Regen Trial Field Day

Dec 2022

Finding A Better Balance

Align Clareview Team:

Kiri Roberts – Farm Manager

Teddie Mallari

Paul Pangilinan

Kevin Gamboa

Ivy Mendez

Moses Peauafi

Align Office Team:

Rhys Roberts – CEO

Michael Mansour – CFO

Clare Buchanan – Head of Environment

Other Speakers:

Canaan Ahu – Soil Matters

Kate Foxcroft - VetEnt

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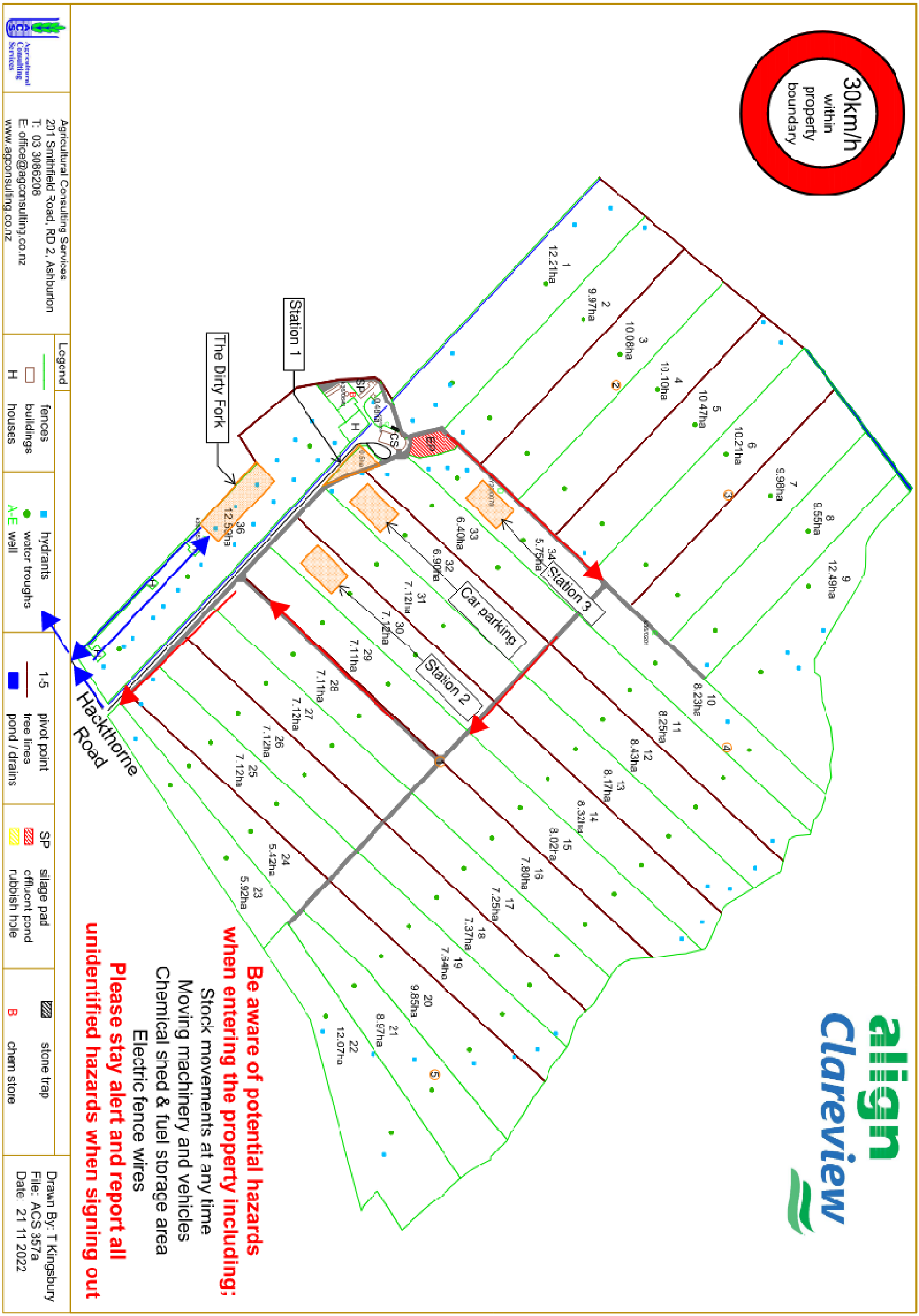
Hazards & Farm Map



About Align Farms

Align Farms was founded in 2012 with a vision to create a multi-generational, pasture to plate, food production business. Our Founding Partners, John Buchanan and Rob Cameron, had a clear goal in mind; finding a better balance for their staff, their farm, and their environment.

Today, Align has grown to 10 farms and a full-time team of 32. We're committed to seeking innovative ways to farm, and sharing what we find with farmers across New Zealand.

Vision: align with nature to produce nutrient-rich foods. So we can advance human health, improve environmental outcomes, and create a resilient, diverse, and productive environment for all to enjoy.

Values:

- **One Team:** From the boardroom to the paddock, our people make all the difference. We foster a culture of excellence and collaboration. We aim to be world-leading employers. We offer development opportunities, training, support, and flexible working. Because we believe better people make better farmers.

- **Responsible Stewards:** We're guardians of our animals, our land, and our environment. We engage with community stakeholders at every level, sharing our vision and plans for the future. We're also an active member of the community ourselves, involved in governance, volunteering, sponsorships and more.

- **Multi-Generational:** We take a long-term view – engaging not just today's generations, but tomorrow's too. We connect and work with farming families, both on-the-ground and with our extended team. So we can collaborate with past and future thinkers, and find ways to regenerate resources, not reduce them.

- **Innovation:** No. 8 wire, milking systems, and all-round Kiwi ingenuity. New Zealand farmers are known for innovation. Business success relies on actively disrupting, not waiting to be disrupted. So we challenge the status quo – harnessing the power of our people to ideate, prototype, and implement change.

About Align Clareview

Align Clareview was purchased in 2013 and it has been managed by Kiri Roberts ever since. At 292 ha effective area, it is the biggest dairy platform in the Align group and is located in Westerfield, 25 km from Ashburton. The farm has been split in half for the trial with two herds, designated paddocks, 2 milk vats, 2 budgets and 2 separate farm systems.

Shed:

80 Bail Rotary with cup removers & in-shed meal system

Irrigation:

5 Pivots covering 265 ha

Sprinklers in the corners covering 27 ha

Drawing from 3 groundwater wells

Effluent:

Spread underslung via the 3 largest pivots covering a 237 ha area

Climate

Average temp: 11.4 ˚C

Average rainfall: 731 mm/yr

Annual PET: 806 mm/yr

Soil Types:

Name	S Map ref:	Order	Drainage	Area (ha)
Rangitata	Rang_32a.1	Recent	Well	124.7
Mayfield	Mayf_2a.1	Pallic	Moderately Well	118.2
Wakanui	Paha_7a.1	Pallic	Imperfect	34.4
Lismore	Lism_1a.1	Brown	Well	5.5
Tempelton	Temp_2a.1	Pallic	Moderately Well	5.3
Riverbed	River_1a.1	Raw	Well	3.9

Staffing and Management

Clareview has a family team of 3 full time and 2 part time excluding management. They run a 6 on 2 off roster, cruisy weekends, and an average 6 day rostered hours of - Winter: 30hours, Calving: 50hours, Summer/Autumn: 40hours.

Herd details

Frisian cross herd, 194 BW 230 PW 445kg LW

What is Regen?

Regenerative Agriculture is any practice, process or management approach that enhances the functioning of the systems on which it relies. This includes core ecosystem cycles such as energy, water and minerals by enhancing biological function. It also includes improving economic and social systems. In other words, any practice that makes the land, community and bottom-line healthier year after year is regenerative. It is based on outcomes, distinguishing it from most sustainable/conservation agriculture efforts.

With its roots in the United States, regenerative agriculture is spreading around the world. It's a way of farming to achieve better soil and water quality, reduce nutrient loss, cut down carbon, and soften farming's environmental footprint.

Here at Align, we're committed to making our farms truly intergenerational businesses. This means finding new ways to operate as sustainably and responsibly as possible.

As regenerative farming's profile continued to rise throughout the New Zealand farming community, we saw the need for definitive data about this innovative approach. That's why we've embarked on a multi-year study of regenerative farming.

Using Align Clareview as our research field, we're collecting detailed data about regenerative farming's environmental, social, economic, and food quality impact. With this information, we aim to provide definitive answers to some of the biggest questions surrounding regenerative farming.

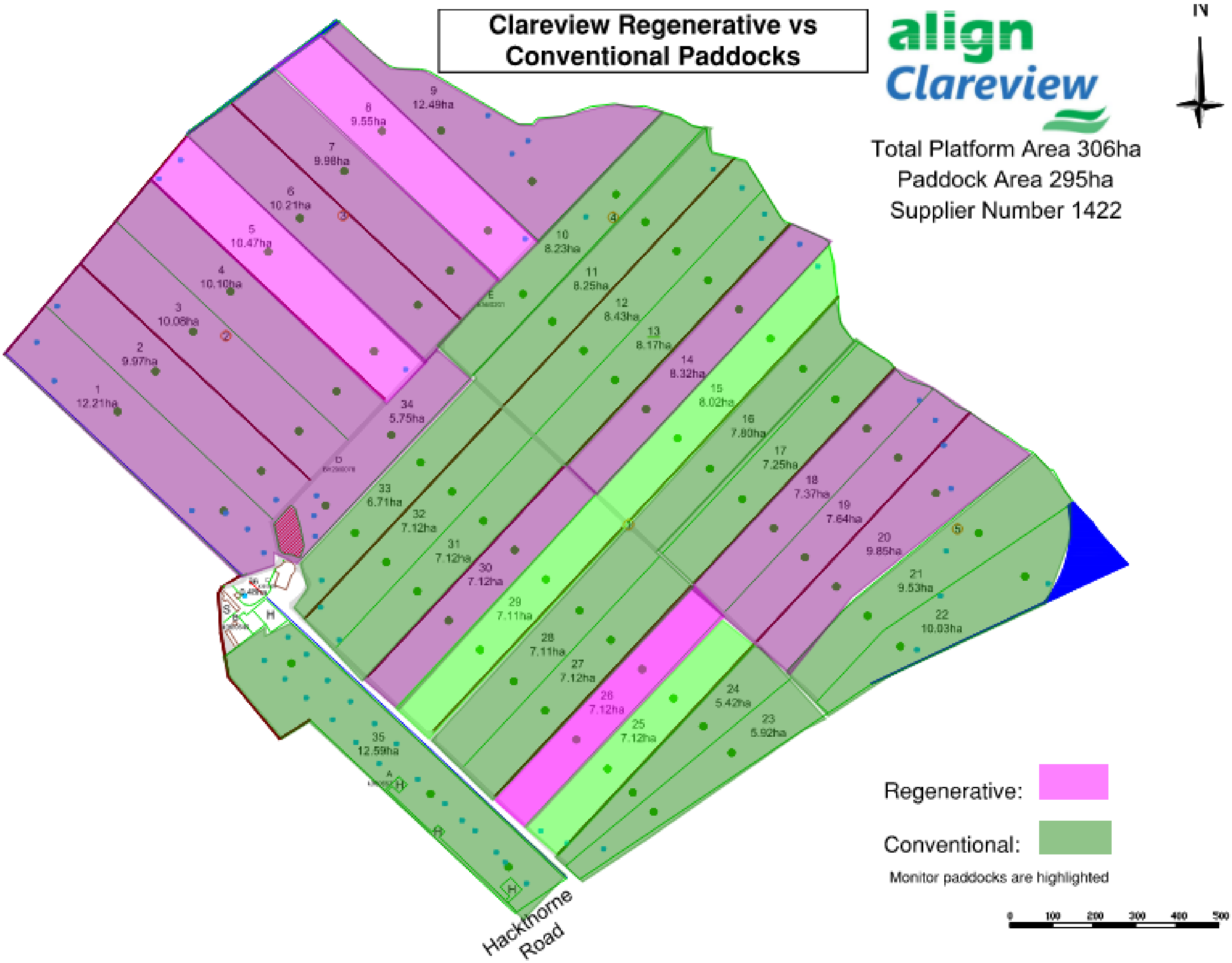
We want to safeguard the future of every Kiwi farm – not just our own. From definitive data to transparent financial figures, we look forward to sharing all our findings with the wider farming community. So we can make sure every farm can continue to provide for New Zealanders – and the world – for generations to come.

From https://regenerativeagriculturefoundation.org :

Regenerative Agriculture is:

- **Not a new idea.** While the use of the term has increased dramatically, the concept goes back millenia. It's a paradigm shift from an emphasis largely on production to recognizing multiple priorities for agriculture, and advancing those priorities by incorporating indigenous knowledge, modern research, adaptive learning, and a deep respect for farmer wisdom.
- **Difficult to define.** Regenerative Agriculture is not a well-delineated set of practices, a certified type of farming, or solely based on a series of metrics such as concentrations of soil organic carbon and water quality. It is better thought of as steps toward solving multiple crises.
- **Grounded in community.** Agriculture touches us in many ways besides the calories produced. Regenerative agriculture provides a framework for valuing those touchpoints.
- **A journey.** It moves us toward a world of plentiful food and fiber production, restored ecosystems, well-functioning water and carbon cycles, flourishing communities, and a just, equitable and thriving food economy.

Regen Paddock Layout & Species



Paddock 2, 7, 8: Timothy, Cocksfoot, Ryegrass, Prairie Grass, Meadow Fescue, Grazing Brome, Red Clover, White Clover, Sheep's Burnett, Birds Foot Trefoil, Black medic, Plantain, Chicory, Phalaris

Paddock 8, 9, 18, 19, 20, 26, 30: Broome, Chichory, Cocksfoot, Lucerne, Fescue, Festulolium, Perrenial Ryegrass, Phalaris, Plantain, Prairie Grass, Radish, Ryecorn, Sheep's Burnett, Strawberry Clover, Timothy

Paddock 4 & 14 Right Hand Side: Jeta Ryegrass, Red Clover, Persian Clover, White Clover, Plantain, Chicory

Paddock 34 & 14 Left Hand Side: Timothy, Cocksfoot, Tetraploid Ryegrass, Prairie Grass, Fescue, Grazing Brome, Red Clover, White Clover, Sheeps Burnett, Lotus, Sub Clover, Plantain, Chichory, Phalaris

Paddock 6: Annual Cover Crop: Allure Persian Clover, Crimson Clover, Kale, Swede, Black Oats, Ryecorn, Buckwheat, Tic Beans, Ryegrass, Lupins, Phacelia, Common Vetch, Sunflower

Paddock 3 and 5: Ryegrass White Clover

Paddock 14 had been heavily cropped previously (maize, barley, kale) so we decided to experiment with it and put a cover crop on the left-hand side before drilling into a pasture mix, while going directly into the pasture mix on the right hand side (no cover crop). Unfortunately, the left side looks quite messy because of the stand down period between the cover crop and the grass mix, so it hasn't exactly done what we had hoped and you can see the additional weed pressure on the left hand side as a result.

