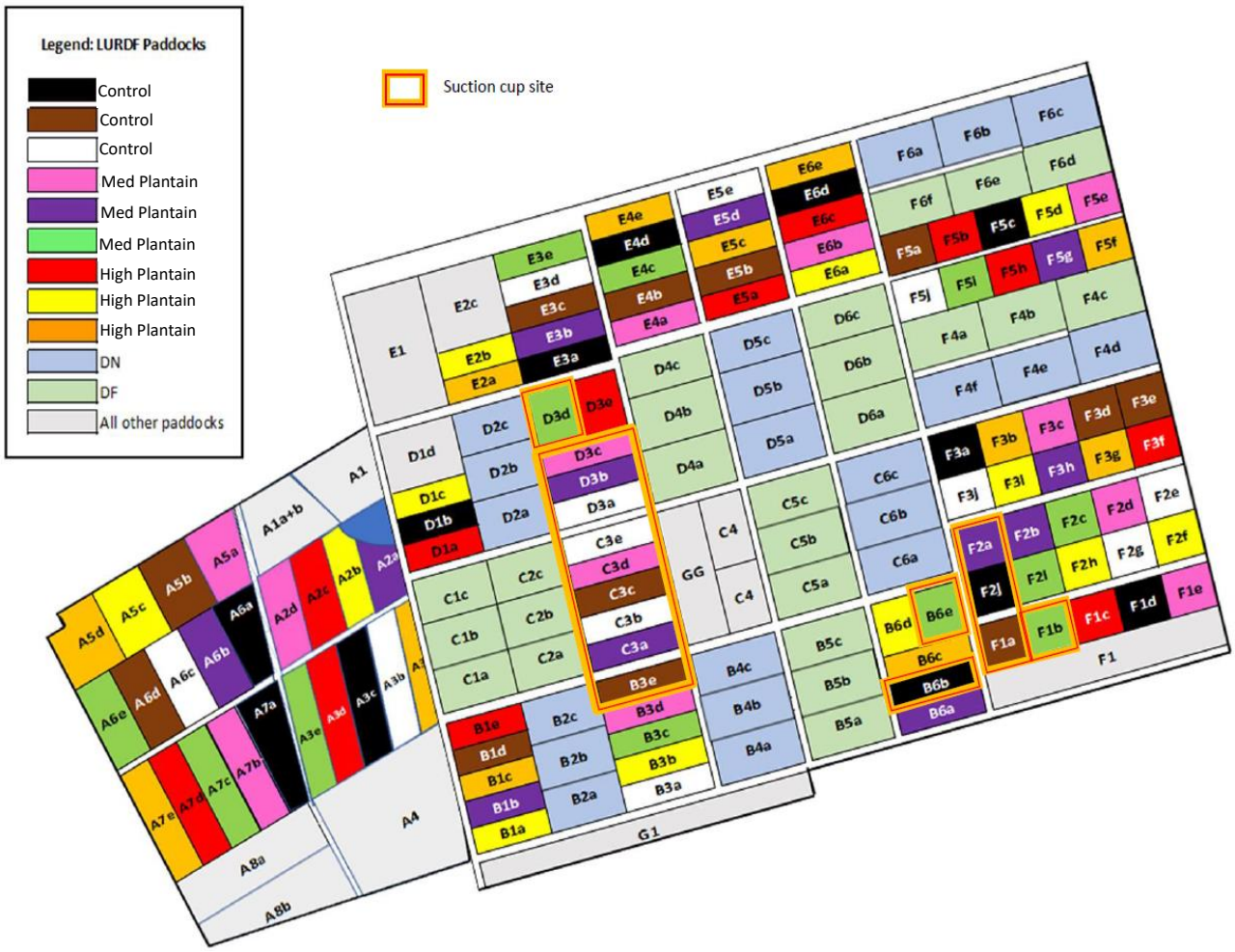


Figure 1 Lincoln University Research Dairy Farm (LUDRF) map

Table 1 Farm key performance measures (LURDF)

	2021/22			2022/23		
	Control	MPL	HPL	Control	MPL	HPL
Pasture grown (t DM/ha)	12.4	12.9	13.6	14.0[a]	14.2[a]	13.4[b]
Pasture conserved (t DM)	0.61	1.07	1.88	1.40	1.53	0.78
Silage offered to milkers (t DM)	1.99	1.95	1.95	4.7[a]	4.3[a]	6.0[b]
N applied (N kg/ha)	151	150	144	143	145	144
Days in milk	256	257	258	270	269	267
Milk solids (kg/cow)	410	401	410	471	449	451
Milk solids (kg/ha)	1,367	1,335	1,367	1570	1496	1503
Fat yield (kg/ha)	782	760	782	899	851	854
Protein yield (kg/ha)	584	575	585	671	645	649

MPL: med level plantain (aimed for 30% plantain in the sward DM)
HPL: high level plantain (aimed for 50% plantain in the sward DM)

LURDF Suction cup site (Lincoln Agritech)

- N leaching was measured in <u>two out of the three treatments</u> (Medium Plantain vs. Control) using a total of **<u>735</u>** <u>suction cups and</u> **<u>28</u>** <u>lysimeters</u>. Suction cups were installed in **23%** <u>of the pasture area</u> for each treatment.

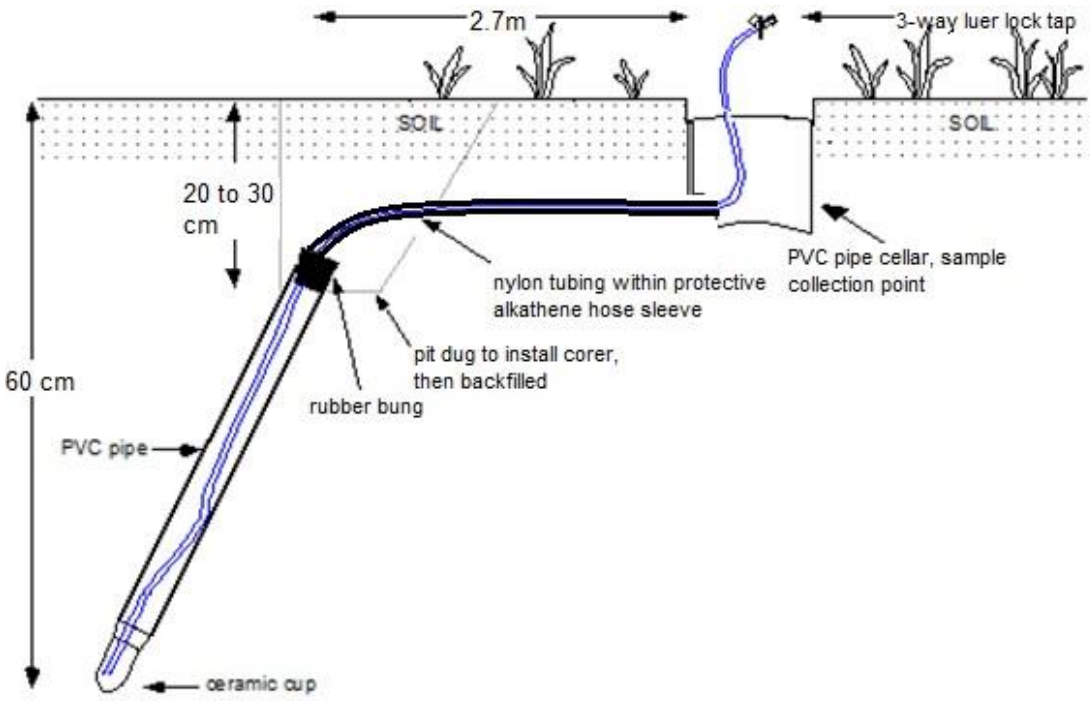


Figure 2. Installation of Suction cup

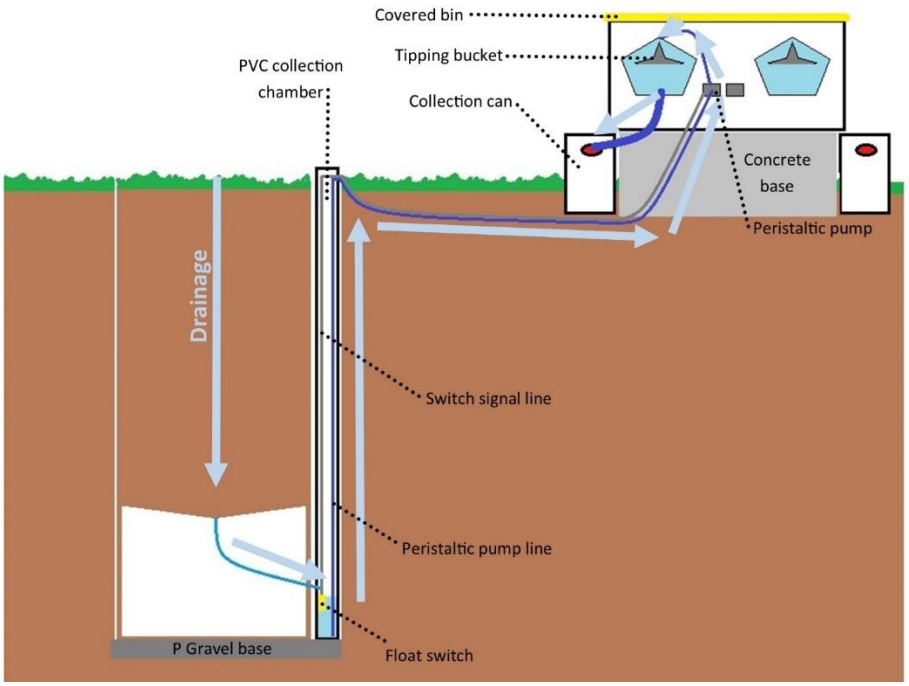
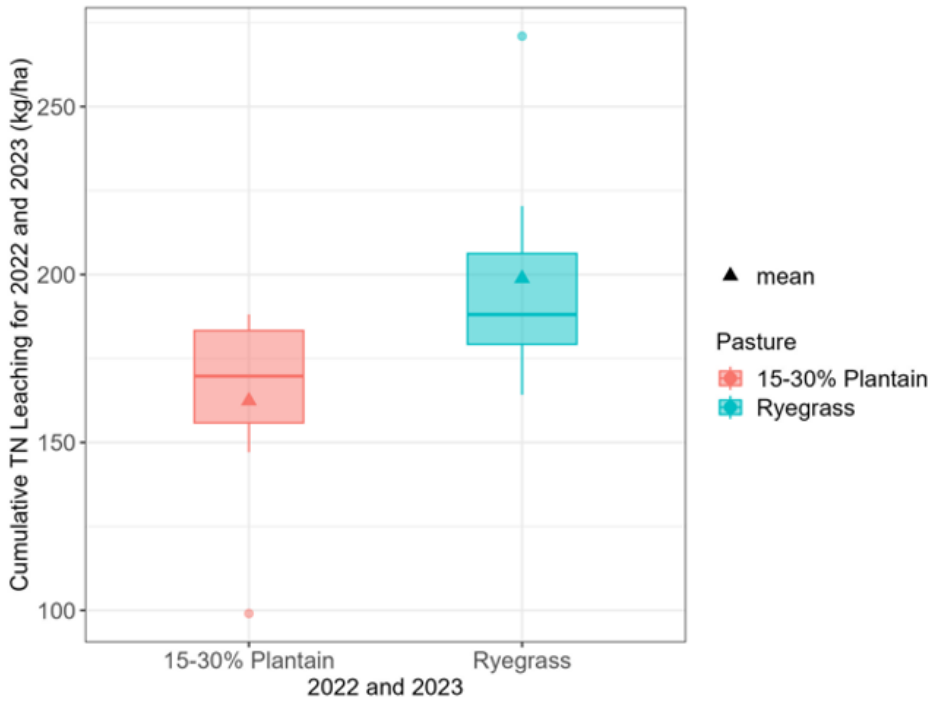