Season Summary 21-22

	Regenerative	Conventional
Stocking Rate	3.3 cows/ha	3.7 cows/ha
kg MS/cow	391 kg MS/cow	428 kg MS/cow
kg MS/ha	1255 kgMS/ha	1601 kgMS/ha
EBIT	$5,282	$6,943
Pasture Grown	16,988 kgDM/ha	16,561 kgDM/ha
N Fertiliser	5.5 kg N/ha	163 kg N/ha
Supplements	353 kgDM/cow	471 kgDM/cow
N Loss	33 kgN/ha	65 kgN/ha
GHG Loss	1,716 eCO2/tonnes/yr	2,330 eCO2/tonnes/yr

2021/22 Results

Farm Performance

	Conventional	Regenerative	Difference
Kg MS/ha	1601	1255	-22%
Kg MS/Cow	428	391	-9%
KG LWT/Cow	445	445	0%
MS as % LWT	96%	88%	-9%
Total kgMS produced	236894	185672	-22%

Economics

Milk Income/ha ($9.30/kgMS)	$14,892	$11,667	-22%
Stock Sales/ha	$432	$339	-22%
Gross Farm Revenue/ha	$15,324	$12,006	-22%
Operating Expenses/kgMS	$5.23	$5.36	2%
Operating Profit/ha	$6,949	$5,282	-24%

Sensitivity Analysis

Op Profit/ha @ $6.00	$1,661	$1,142	-31%
Op Profit/ha @ $7.00	$3,262	$2,396	-27%
Op Profit/ha @ $8.00	$4,863	$3,651	-25%
Op Profit/ha @ $9.00	$6,463	$4,906	-24%
Op Profit/ha @ $10.00	$8,064	$ 6,160	-24%
Milk Price Needed for similar operating profit	$4.49		

Environmental

Total GHG/ha (t CO2-eq/ha/yr)	2329.9	1716.4	-26%
Methane (t CO2-eq/ha/yr)	1540.8	1233	-20%
Nitrous Oxide (t CO2-eq/ha/yr)	455.2	288.8	-37%
Carbon Dioxide (t CO2-eq-ha/yr)	333.9	194.5	-42%
kgMS/t GHG (t CO2-eq/ha/yr)	101.7	108.2	6%
N Loss (kg N/ha)	65	33	-49%
N Surplus (kg N/ha)	244	129	-47%
Nitrogen Conversion Efficiency (%)	29	39	34%

Actuals 2021-22

Align Farms Ltd- Clareview

FY22 Profit & Loss | *Actuals for the period ending 31 May 2022*
Actuals to 31 May 2022- Accrual basis (12)

	Conventional	Regenerative	Combined	Conventional	Regenerative	Combined
Effective Aera	148	148	296	148	148	296
Stocking Rate	3.74	3.21	3.47	3.74	3.21	3.47
Cow Numbers	553	475	1,028	553	475	1,028
Milksolids	236,894	185,673	422,567	236,894	185,673	422,567
Milksolids Per Cow	428	391	411	428	391	411
Milksolids Per Ha	1,601	1,255	1,428	1,601	1,255	1,428
Payout Kg/MS	$ 9.30	$ 9.30	$ 9.30	$ 9.30	$ 9.30	$ 9.30
Stock Sales p/KgMS	$ 0.23	$ 0.23	$ 0.23	$ 0.23	$ 0.23	$ 0.23
Gross Income per KgMS	$ 9.53	$ 9.53	$ 9.53	$ 9.53	$ 9.53	$ 9.53
Total Revenue	$ 2,256,439	$ 1,768,547	$ 4,024,987	$ 2,256,439	$ 1,768,547	$ 4,024,987

			Actual + Forecast p / kgMS / Cow / Ha			Actual + Forecast $$		
PRODUCTION kgMS>>>			236,894 kgMS	185,673 kgMS	422,567 kgMS	236,894 kgMS	185,673 kgMS	422,567 kgMS
ANIMAL EXPENSES	common traceable	Split						
Animal Health	Traceable	p/cow	*$ 74.01*	*$ 97.16*	*$ 84.71*	*$ 40,928*	*$ 46,152*	*$ 87,080*
Breeding	Traceable	p/cow	*$ 65.79*	*$ 65.79*	*$ 65.79*	*$ 36,382*	*$ 31,250*	*$ 67,632*
Calf Rearing	Traceable	p/cow	*$ 11.39*	*$ 11.39*	*$ 11.39*	*$ 6,296*	*$ 5,408*	*$ 11,704*
Total Animal Expenses						*$ 83,605*	*$ 82,811*	***$ 166,416***
FEED EXPENSES								
Feed On Farm / Supplements	Traceable	p/cow	*$ 433.49*	*$ 365.46*	*$ 402.06*	*$ 239,722*	*$ 173,592*	*$ 413,314*
Feed On Farm / Oats, Swedes, Maize	Traceable	p/ha	*$ 90.86*	*$ -*	*$ 45.43*	*$ 13,447*		*$ 13,447*
Feed Off Farm / Grazing	Traceable	p/cow	*$ 433.45*	*$ 433.45*	*$ 433.45*	*$ 239,695*	*$ 205,887*	*$ 445,582*
Total Feed Expenses						*$ 492,864*	*$ 379,479*	***$ 872,343***
PASTURE EXPENSES								
Irrigation (Excluding Electricty)	Common	50:50	¢ 0.11	¢ 0.13	¢ 0.12	$ 25,024	$ 25,024	$ 50,048
Fertiliser	Traceable	p/ha	$ 985	$ 510	$ 747.43	$ 145,713	$ 75,527	$ 221,240
Pasture Renewal (Regrassing)	Traceable	p/ha	$ 178.59	$ -	$ 89.29	$ 26,431		$ 26,431
Regen/Diverse crop	Traceable	p/ha	$ -	$ 129.20	$ 64.60		$ 19,122	$ 19,122
Weed & Pest	Common	50:50	¢ 0.01	¢ 0.01	¢ 0.01	$ 2,565	$ 2,565	$ 5,130
Total Pastaure Expenses						*$ 199,733*	*$ 122,238*	***$ 321,971***
OPERATING EXPENSES								
Electricty (Include Irrigation Electricty)	Common	p/KgMS	¢ 0.26	¢ 0.26	¢ 0.26	$ 60,859	$ 47,700	$ 108,559
Freight Exps	Traceable	p/cow	$ 18.49	$ 18.49	$ 18.49	$ 10,225	$ 8,783	$ 19,008
REPAIRS & MAINTENANCE (R&M)	Common	p/KgMS	¢ 0.19	¢ 0.19	¢ 0.23	$ 55,111	$ 43,194	$ 98,305
Shed Exps	Common	p/KgMS	¢ 0.08	¢ 0.06	¢ 0.06	$ 13,249	$ 10,384	$ 23,633
Staff Costs	Common	p/KgMS	¢ 0.95	¢ 1.04	¢ 0.99	$ 224,160	$ 192,543	$ 416,703
Vehicle Exps	Common	p/KgMS	¢ 0.12	¢ 0.13	¢ 0.13	$ 28,941	$ 24,858	$ 53,799
Total Operating Expenses						*$ 392,544*	*$ 327,463*	***$ 720,007***
OTHER OPERATING EXPENSES								
Health and Safety (H&S)	Common	p/KgMS	¢ 0.020	¢ 0.025	¢ 0.02	$ 4,636	$ 4,636	$ 9,271
Other Operating Expenses	Common	p/KgMS	¢ 0.010	¢ 0.012	¢ 0.01	$ 2,314	$ 2,314	$ 4,628
Total Operating Expenses						*$ 6,950*	*$ 6,950*	***$ 13,899***
OVERHEAD EXPENSES								
Administration (Farm)	Common	p/KgMS	¢ 0.05	¢ 0.05	¢ 0.08	$ 16,910	$ 16,910	$ 33,819
Administration (Overheads)	Common	p/KgMS	¢ 0.29	¢ 0.29	¢ 0.31	$ 64,735	$ 64,735	$ 129,470
Rates	Common	p/KgMS	¢ 0.05	¢ 0.05	¢ 0.05	$ 10,176	$ 10,176	$ 20,351
Insurance	Common	p/KgMS	¢ 0.06	¢ 0.06	¢ 0.07	$ 15,717	$ 15,717	$ 31,434
ACC Levies	Common	p/KgMS	¢ 0.02	¢ 0.02	¢ 0.03	$ 6,301	$ 6,301	$ 12,601
Total Overhead Expenses						*$ 113,838*	*$ 113,838*	***$ 227,675***
Total Farm Working Expenses (F.W.E)	Per KgMS		$ 5.44	$ 5.56	$ 5.50	$ 1,289,534	$ 1,032,777	$ 2,322,311
	Per cow		$ 2.332	$ 2.174	$ 2.259			
	Per Ha		$ 8.713	$ 6.978	$ 7.846			
Dairy Operating (Surplus/Deficit) (EBITDA)	Per KgMS		$ 4.08	$ 3.96	$ 4.03	$ 966,905	$ 735,771	$ 1,702,676
	Per cow		$ 1.748	$ 1.549	$ 1.656			
	Per Ha		$ 6.533	$ 4.971	$ 5.752			

Anticipated 2022-23 Season Summary

	Regenerative	Conventional
Stocking Rate	3.0 cows/ha	3.6 cows/ha
kg MS/cow	444 kg MS/cow	438 kg MS/cow
kg MS/ha	1411 kgMS/ha	1689 kgMS/ha
EBIT	$5,871	$5,903
Pasture Grown	17000 kgDM/ha	16500 kgDM/ha
N Fertiliser	9.6 kg N/ha	141 kg N/ha
Supplements	550 kgDM/cow	600 kgDM/cow
N Loss	33 kgN/ha	48 kgN/ha
GHG Loss	1841 eCO2/tonnes/yr	2,340 eCO2/tonnes/yr

November 27th 2022 Weekly Data

	Regenerative	Conventional
Cows in Milk	3.0 cows/ha	3.6 cows/ha
Production/cow this week	1.87 kg cow/day	1.89 kg cow/day
Production/ha YTD	536.3 kg/ha	619.9 kg/ha
Average Cover	2029 kgDM/ha *	1966 kgDM/ha
Average Daily Growth	106.8 kgDM/ha *	95.5 kgDM/ha
Round Length	25 Days	22 Days
Supplements Fed	3 kgDM/cow/day	3 kgDM/cows/day
N Fertiliser (synthetic and organic)	0.19 kg N/ha	2.1 kg N/ha
Animal Health Cases	0.9 % of herd	1.3 % of herd
Somatic Cell Count	189,000 cells/ml	155,000 cells/ml
Irrigation Applied	16.4 m³/ha	73.9 m³/ha**

2022/23 Budget

Farm Performance	Conventional	Regenerative	Difference
Kg MS/ha	1689	1411	-16%
Kg MS/Cow	438	444	1%
KG LWT/Cow	445	445	0%
MS as % LWT	98%	100%	1%
Total kgMS produced	249,920	208,880	-16%

Economics

Milk Income/ha ($9.00/kgMS)	$15,198	$12,702	-16%
Stock Sales/ha	$456	$381	-16%
Gross Farm Revenue/ha	$15,654	$13,083	-16%
Operating Expenses/kgMS	$5.77	$5.11	-11%
Operating Profit/ha	$5,903	$5,871	-3%

Sensitivity Analysis

Op Profit/ha @ $6.00	$908	$1,566	72%
Op Profit/ha @ $7.00	$2,597	$2,977	15%
Op Profit/ha @ $8.00	$4,286	$4,388	2%
Op Profit/ha @ $9.00	$5,974	$5,800	-3%
Op Profit/ha @ $10.00	$7,663	$7,211	-6%
Milk Price Needed for similar operating profit	$ 8.37		

Environmental

Total GHG/ha (t CO2-eq/ha/yr)	2340	1841	-21%
Methane (t CO2-eq/ha/yr)	1550	1284	-17%
Nitrous Oxide (t CO2-eq/ha/yr)	433	280	-35%
Carbon Dioxide (t CO2-eq-ha/yr)	357	276	-23%
kgMS/t GHG (t CO2-eq/ha/yr)	106.8	113	6%
N Loss (kg N/ha)	48	33	-31%
N Surplus (Kg N/ha)	229	152	-34%
Nitrogen Conversion Efficiency (%)	32	40	25%

22-23 Actuals to 31 Oct 22 (5+7)

Align Farms Ltd- Clareview

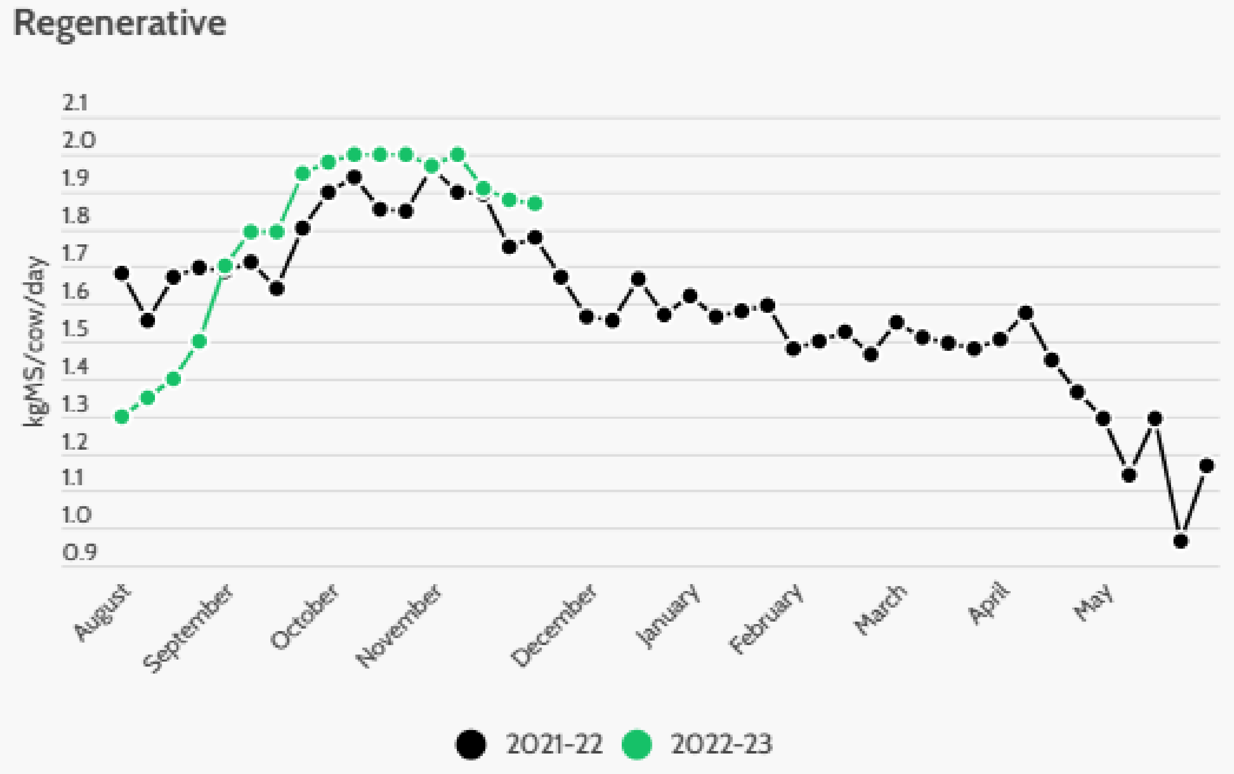
FY23 Profit & Loss | Actuals for the period ending 31 May 2023
Actuals to 31 Oct 2022- Accrual basis (5+7)

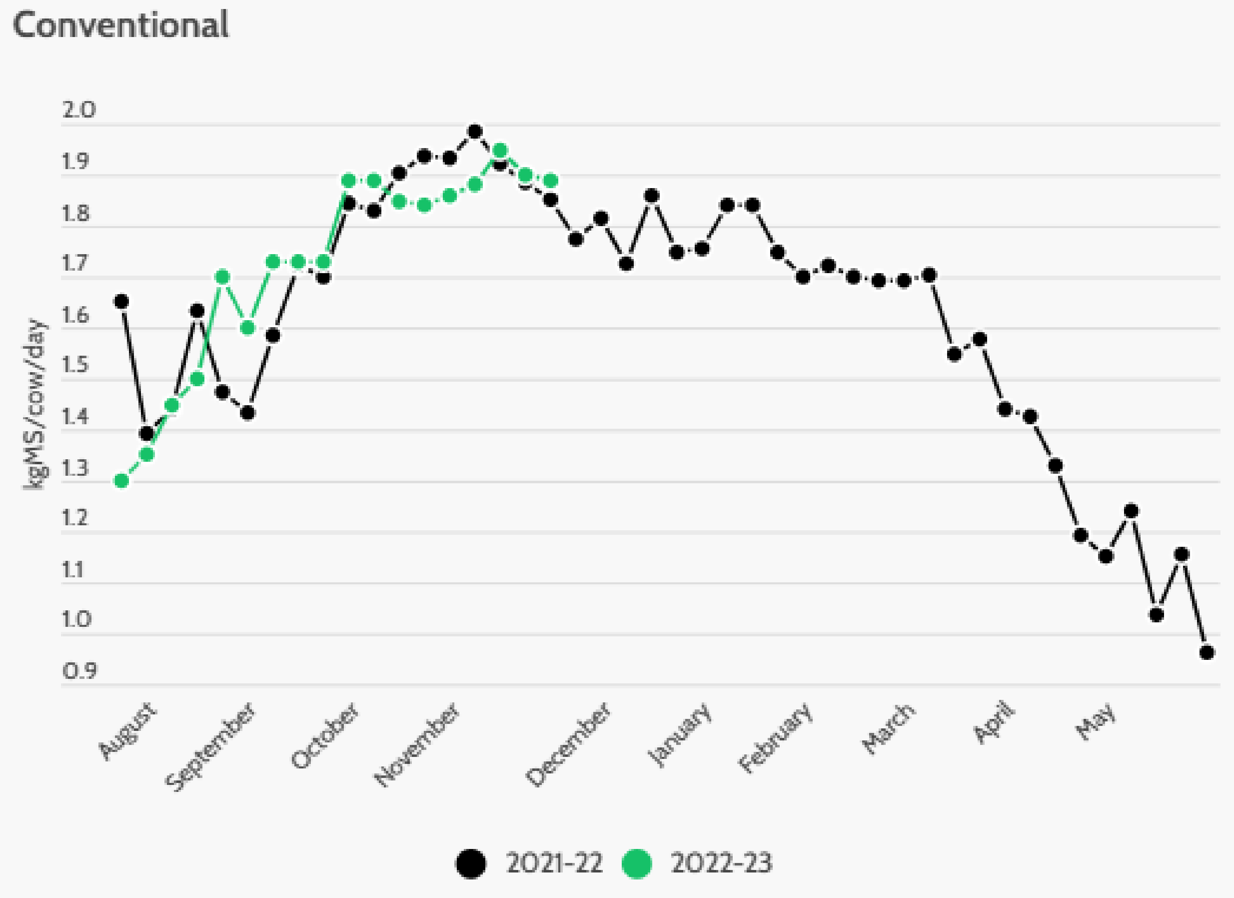
	Conventional	Regenerative	Combined	Conventional	Regenerative	Combined
Effective Aera	148	148	296	148	148	296
Stocking Rate	3.84	3.28	3.56	3.84	3.28	3.56
Cow Numbers	568	486	1,054	568	486	1,054
Milksolids	249,920	208,880	458,800	249,920	208,880	458,800
Milksolids Per Cow	440	430	435	440	430	435
Milksolids Per Ha	1,689	1,411	1,550	1,689	1,411	1,550
Payout Kg/MS	$ 9.25	$ 9.25	$ 9.25	$ 9.25	$ 9.25	$ 9.25
Stock Sales p/KgMS	$ 0.29	$ 0.29	$ 0.29	$ 0.29	$ 0.29	$ 0.29
Gross Income per KgMS	$ 9.54	$ 9.54	$ 9.54	$ 9.54	$ 9.54	$ 9.54
Total Revenue	$ 2,383,258	$ 1,991,897	$ 4,375,155	$ 2,383,258	$ 1,991,897	$ 4,375,155