Figure 3. Lysimeter set up

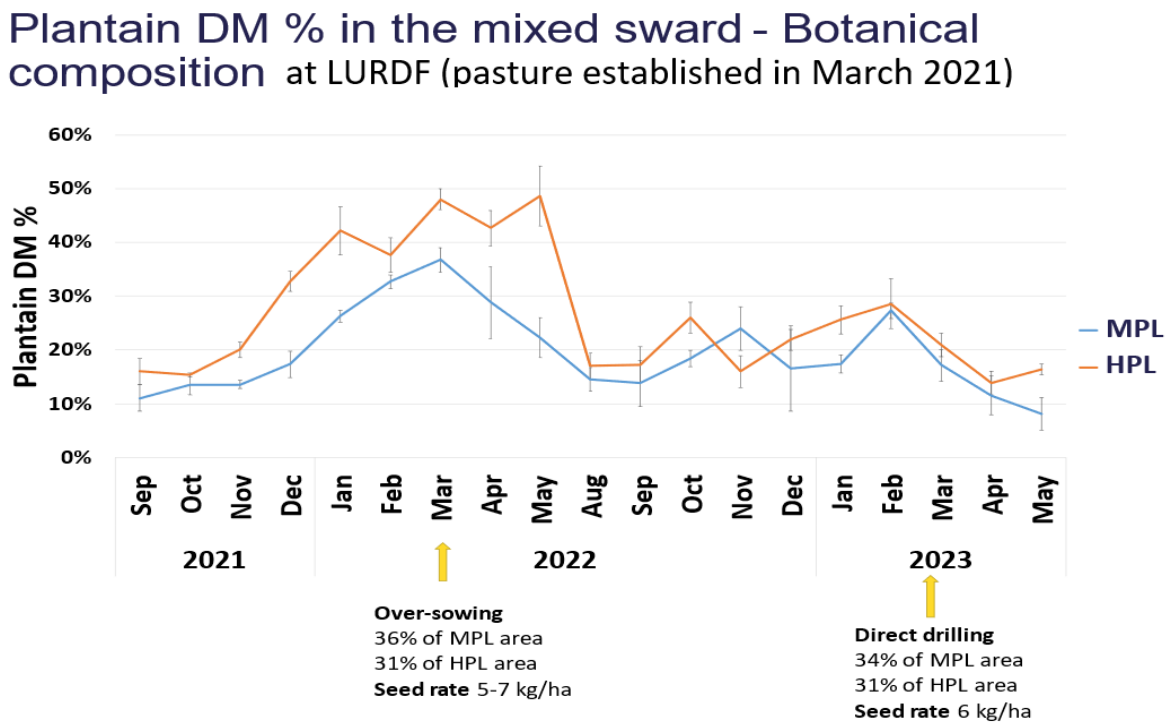
Total N leaching under Plnatain vs RGWC at LURDF

- Sward with 15%-30% pntain reduced total N leaching by 18% (P=0.037)
- Commulative total N leached dring 2022 & 2023



Plantain proportion in the mixed swards

- Botanical and visual assessment of plantain %. Visual assessment guid and recording template available via https://www.dairynz.co.nz/feed/crops/assessing-plantain/
- Plantain is a short-lived perennial herb.
- Under grazing condition, plantain content peaked at approximately **13-15** months after pasture establishment before it starts to decline.
- Plantain re-seeding should be considered to maintain plantain in the mixed pasture but associated with additional cost. For example, re-establishing plantain at 3 kg/ha seed rate would approximately cost **NZ $60 per ha via broadcasting**. Direct drilling should be more expensive.
- Establishment of plantain in existing pastures? Under irrigation, **direct drilling** is more effective than **broadcast sowing** (Bryant et al. 2019, JNZG 81: 131-138). More successful establishment in summer-dry environments.
- Similar **grazing managements** have been applied across pasture treatments at LURDF. Less is known on best management or whether it affects persistency of plantain.
- To manage plantain seed heads and overall pasture quality, **post grazing topping** was applied on some paddocks during summer.

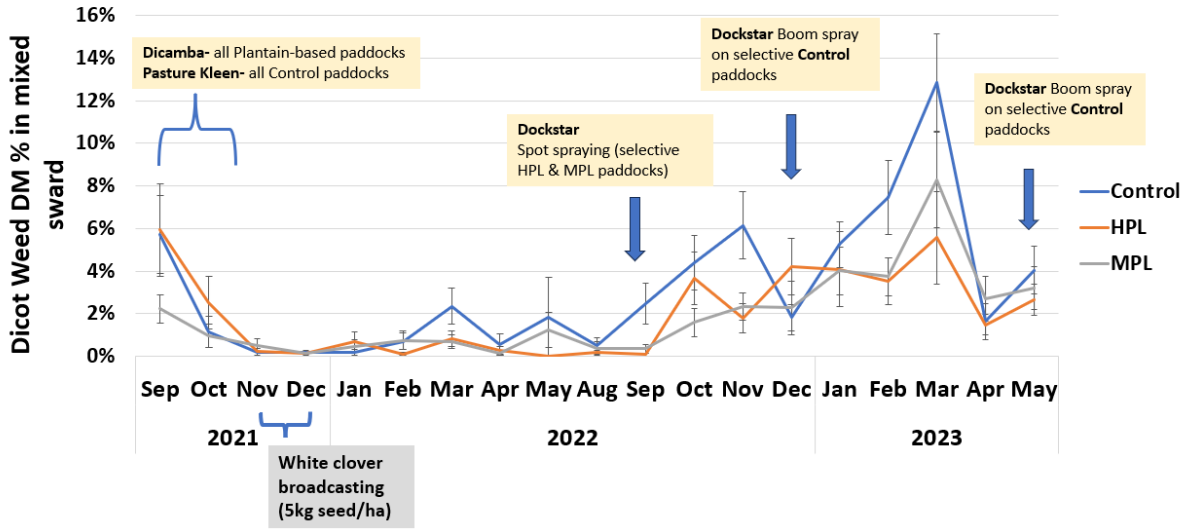


Weed management

- Plantain shares physiological and morphological characteristics with other dicot weed (e.g. dock), thus limited herbicide options are available.

Summary of pros and cons of some available herbicides used or discussed to be used on plantain-based pasture at LURDF.

Herbicide commercial name	Active ingredient	Pros	Cons
Kamba	Dimethylamine and Monomethylamine Salt	• Safe on plantain	• Kills clover • Effective only on seedling dock
Dictate	Bentazone as Sodium salt	• Is on label for plantain • Safe on clover	• Effective only on seedling weeds
Harmony	Thifensulfuron-Methyl	• Good control of dock	• Kills plantain • Prolonged plant back withholding
Dockstar	Asulam as Sodium salt	• Good control of dock • Safe on clover	• Kills plantain
T-Max	Aminopyralid as Triisopropylamine salt	• Safe on Plantain	• Kills clover • Prolonged plant back with-holding for clover
Dynamo	Flumetsulam and Bentazone as a soluble concentrate	• Is on label for plantain • Good general weed control • Safe on clover	• Can supress plantain



Effect of chemical herbicide applications on weed content in mixed pastures sown with an increasing plantain seed rate at LURDF: perennial ryegrass and white clover (RGWC) without plantain (**Control**); RGWC + 3 kg/ha plantain seed rate (**MPL**; medium PL) or RGWC + 6 kg/ha plantain seed rate (**HPL**; High PL).

Plantain and animal health

- Data suggest plantain pastures have lower facial eczema spores than ryegrass pastures.
- Caution with varying plantain intake during calving – potential metabolic risk.
- No consistent issues with grazing plantain among partner farmers. Looked for bloat, clostridial, metabolic.
- Lincoln monitoring – higher cadmium and copper in livers as expected. Not high enough for concern.
- Animals may drink less water with plantain – caution with inline dispensers.

Pivot on Plantain

Goal: To achieve 30% plantain in the diet; to achieve a 30% reduction in nitrate leaching.