			Actual + Forecast p / kgMS / Cow / Ha			Actual + Forecast $$		
PRODUCTION kgMS>>>			249,920 kgMS	208,880 kgMS	458,800 kgMS	249,920 kgMS	208,880 kgMS	458,800 kgMS
ANIMAL EXPENSES	common traceable	Split						
Animal Health	Traceable	p/cow	$ 76.35	$ 79.13	$ 77.63	$ 43,368	$ 38,458	$ 81,826
Breeding	Traceable	p/cow	$ 72.90	$ 72.90	$ 72.90	$ 41,406	$ 35,428	$ 76,834
Calf Rearing	Traceable	p/cow	$ 16.40	$ 16.40	$ 16.40	$ 9,314	$ 7,970	$ 17,284
Other Animal - Allflex	Traceable	p/cow	$ 36.21	$ 36.21	$ 36.21	$ 20,567	$ 17,597	$ 38,164
Total Animal Expenses						$ 114,654	$ 99,454	**$ 214,108**
FEED EXPENSES								
Feed On Farm / Supplements	Traceable	p/cow	$ 457.39	$ 356.38	$ 410.82	$ 259,800	$ 173,200	$ 433,000
Feed On Farm / Oats, Swedes, Maize	Traceable	p/ha	$ 93.92	$ -	$ 46.96	$ 13,900		$ 13,900
Feed Off Farm / Grazing	Traceable	p/cow	$ 509.95	$ 509.95	$ 509.95	$ 289,651	$ 247,836	$ 537,487
Total Feed Expenses						$ 563,351	$ 421,036	**$ 984,387**
PASTURE EXPENSES								
Irrigation (Excluding Electricty)	Common	50:50	c 0.06	c 0.07	c 0.06	$ 14,728	$ 14,728	$ 29,455
Fertiliser	Traceable	p/ha	$ 1,033	$ 510	$ 771.49	$ 152,834	$ 75,527	$ 228,361
Pasture Renewal (Regrassing)	Traceable	p/ha	$ 64.29	$ -	$ 32.15	$ 9,515		$ 9,515
Regen/Diverse crop	Traceable	p/ha	$ -	$ 65.67	$ 32.83		$ 9,719	$ 9,719
Weed & Pest	Common	50:50	c 0.01	c 0.01	c 0.01	$ 2,946	$ 2,946	$ 5,891
Total Pastaure Expenses						$ 180,022	$ 102,919	**$ 282,941**
OPERATING EXPENSES								
Electricty (Include Irrigation Electricty)	Common	p/KgMS	c 0.24	c 0.24	c 0.24	$ 60,389	$ 50,473	$ 110,862
Freight Exps	Traceable	p/cow	$ 12.83	$ 12.83	$ 12.83	$ 7,285	$ 6,233	$ 13,518
REPAIRS & MAINTENANCE (R&M)	Common	p/KgMS	c 0.19	c 0.19	c 0.21	$ 53,667	$ 44,855	$ 98,522
Shed Exps	Common	p/KgMS	c 0.08	c 0.10	c 0.10	$ 24,018	$ 20,074	$ 44,092
Staff Costs	Common	p/KgMS	c 0.98	c 1.01	c 1.00	$ 246,136	$ 210,602	$ 456,738
Vehicle Exps	Common	p/KgMS	c 0.09	c 0.09	c 0.09	$ 22,093	$ 18,904	$ 40,997
Total Operating Expenses						$ 413,589	$ 351,140	**$ 764,729**
OTHER OPERATING EXPENSES								
Health and Safety (H&S)	Common	p/KgMS	c 0.023	c 0.028	c 0.03	$ 5,821	$ 5,821	$ 11,641
Other Operating Expenses	Common	p/KgMS	c 0.015	c 0.018	c 0.02	$ 3,714	$ 3,714	$ 7,428
Total Operating Expenses						$ 9,535	$ 9,535	**$ 19,069**
OVERHEAD EXPENSES								
Administration (Farm)	Common	p/KgMS	c 0.05	c 0.05	c 0.04	$ 8,633	$ 8,633	$ 17,266
Administration (Overheads)	Common	p/KgMS	c 0.29	c 0.29	c 0.28	$ 63,285	$ 63,285	$ 126,570
Rates	Common	p/KgMS	c 0.05	c 0.05	c 0.06	$ 13,064	$ 13,064	$ 26,128
Insurance	Common	p/KgMS	c 0.06	c 0.06	c 0.08	$ 17,898	$ 17,898	$ 35,795
ACC Levies	Common	p/KgMS	c 0.02	c 0.02	c 0.03	$ 5,764	$ 5,764	$ 11,528
Total Overhead Expenses						$ 108,644	$ 108,644	**$ 217,287**
Total Farm Working Expenses (F.W.E)	Per KgMS		$ 5.56	$ 5.23	$ 5.41	$ 1,389,795	$ 1,092,726	$ 2,482,521
	Per cow		$ 2,447	$ 2,248	$ 2,355			
	Per Ha		$ 9,391	$ 7,383	$ 8,387			
Dairy Operating (Surplus/Deficit) (EBITDA)	Per KgMS		$ 3.98	$ 4.30	$ 4.13	$ 993,463	$ 899,171	$ 1,892,634
	Per cow		$ 1,749	$ 1,850	$ 1,796			
	Per Ha		$ 6,713	$ 6,075	$ 6,394			

Comparison Graphs

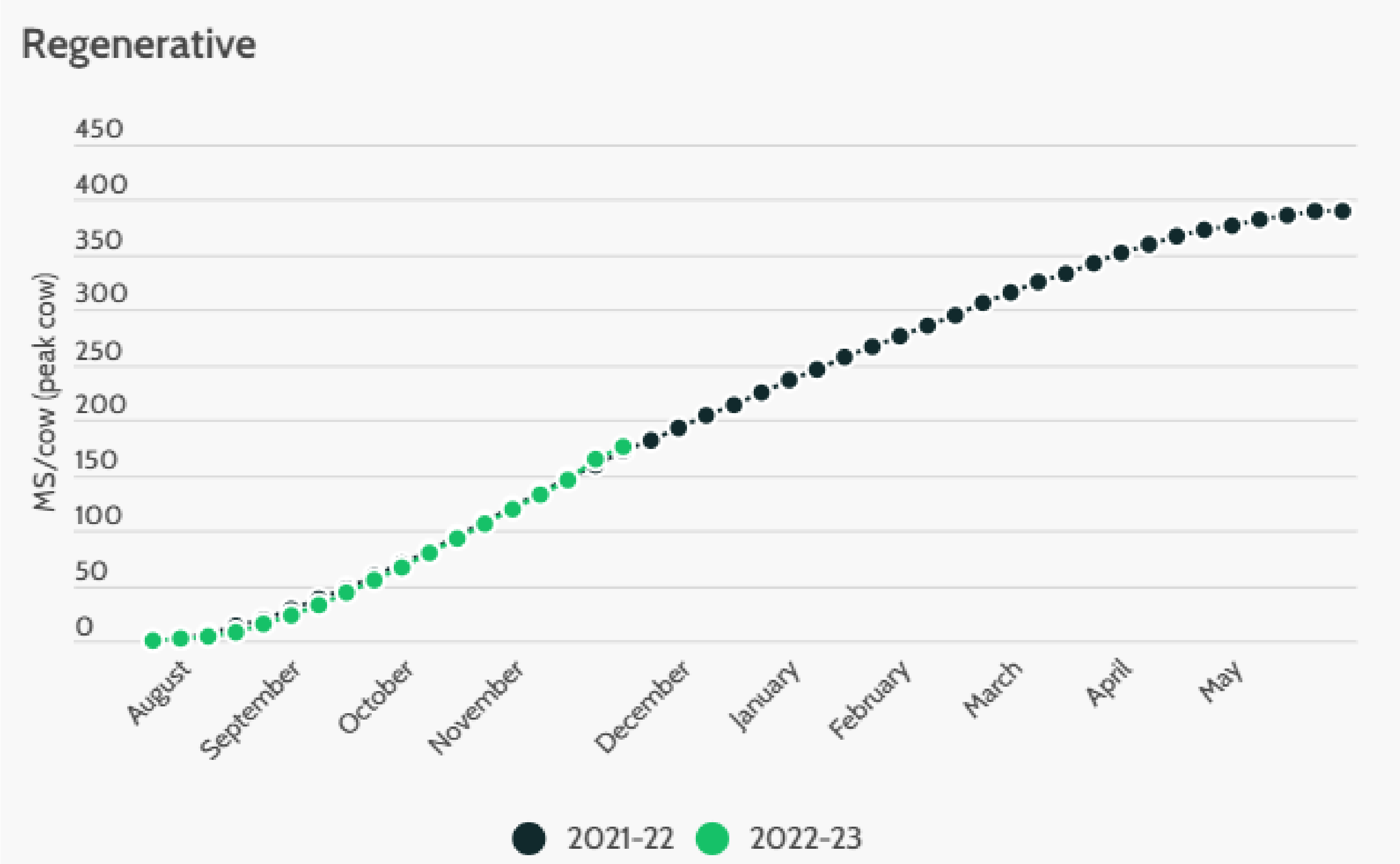
Daily Per Cow Production

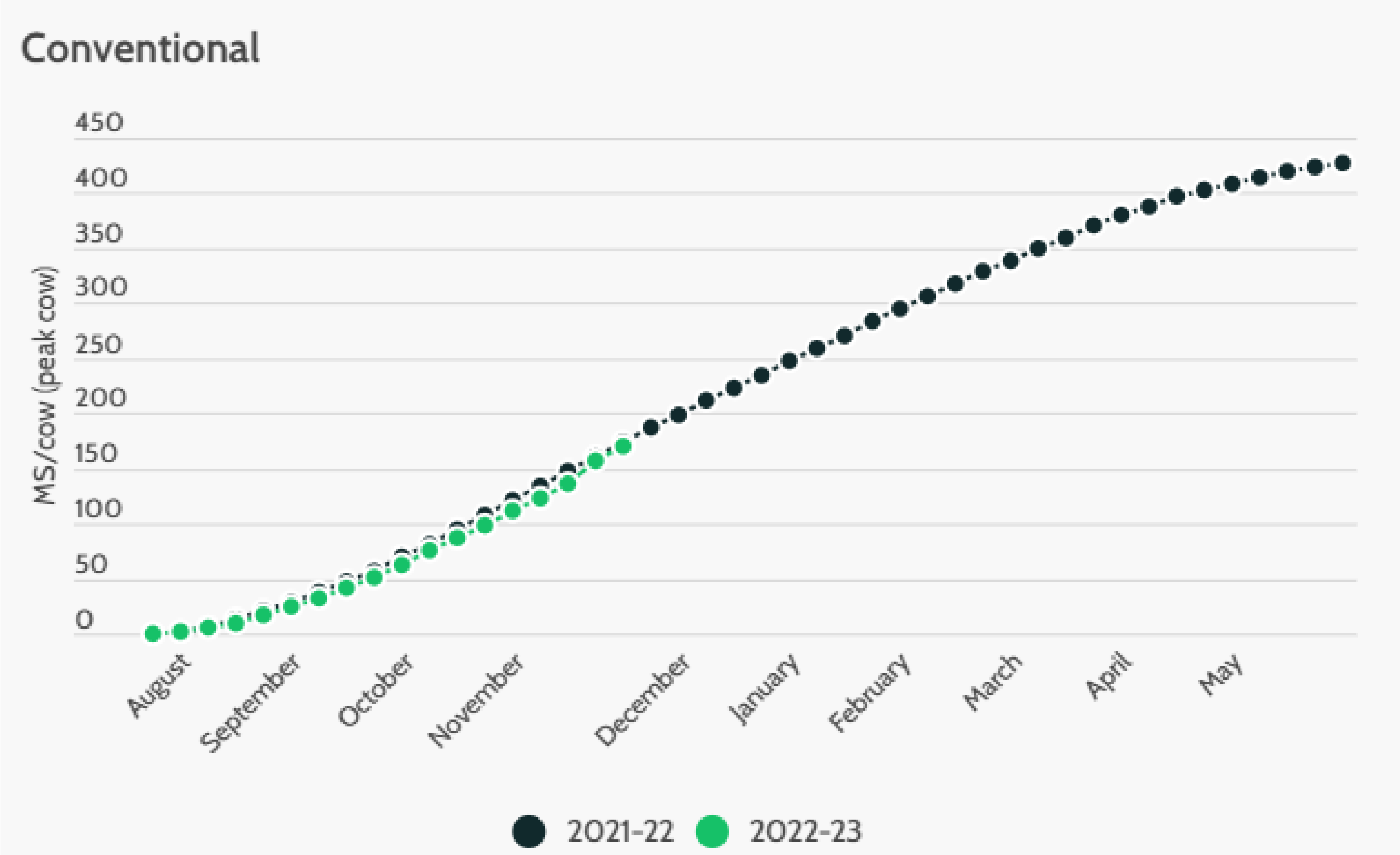




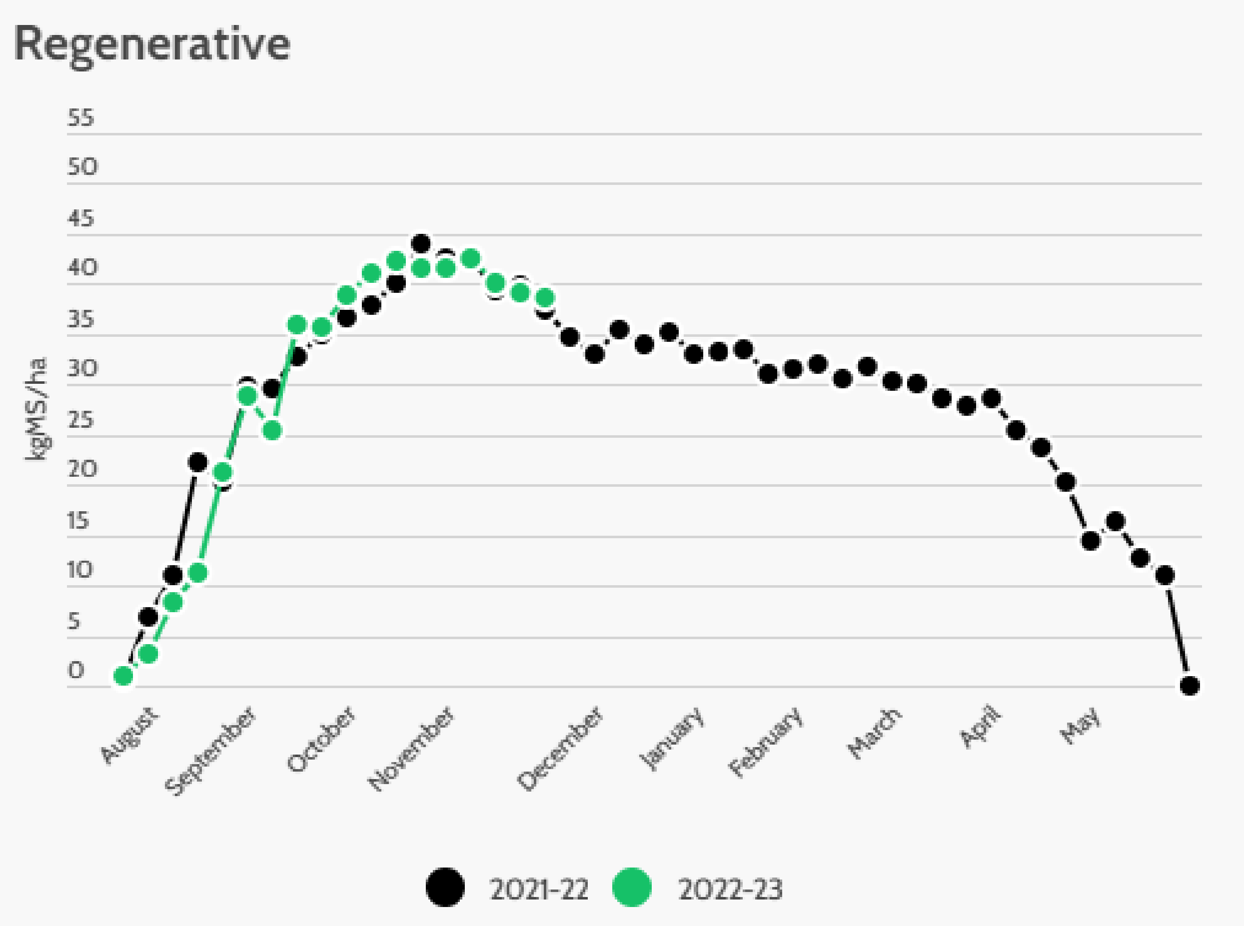
*As cows calve in spring and cows are culled over autumn, the per cow production may be slightly skewed

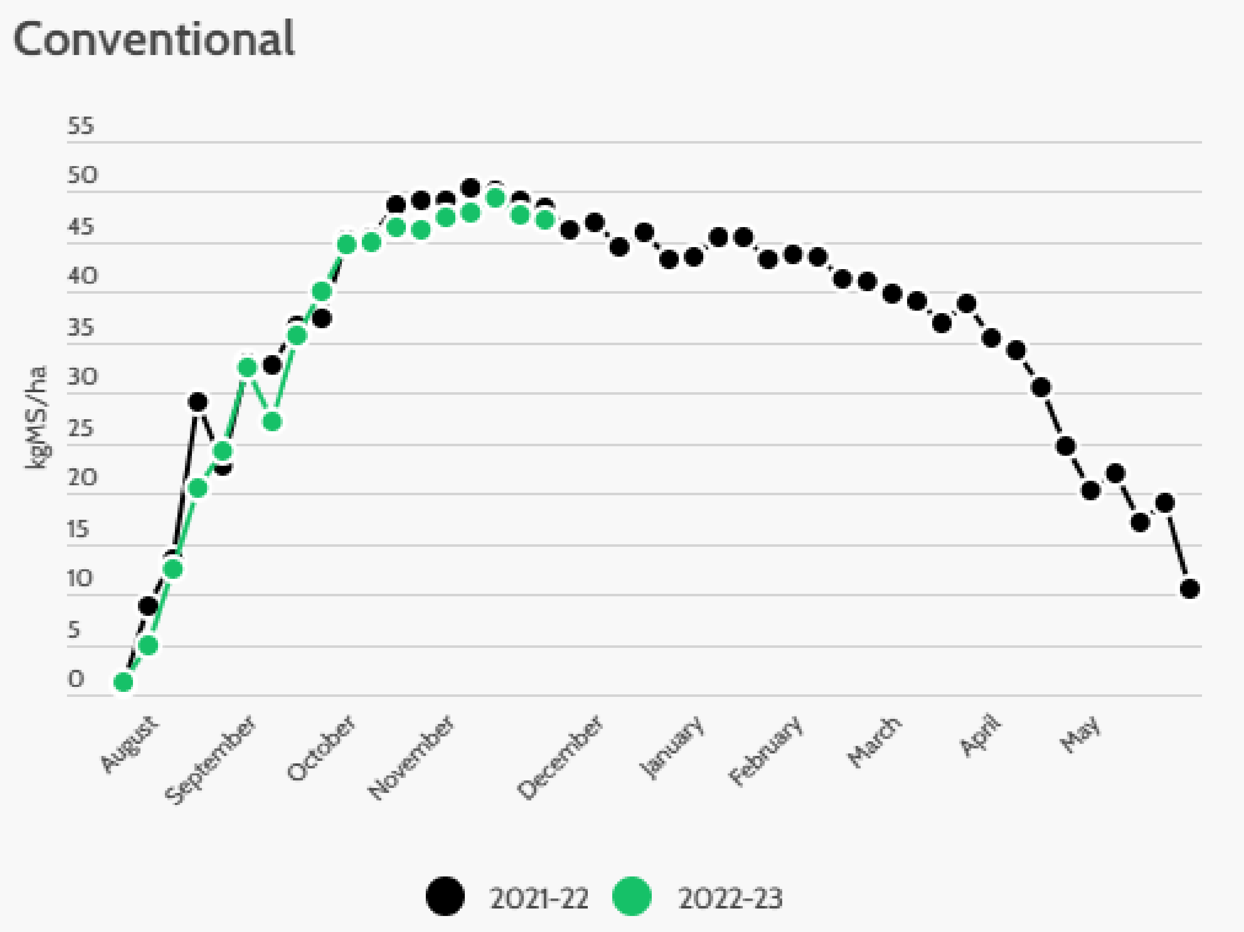
YTD Production Per Cow



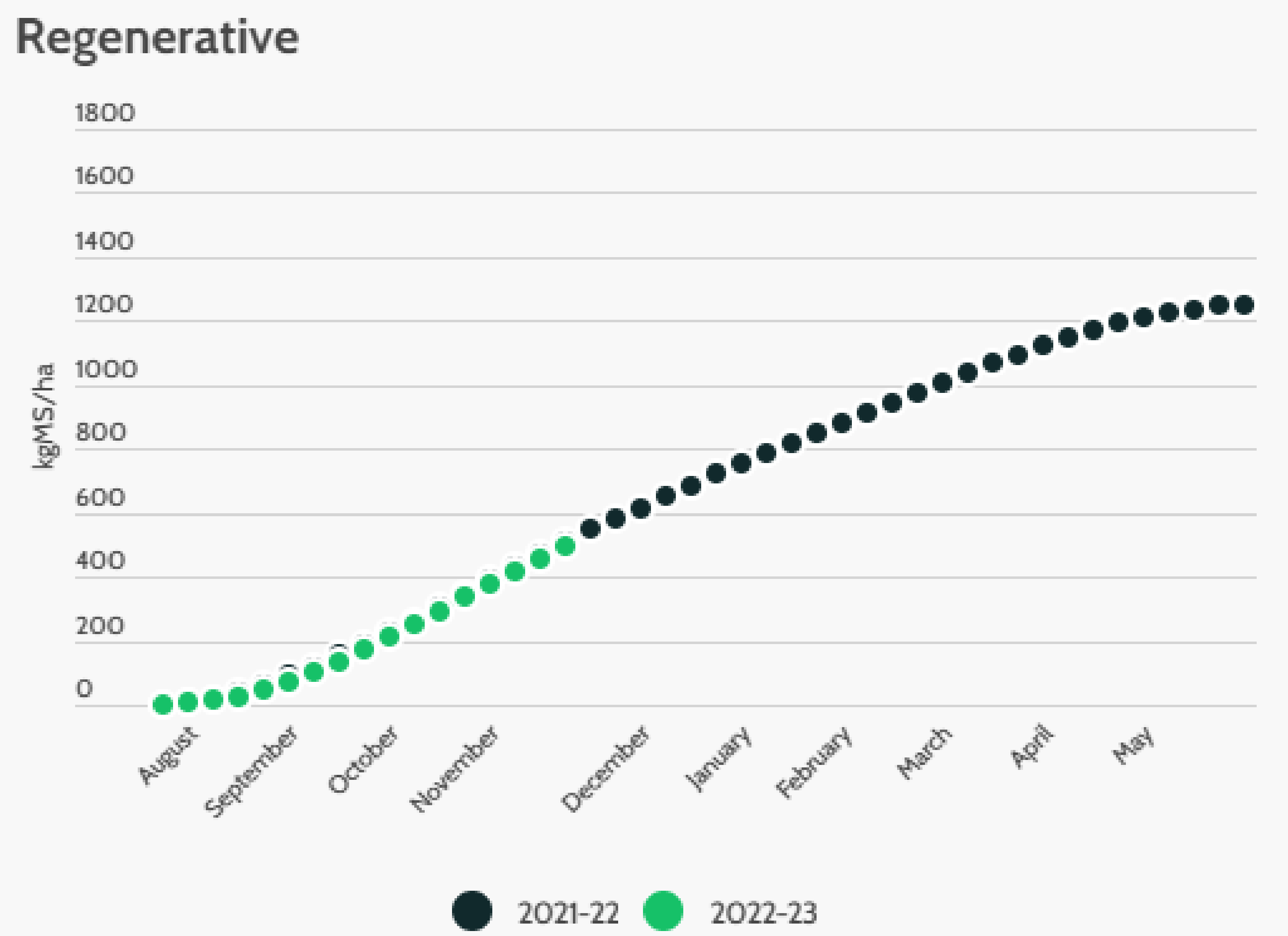


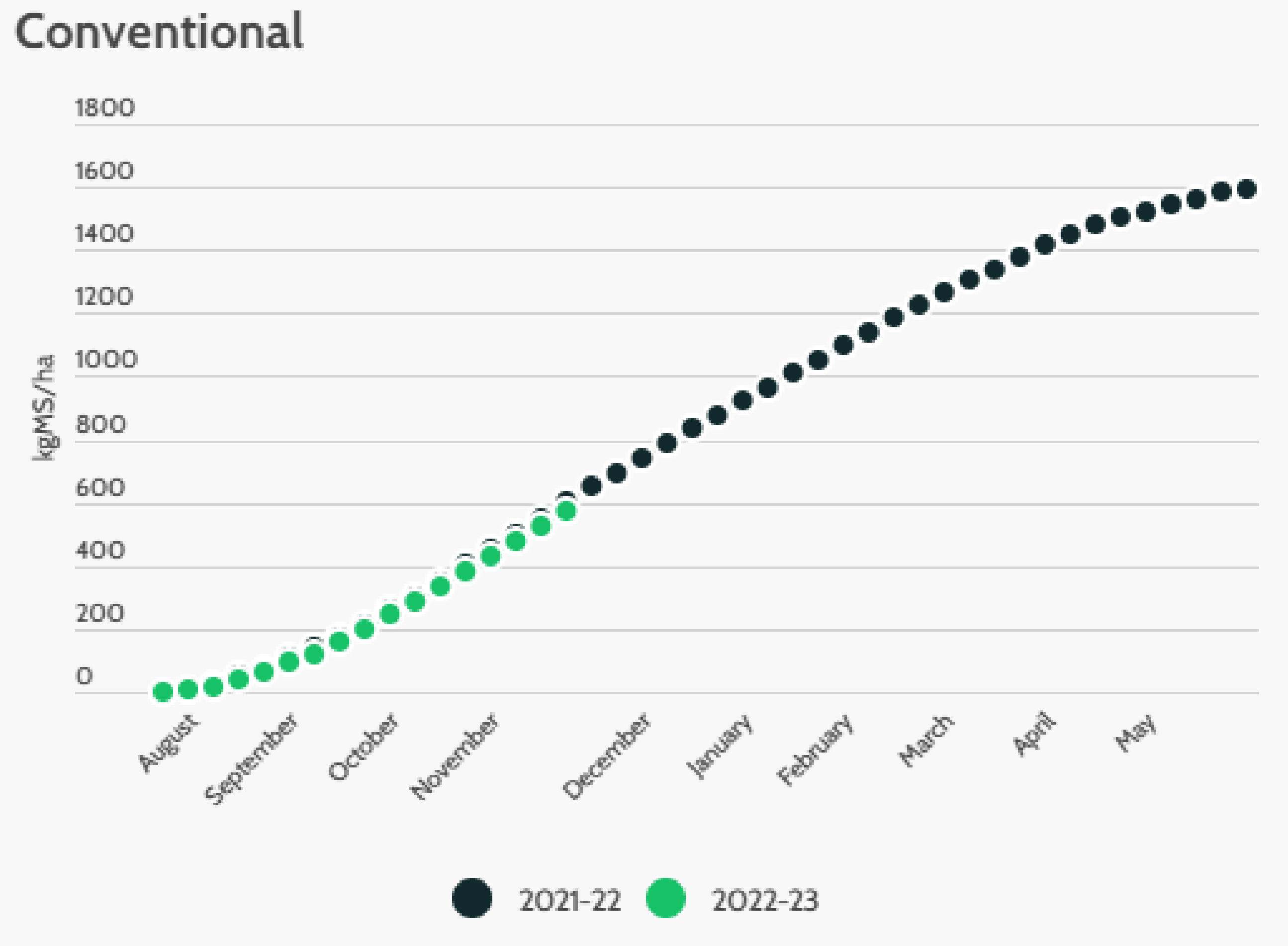
Weekly Milk Production per Hectare



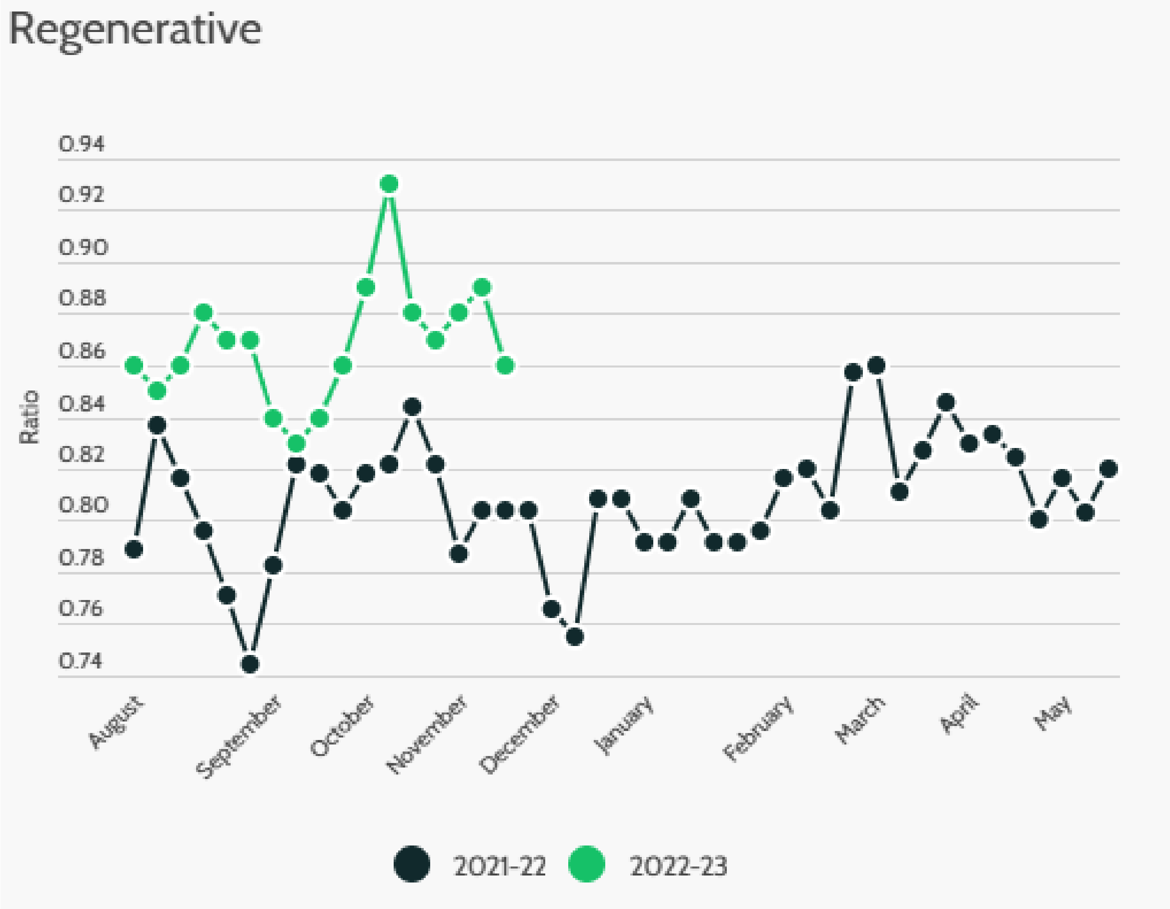


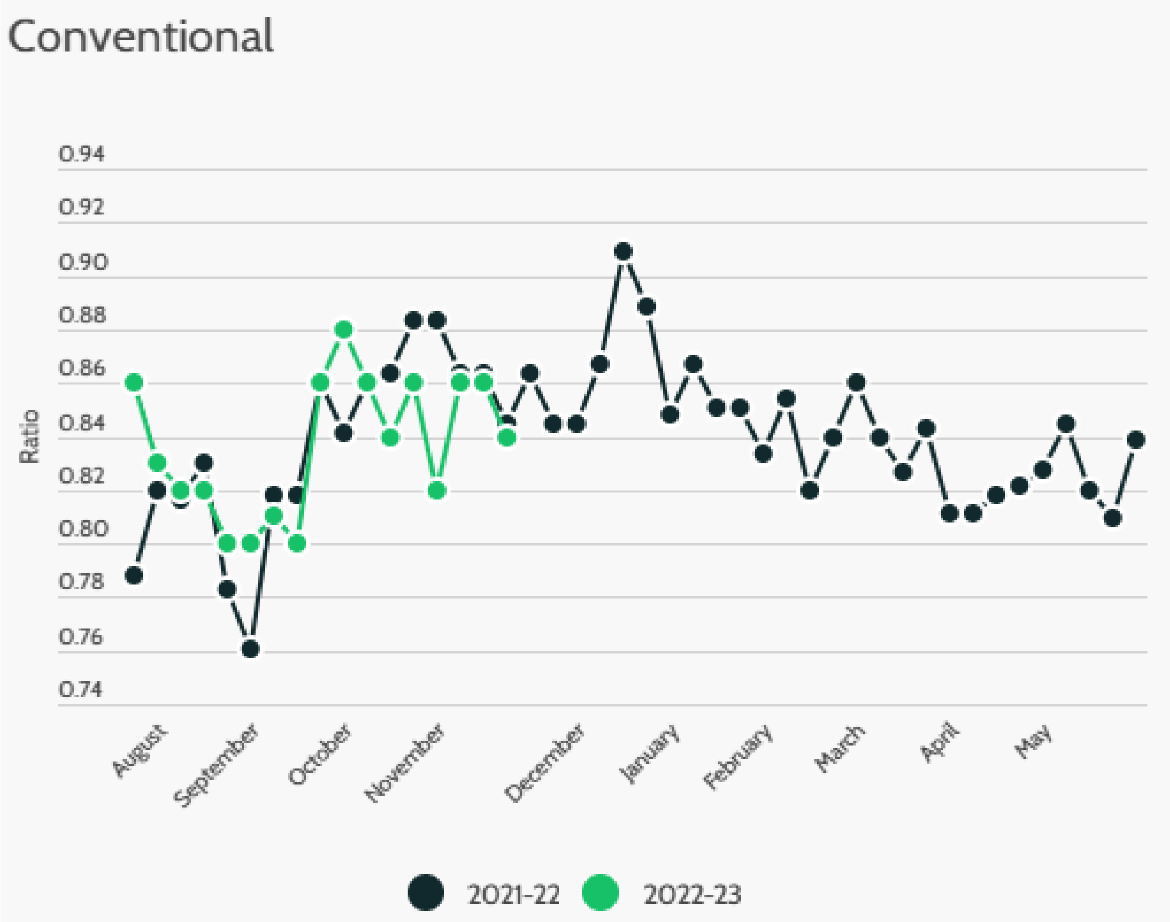
YTD Milk Production