To date:

- LUDF has incorporated plantain in the sward; established but has not persisted.
- LUDF has had pure plantain swards; and has had its challenges.

Pivot: In reviewing science around establishment, peak composition (and decline), establishment method and replenishment data. We have decided to relook at plantain in the sward.

We will look to explore how plantain performs at LUDF, with comparing:

- Establishment method (direct drill vs broadcast)
- Sowing date (autumn vs spring sowing)
- Heavy and light soils
- Replenishment period (every 1 or 2 years)

There will be a stop/go assessment at the end of 2024/25 season to ensure our composition is in line with research data at LURDF.

The plan:

Paddock	Area	Soil Type	Treatment	Year 1	Year 2
1	8	Light	DD/BC 24 Autumn	Y	Y
2	8	Light	DD/BC 24 Autumn	Y	
3	8	Light	DD/BC 24 Spring	Y	Y
4	8	Light	DD/BC 24 Spring	Y	
5	8	Heavy	DD/BC 24 Autumn	Y	Y
6	8	Heavy	DD/BC 24 Autumn	Y	
7	8	Heavy	DD/BC 24 Spring	Y	Y
8	8	Heavy	DD/BC 24 Spring	Y	
Treated	**64**	**ha**			
9	8		Renewal 24/25	Y	Y
10	8		Renewal 24/25		Y
11	8		Pure Sward 23/24		
12	8		Pure Sward 23/24		
13	8		Renewal 23/24	Y	Y
14	8		Renewal 23/24		Y
Treated	**48**	**ha**			

Costs:

Direct Drilling		
Drilling costs		$160/ha
Seed - superstrike Ecotain	$19.75/kg @ 3kgs/ha	$59.25/ha
Total		$219.25/ha
Broadcasting		
Seed - prillcoat Ecotain	$10.35/kg @ 6 kgs/ha	$62.10/ha
Total		$62.10/ha

N Leaching cost comparison:

LURDF Research	Max Plantain %	Average Plantain %	Cost/ha	Cost/ % plantain	Kg N/ha less leached	% N/ha leached	Cost per kg N/ha leached
Direct Drill	36	13	$219	$16.87	3	11.5%	$73.08
Broadcast	25	8.5	$62	$7.31	2	7.7%	$31.05

What does success look like?

- Establish and maintain plantain in the sward. Target remains at 30% composition; however, we will now define success of keeping a composition of 10%.
- Cost control – to find a cost effective strategy for LUDF to maintain plantain in the sward.

Thriving in the Face of Change and Uncertainty

Jack Cocks,[1] SIDDC field day – 14/2/2024

As farmers we face a huge amount of change and uncertainty – its part of being a farmer. The challenge is how we most effectively manage 'ourselves', to not just 'survive' through this change and uncertainty, but to 'thrive' in the face of it. My talk is in two parts:

1. What is our default 'unhelpful thinking style' when faced with change and uncertainty, and how do we counter that? and
2. How do we set ourselves up to 'thrive' in the face of change and uncertainty?

1. Countering our unhelpful thinking style

1. What do you think is your default unhelpful thinking style?

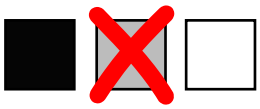
There are ten styles in the attached handout. My default unhelpful thinking style is to 'catastrophise'. What's yours?

2. What is a positive approach you could take to counter this unhelpful thinking style?

[1] I'm an Otago high country farmer. I regularly speaks to farmer, business, and student groups about farmer resilience and wellbeing. My interest in farmer wellbeing grew from a health challenge I faced and resulted in a Kellogg Rural Leadership Programme study. Ph: 021 776 375. Email: jackcnz@icloud.com

Unhelpful Thinking Styles

All or nothing thinking



Sometimes called 'black and white thinking'

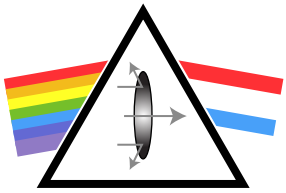
If I'm not perfect I have failed

Either I do it right or not at all

Over-generalising

Seeing a pattern based upon a single event, or being overly broad in the conclusions we draw

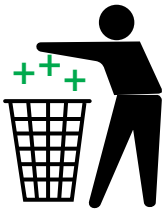
Mental filter



Only paying attention to certain types of evidence.