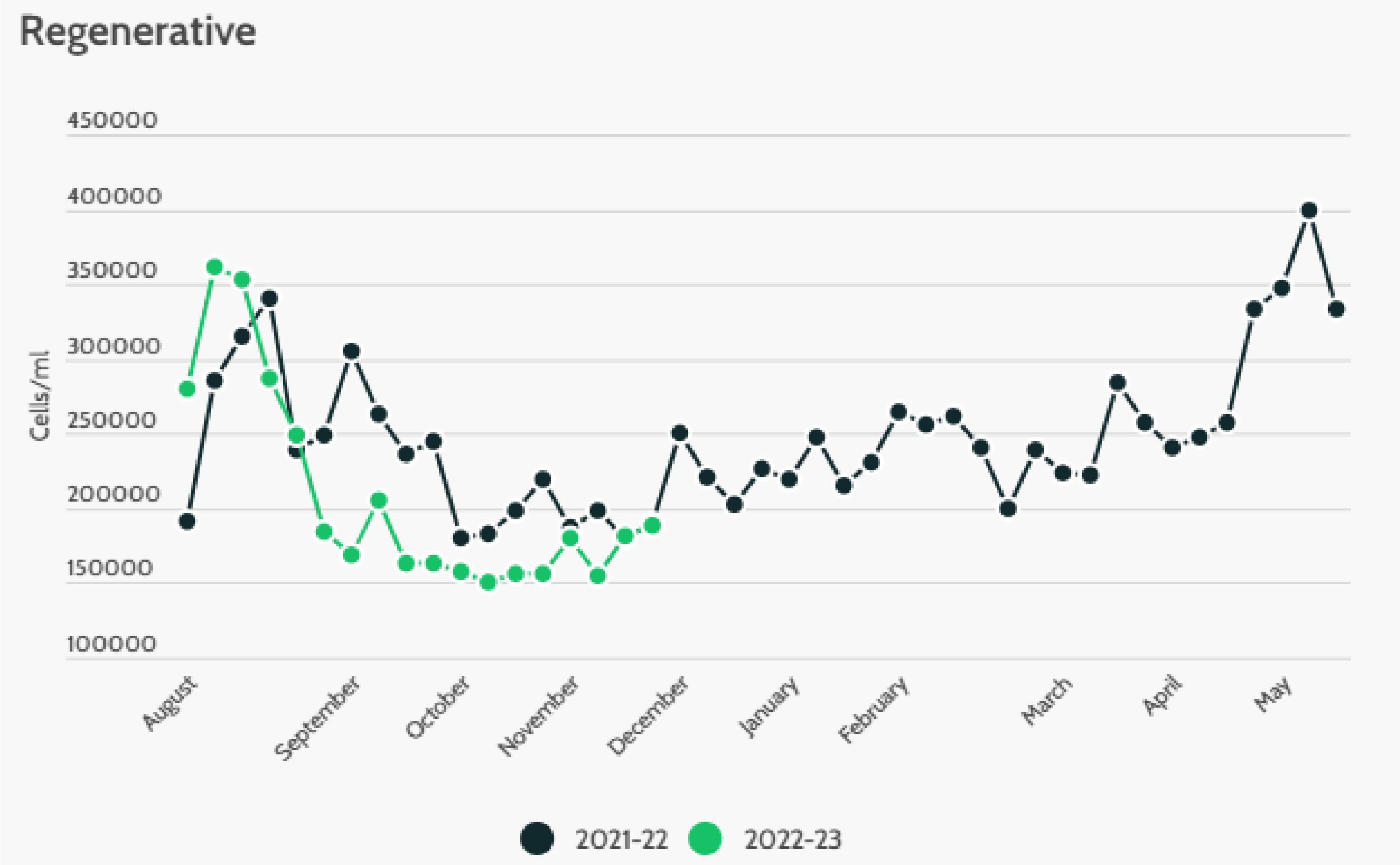


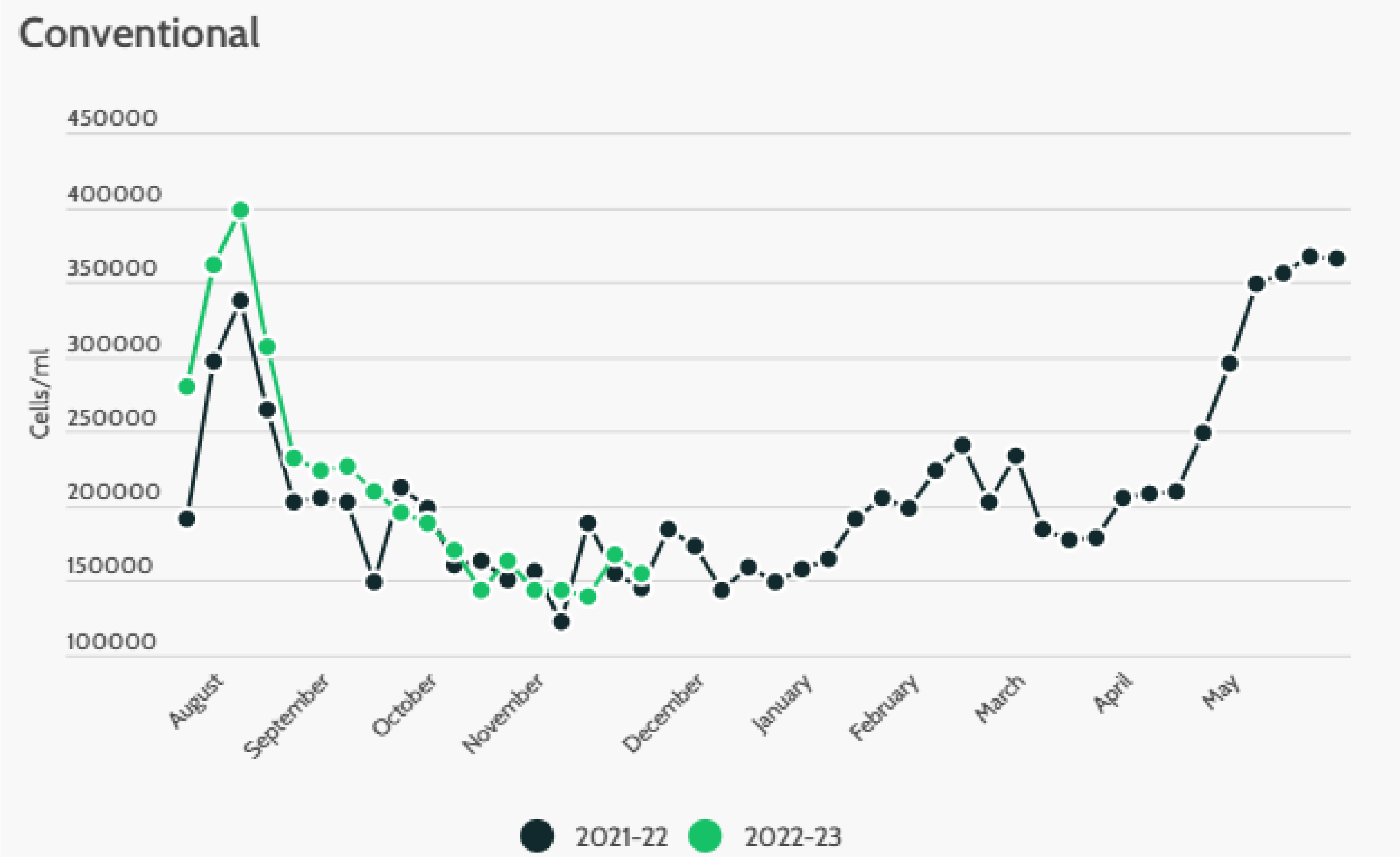
Milk Protein:Fat



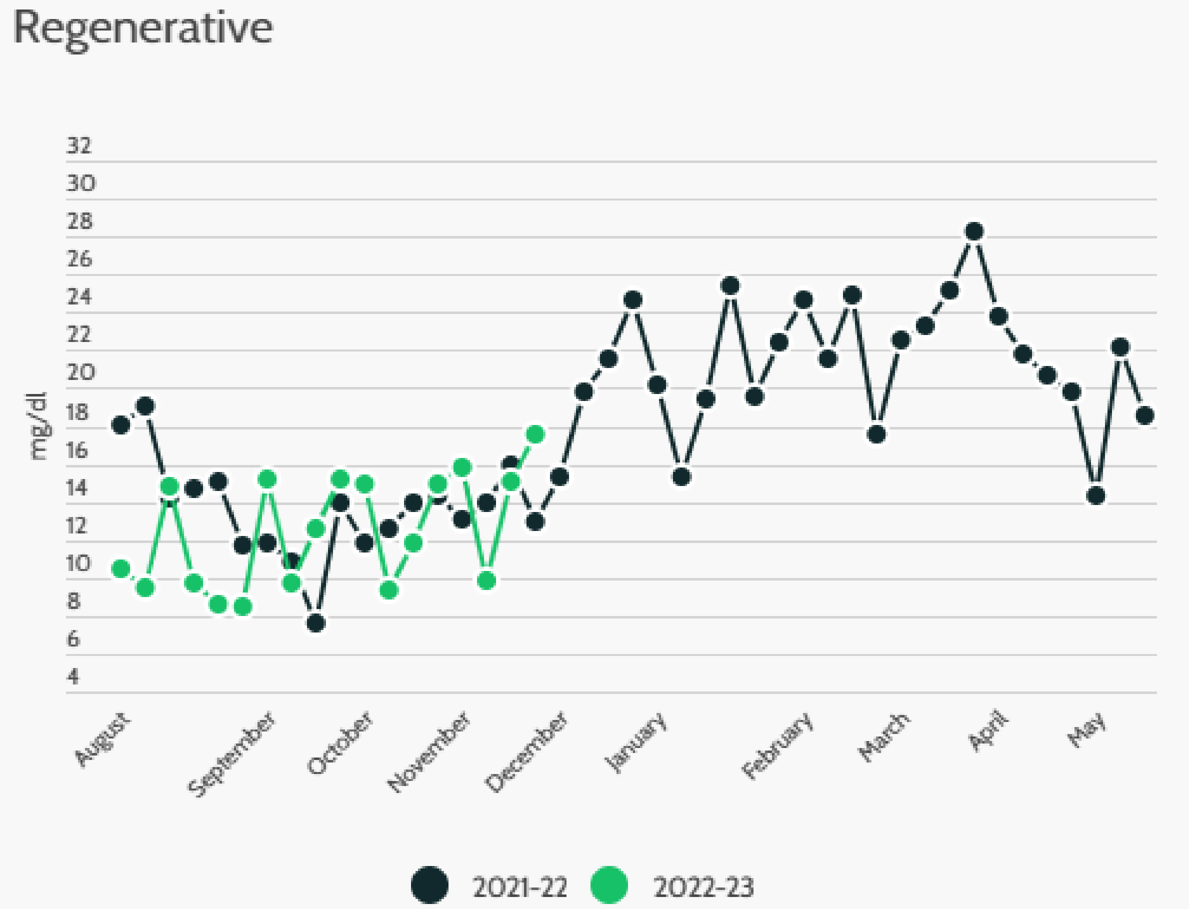


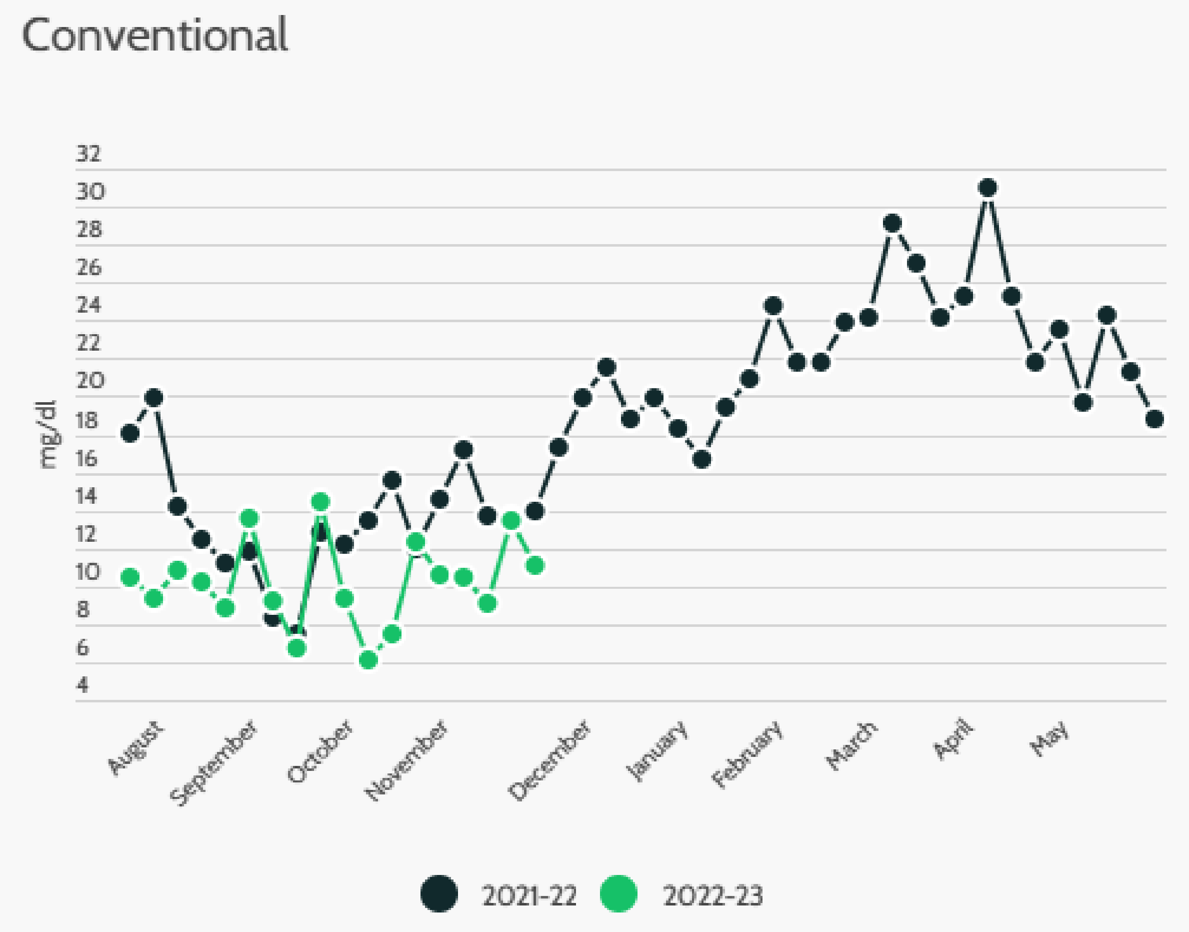
Somatic Cell Count



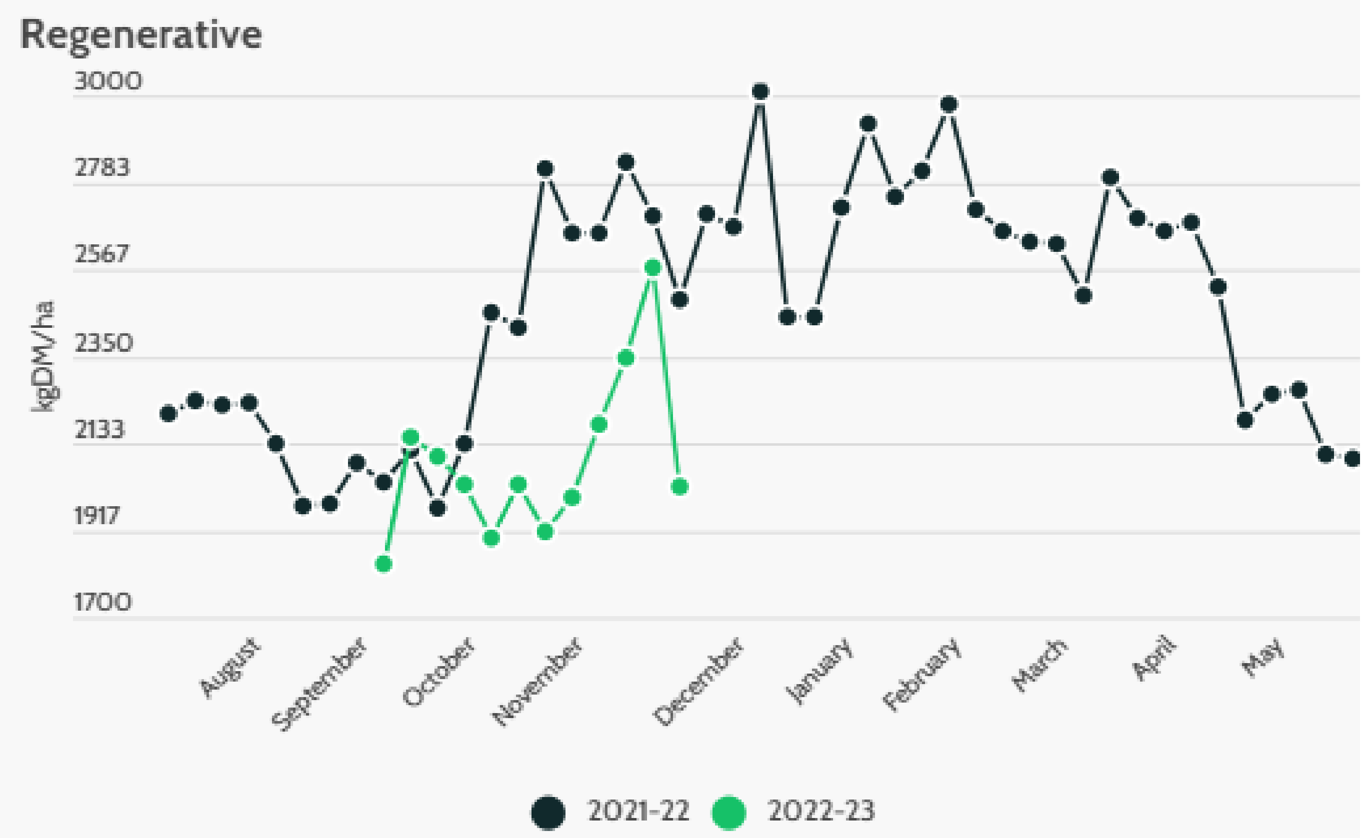


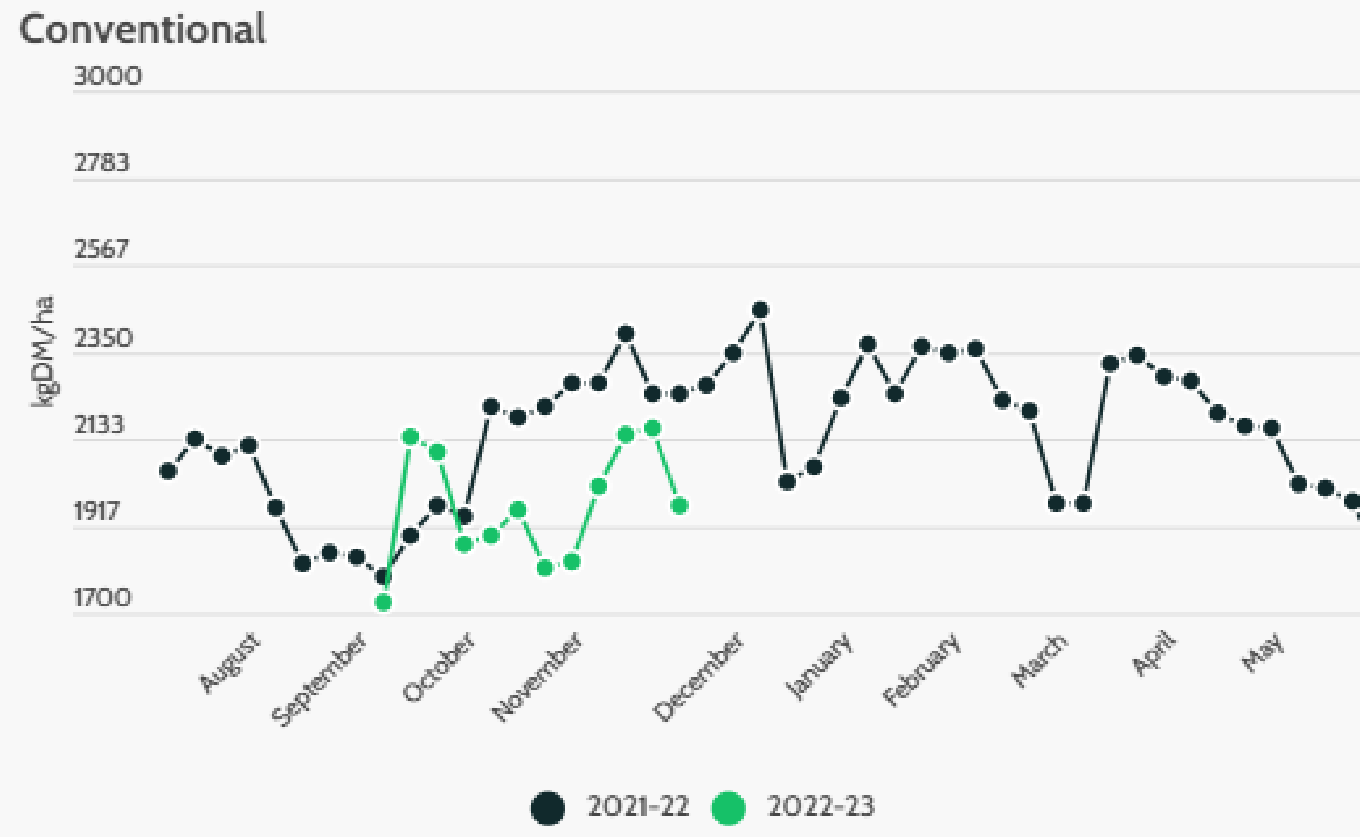
Milk Urea Nitrogen





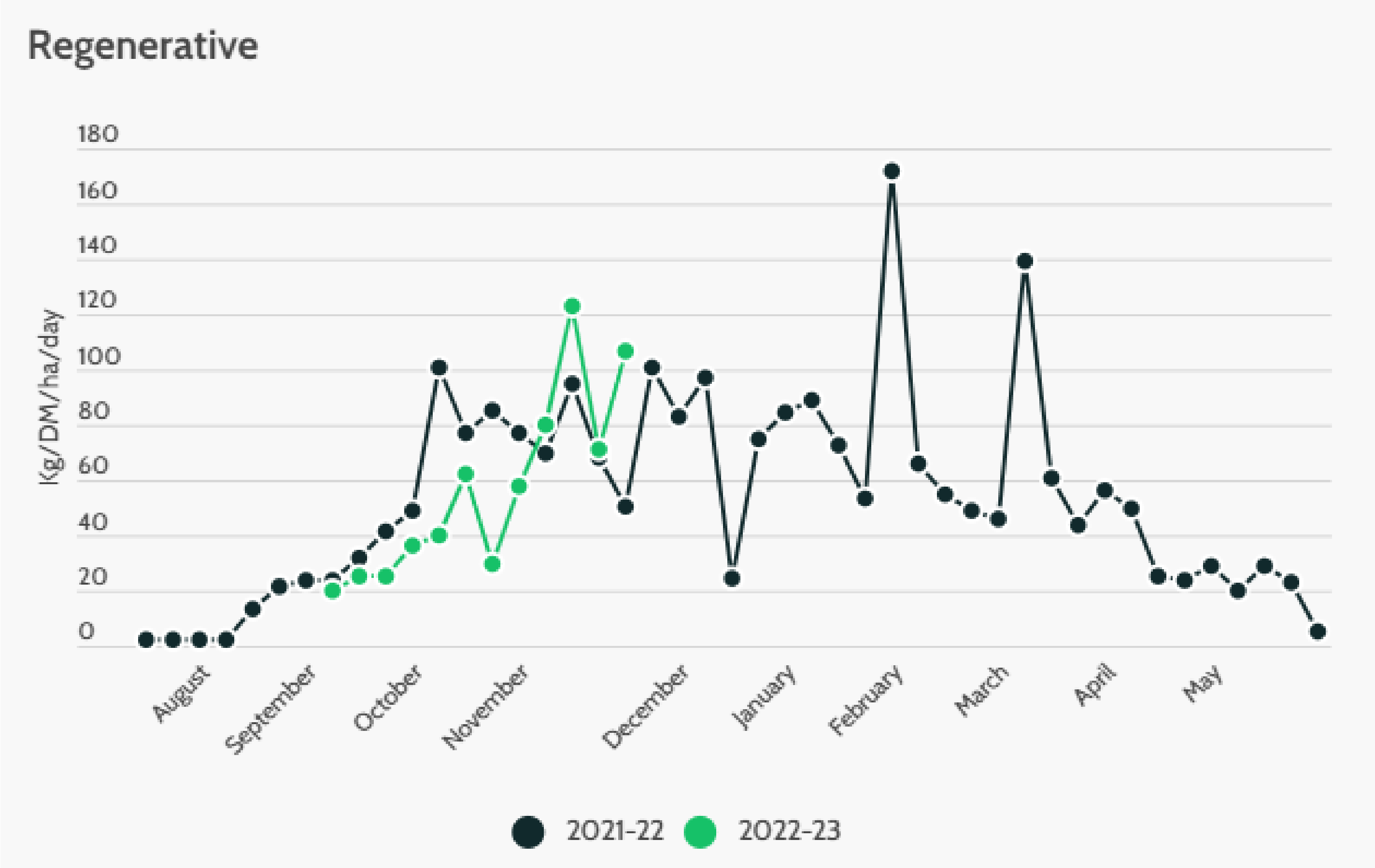
Average Cover

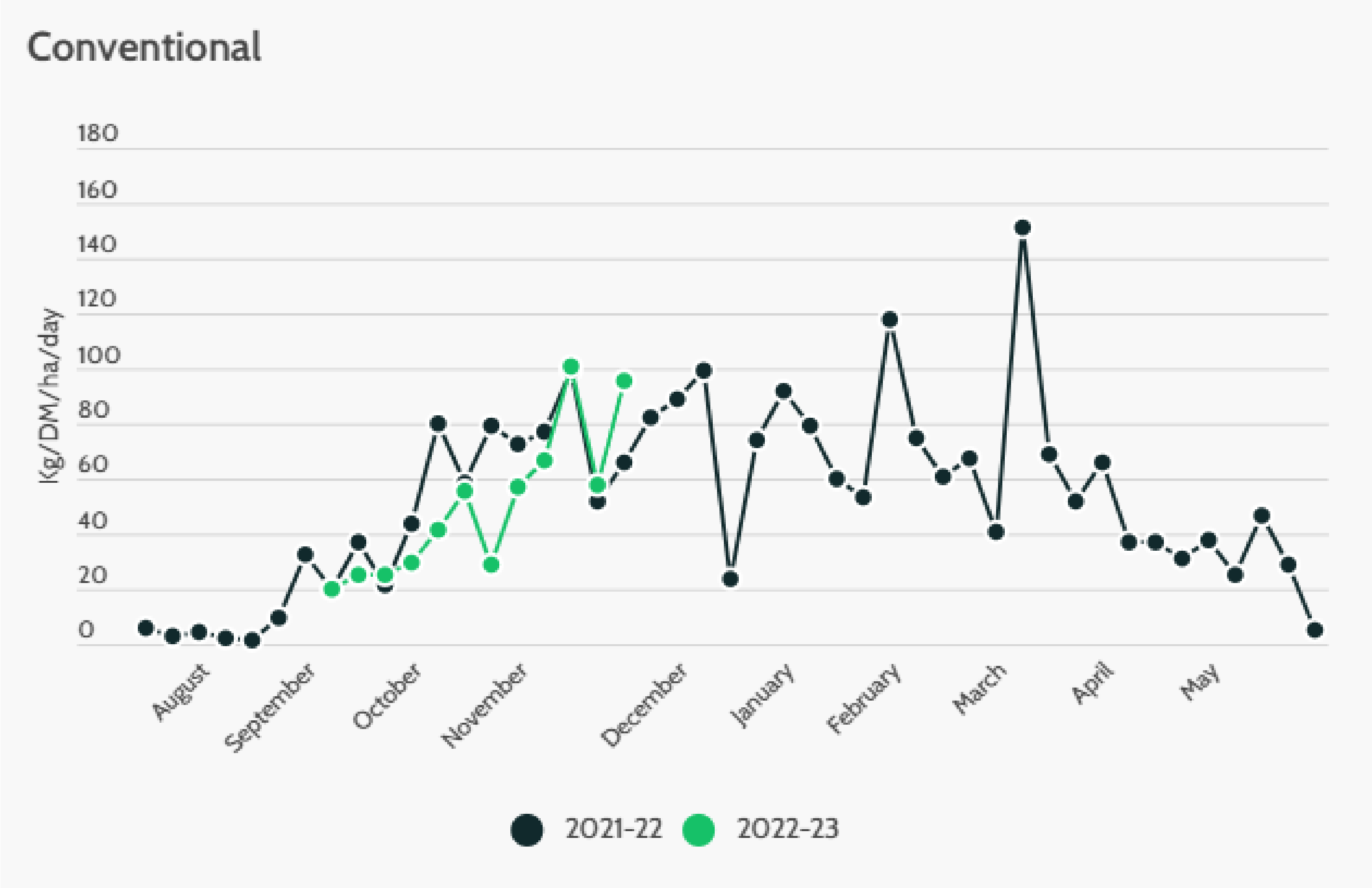




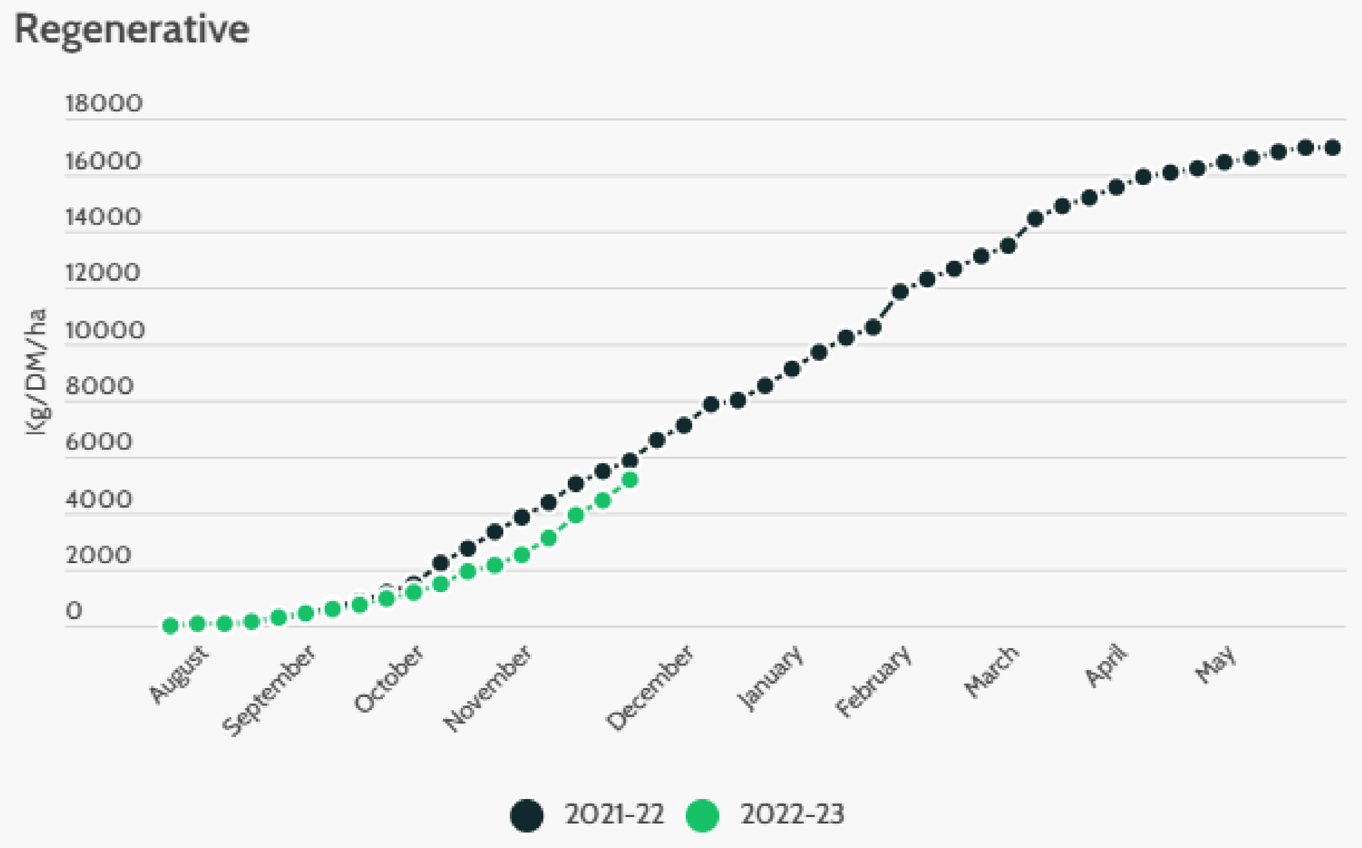
We did not plate meter at the beginning of the 2022-23 season due to extremely wet conditions on the farm and wanting to avoid unnecessary pasture damage.