Noticing our failures but not seeing our successes

Disqualifying the positive



Discounting the good things that have happened or that you have done for some reason or another

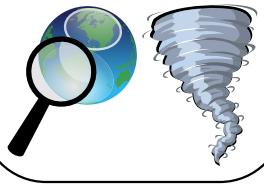
That doesn't count

Jumping to conclusions

There are two key types of jumping to conclusions:

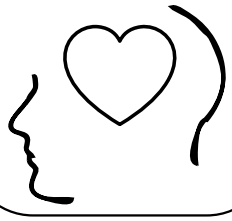
- **Mind reading** (imagining we know what others are thinking)
- **Fortune telling** (predicting the future)

Magnification (catastrophising) & minimisation



Blowing things out of proportion (catastrophising), or inappropriately shrinking something to make it seem less important

Emotional reasoning



Assuming that because we feel a certain way what we think must be true.

I feel embarrassed so I must be an idiot

should / must

Using critical words like 'should', 'must', or 'ought' can make us feel guilty, or like we have already failed

If we apply 'shoulds' to other people the result is often frustration

Labelling

Assigning labels to ourselves or other people

I'm a loser
I'm completely useless
They're such an idiot

Personalisation

"this is my fault"

Blaming yourself or taking responsibility for something that wasn't completely your fault. Conversely, blaming other people for something that was your fault.

2. Wellbeing – setting ourselves up to 'Thrive in the Face of Change and Uncertainty'

When you've been really well and happy with the direction of your life, what's been in your life? To me this is wellbeing, or 'mental fitness'. Farmstrong lists five ways to wellbeing as 'give', 'connect', 'learn', 'keep active', and 'notice the simple things'. This is based on international research on what people who 'thrive' have in their lives. For me, wellbeing is three things; 'connection with others', 'physical exercise', and 'mental stimulation'.

When you've been really well and happy with the direction of your life, what's been in your life?

FARMSTRONG
Live Well Farm Well

"Farming, like professional rugby, is a job with plenty of challenges and rewards. There's always ups-and-downs.

That's why you've got to look after yourself. Investing in your wellbeing means you will have some to draw on when you are under pressure. It will also make you healthier and more productive on the farm.

International research found that people who thrive had five things in common. The key is to lock them in as small, but regular improvements, so they become a habit.

The Five Ways to Wellbeing have made a huge difference to my life."

Sam Whitelock
Farmstrong Ambassador

Find out what works for you then lock it in.

"To farm well, you need to live well. That's where the Five Ways to Wellbeing come in. I've made these part of my life and I encourage you to do the same."

Sam Whitelock
Farmstrong Ambassador

farmstrong.co.nz

Founding Partners

Mental Health Foundation of New Zealand
mauri tū, mauri ora

FMG

Strategic Partner

ACC

INHD 07/19 FST0033

FARMSTRONG
Live Well Farm Well

Join me and lock in the **Five Ways to Wellbeing**

Sam Whitelock
FARMSTRONG
AMBASSADOR

CONNECT

1.

Making friends and spending time with your mates makes a big difference to how you feel. Even when life is busy, try and make it a priority. The rewards will be huge.

TAKE NOTICE

2.

Take notice of the small things in life that make you happy. Each day take a few extra moments to stop and appreciate the good things that are happening for you.

Give

3.

When you give to others, not only do they benefit, but it also makes you feel a lot happier. Consider ways you can give back to the people around you and don't forget about yourself too.

KEEP LEARNING

4.

Being curious and learning new things on or off the farm, will help you farm smarter. At whatever age learning new things, keeps your thinking open and flexible.

BE ACTIVE

5.

Keeping active is a great way to feel good. Working up a sweat releases endorphins that make you feel fresher and better able to cope with challenges.