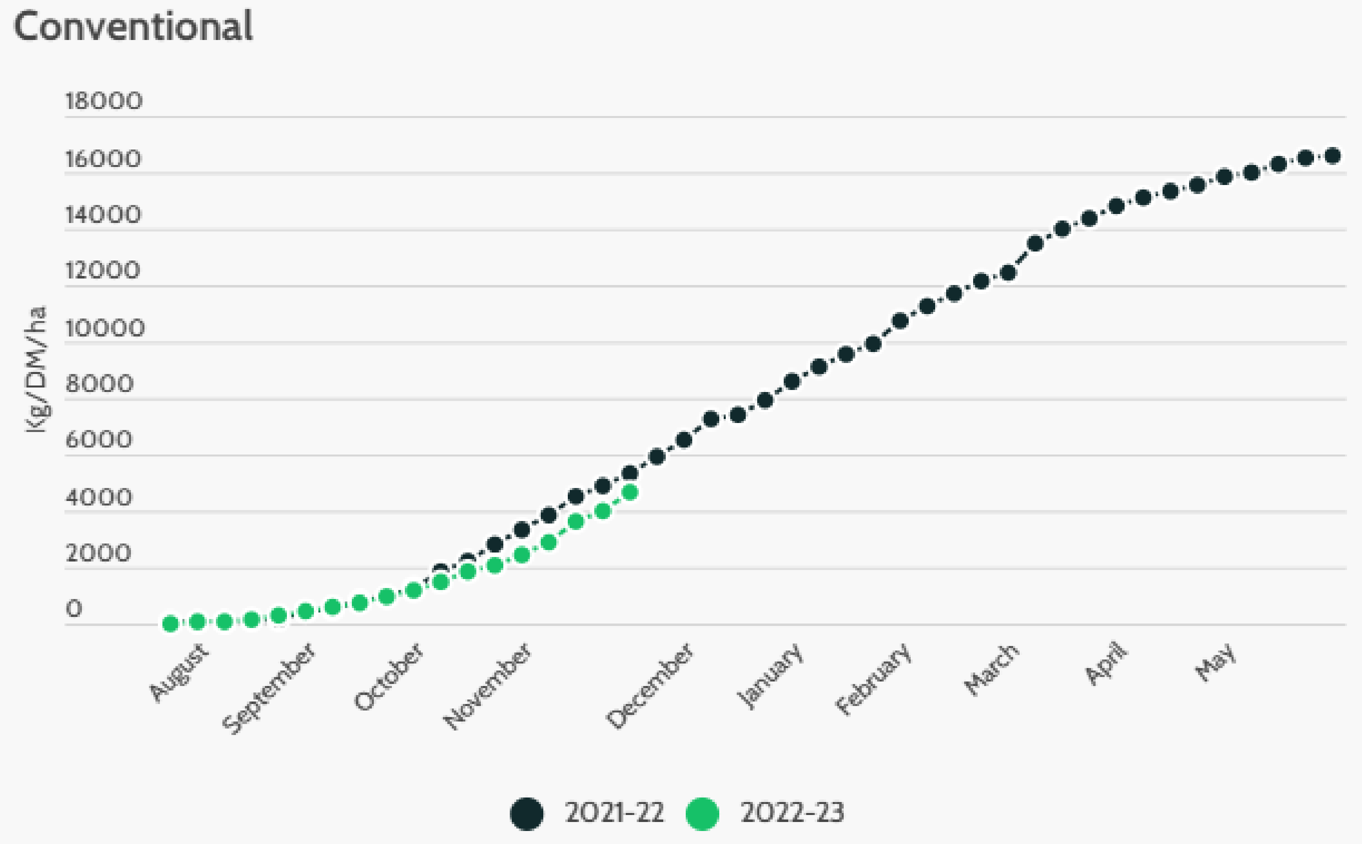
Daily Pasture Growth





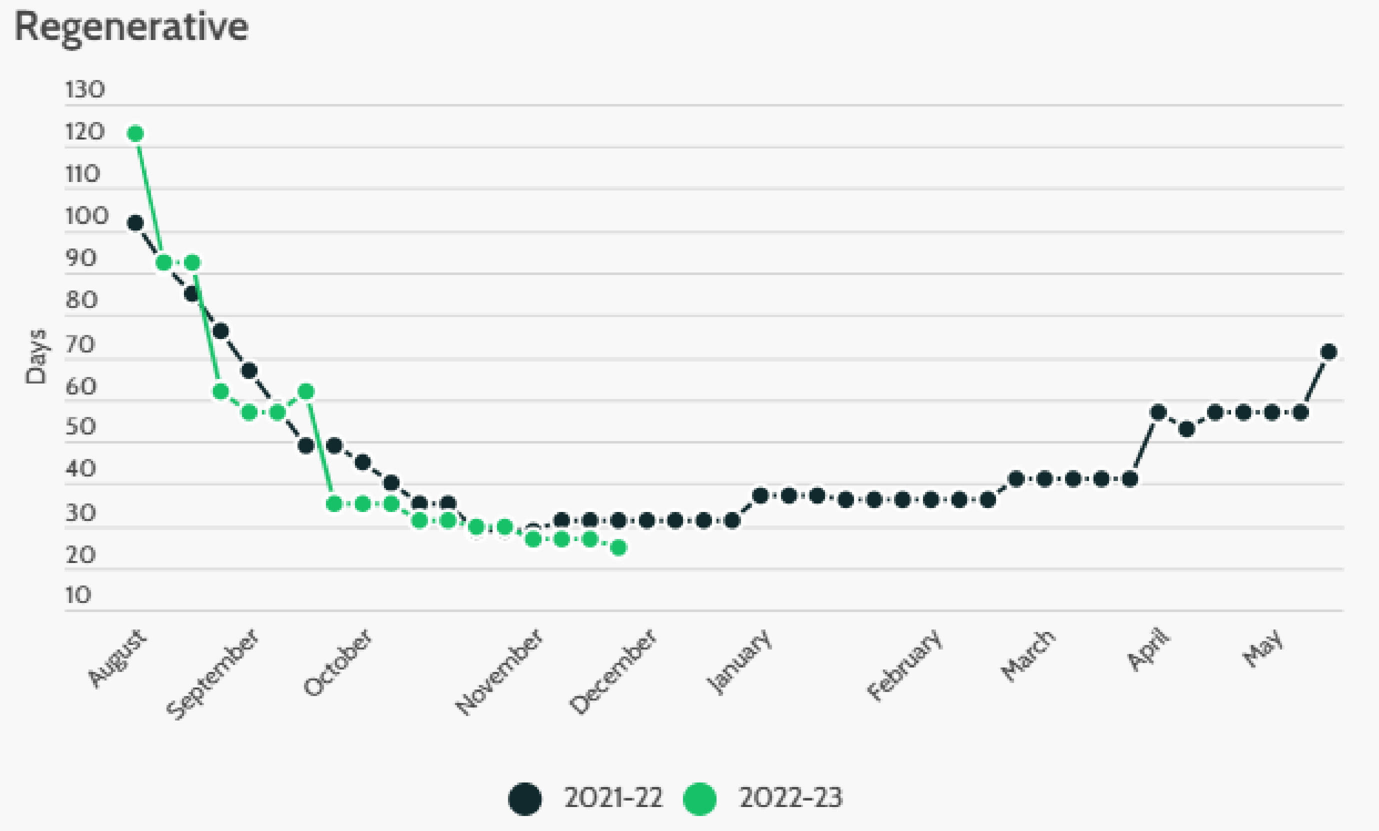
YTD Pasture Growth

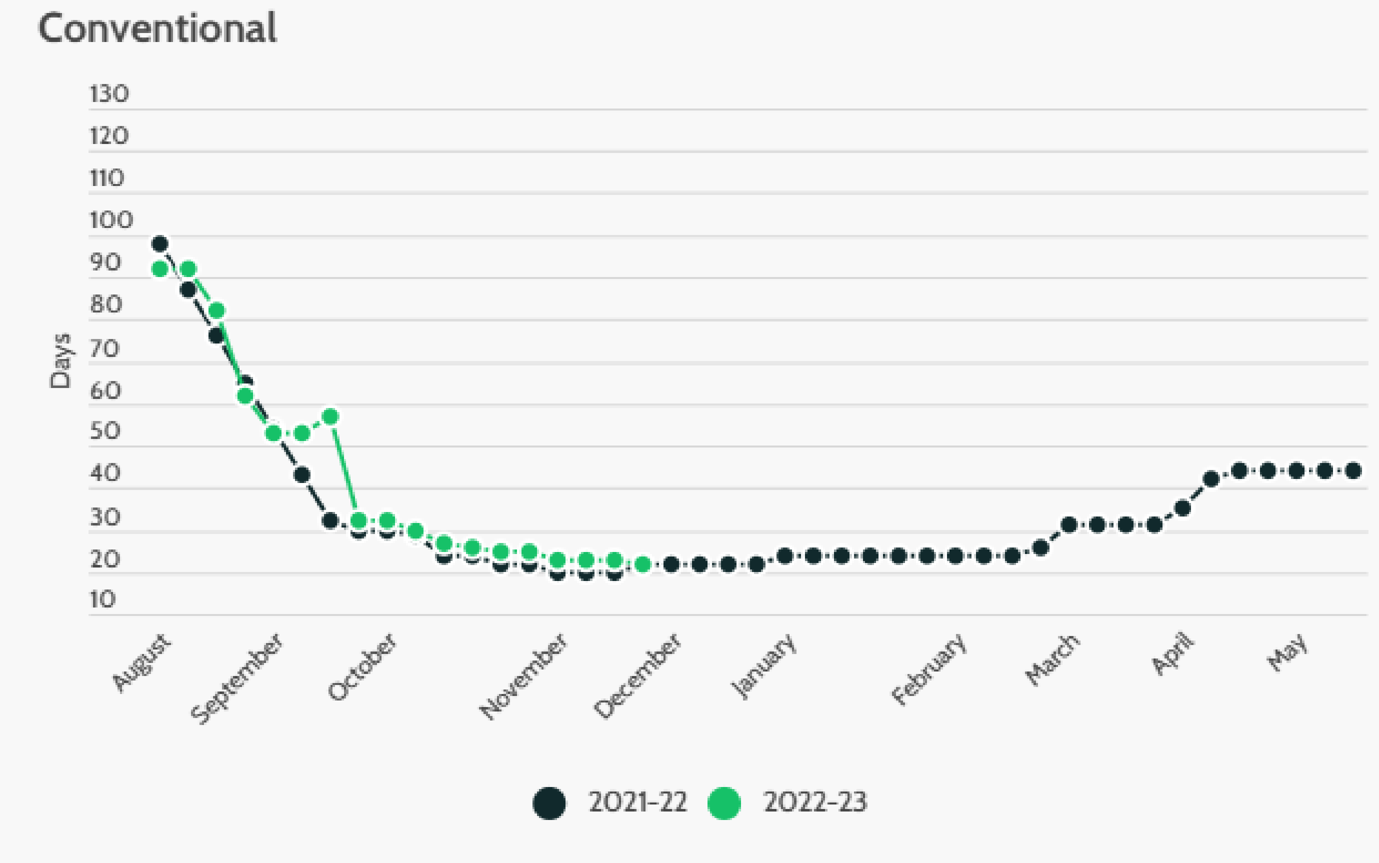




We did not plate meter at the beginning of the 2022-23 season due to extremely wet conditions on the farm and wanting to avoid unnecessary pasture damage. Monitoring began in week 7 and was estimated prior to that (and kept consistent for both sides)

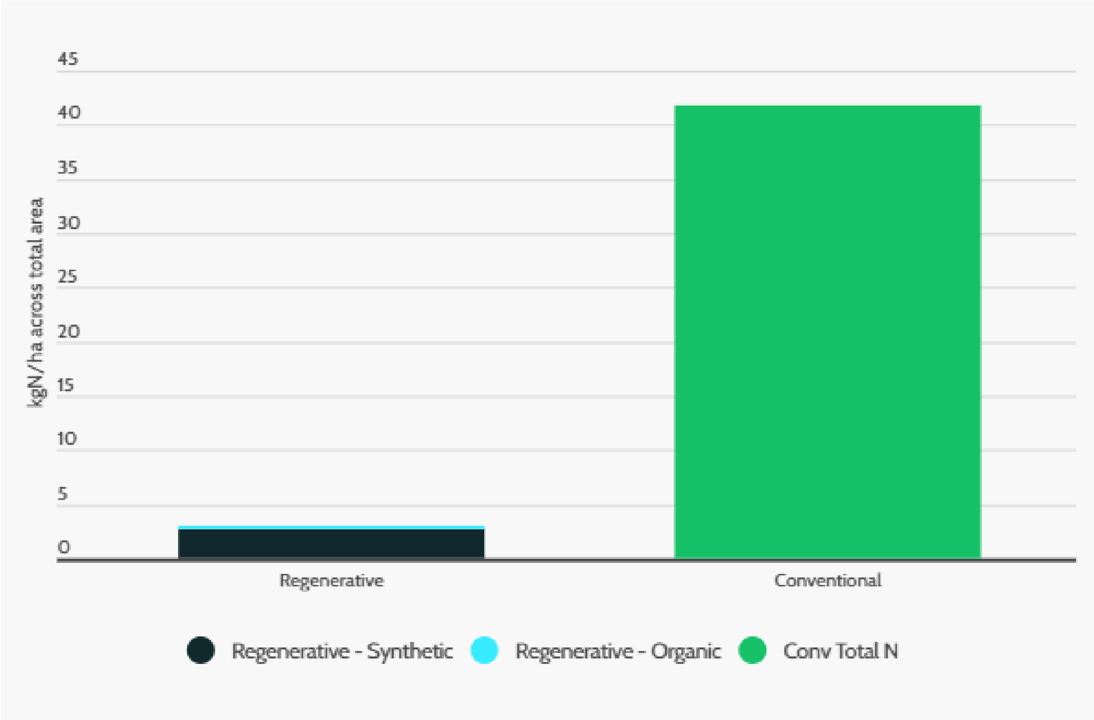
Round Length





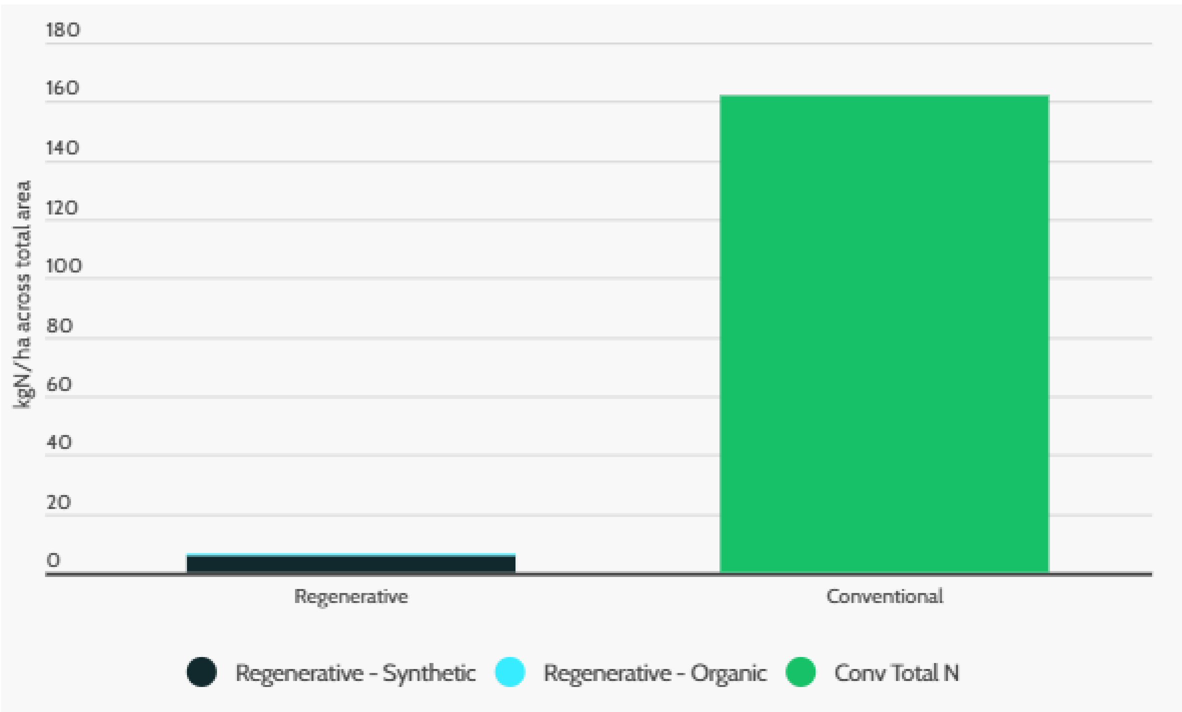
N Fertiliser

2022-23 YTD



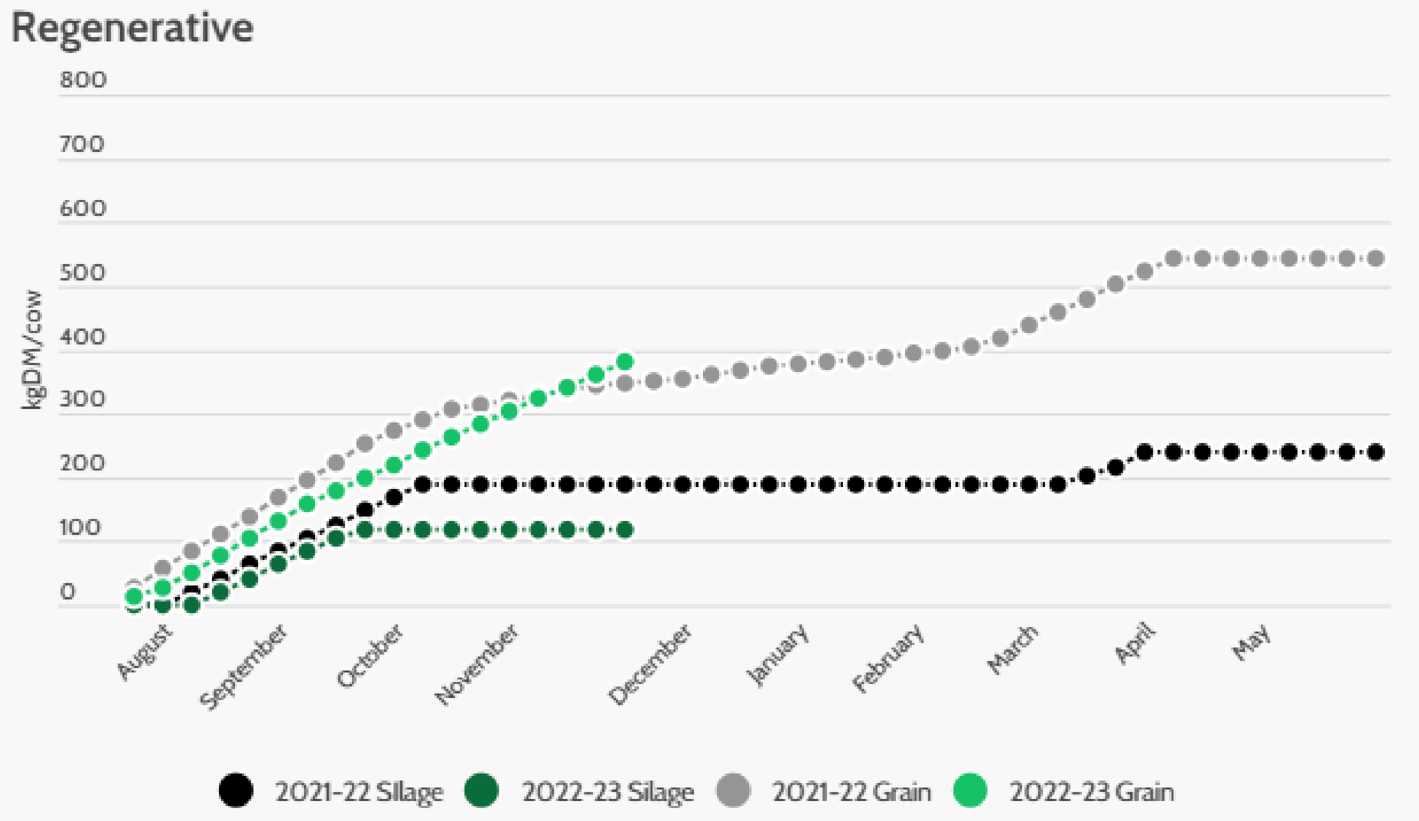
Regen Total:	3.1 kg N/ha	Conventional:	41.9 kg N/ha
Regen Synthetic	2.7 kg N/ha		
Regen Organic	0.4 kg N/ha		

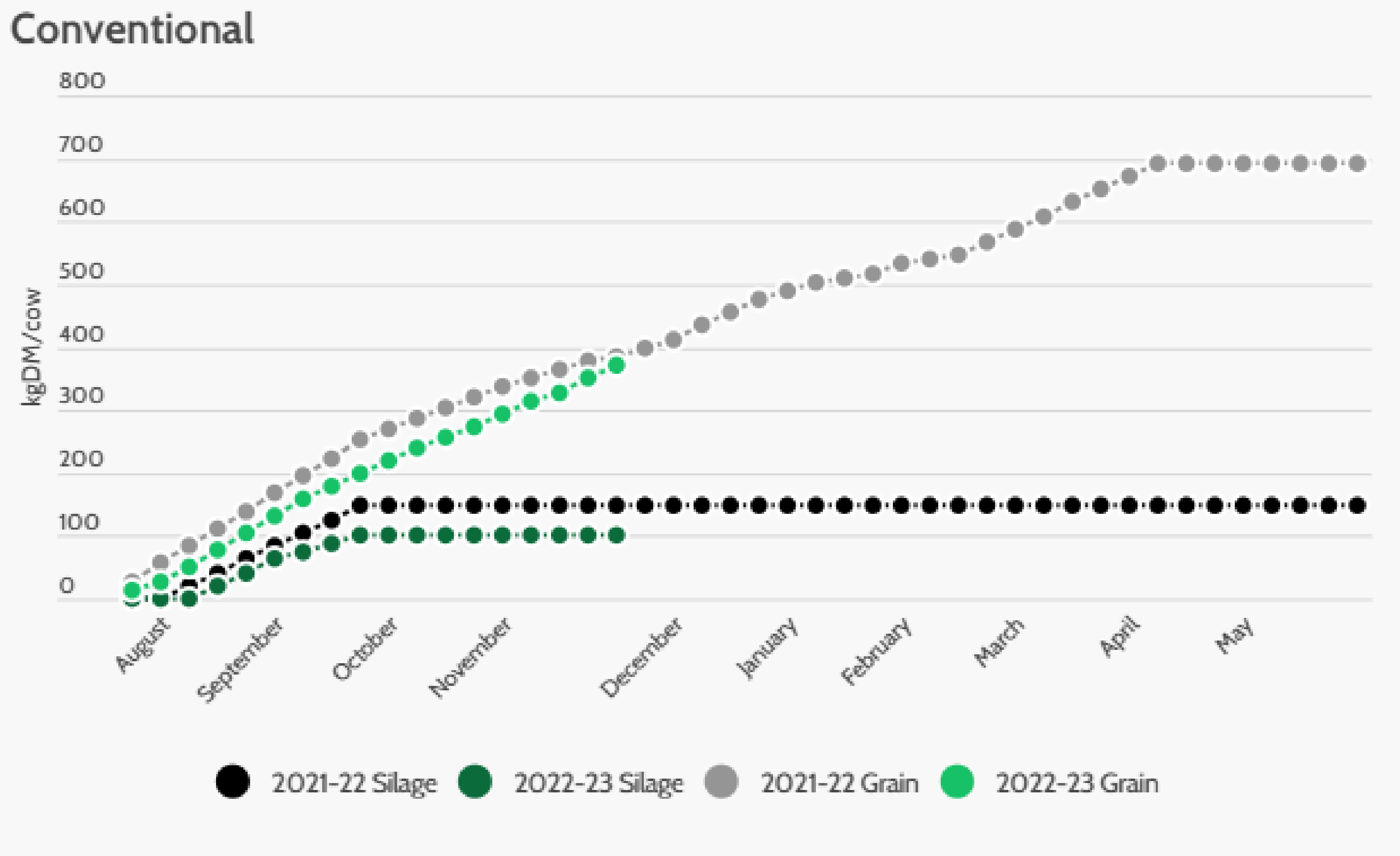
2021-22



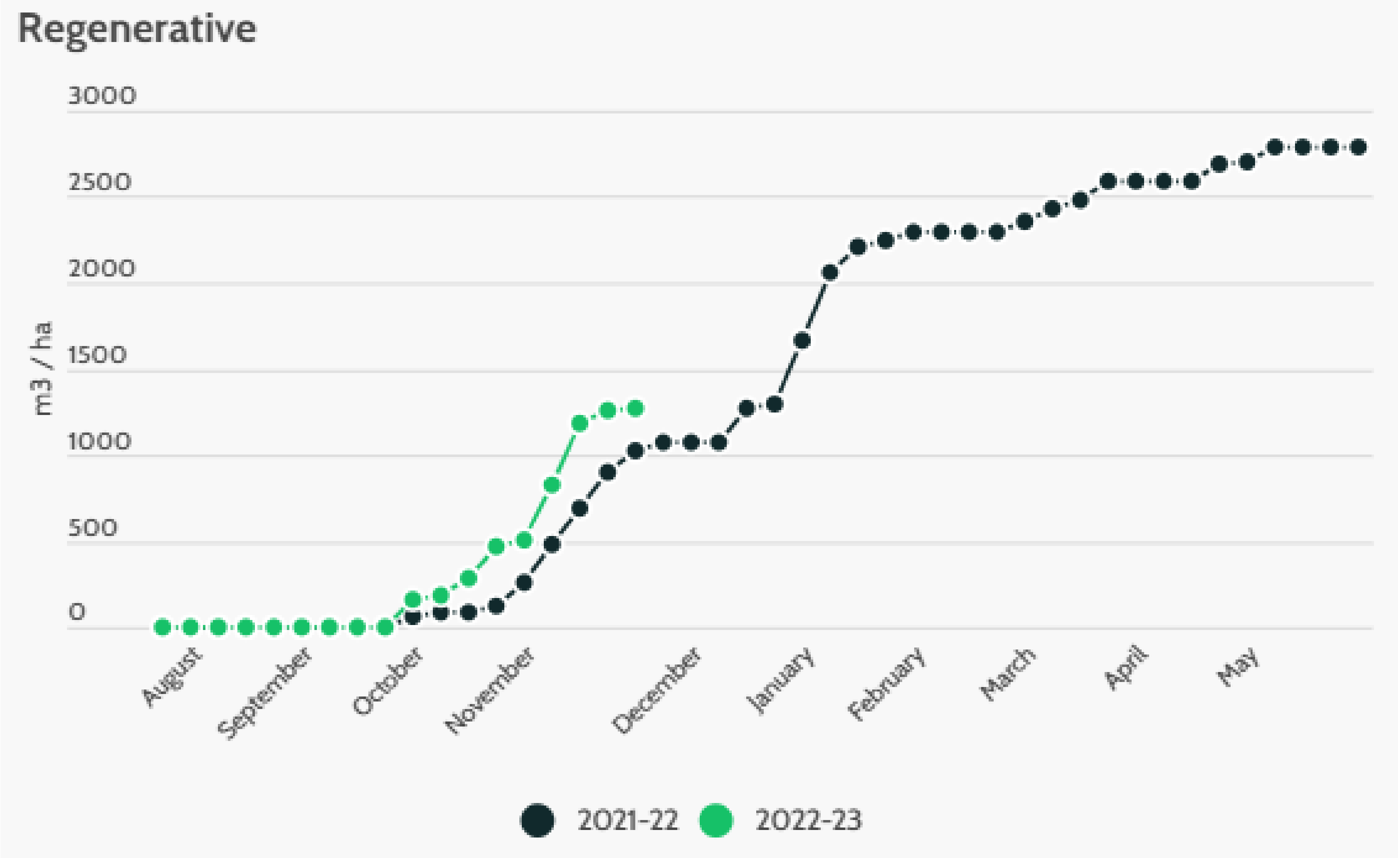
Regen Total:	6.4 kg N/ha	Conventional:	162 kg N/ha
Regen Synthetic	5.5 kg N/ha		
Regen Organic	0.9 kg N/ha		

Supplements Fed YTD

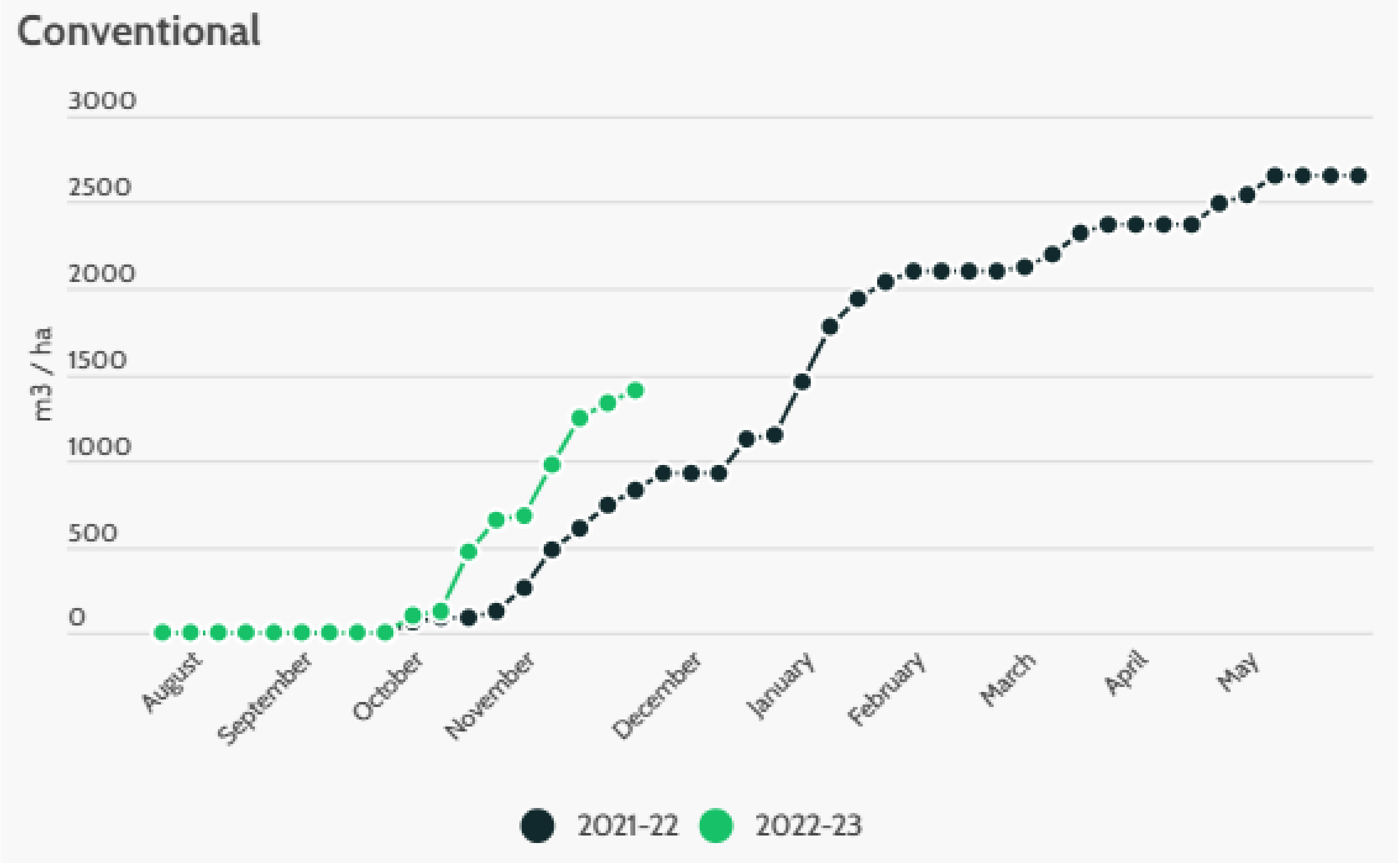




Irrigation

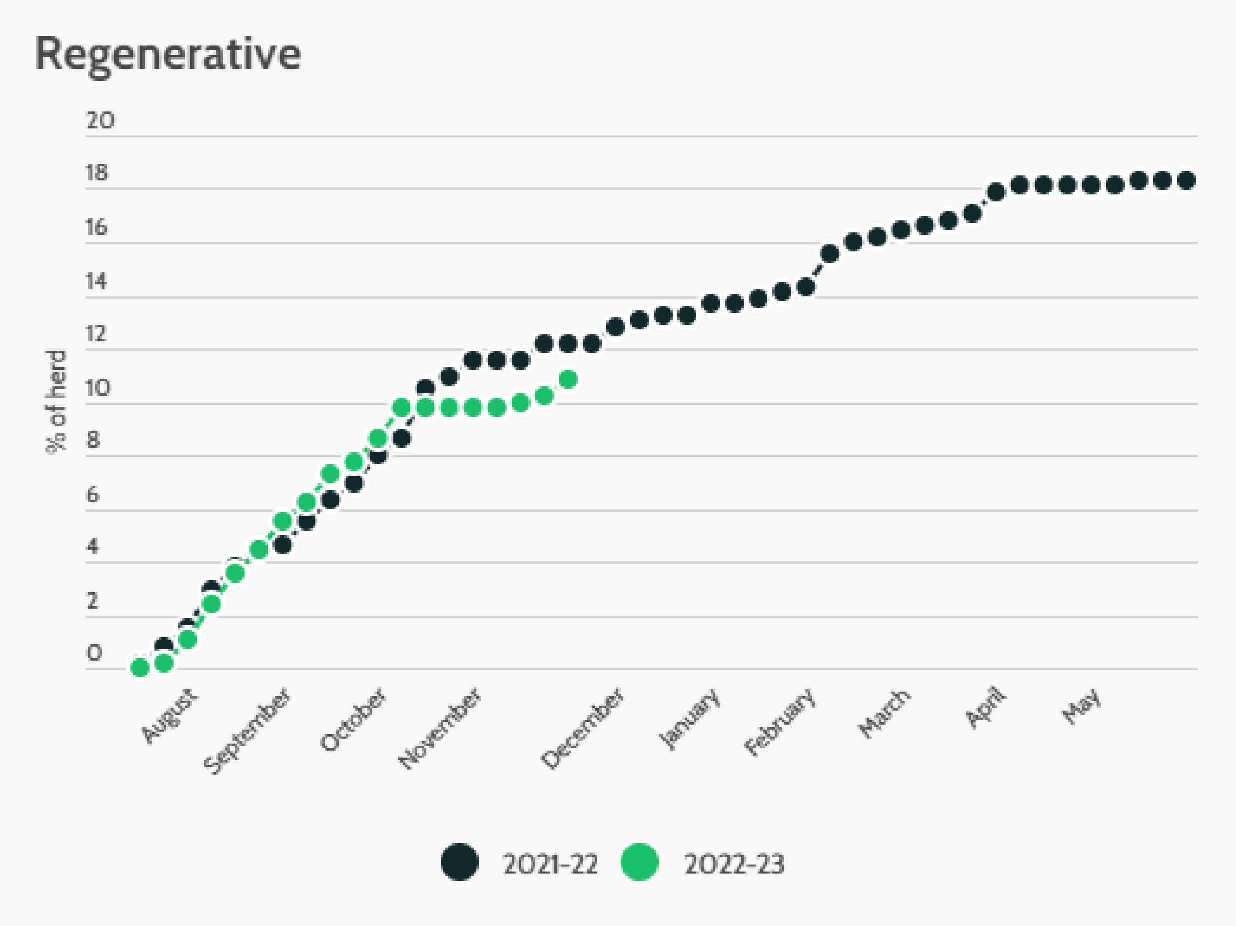


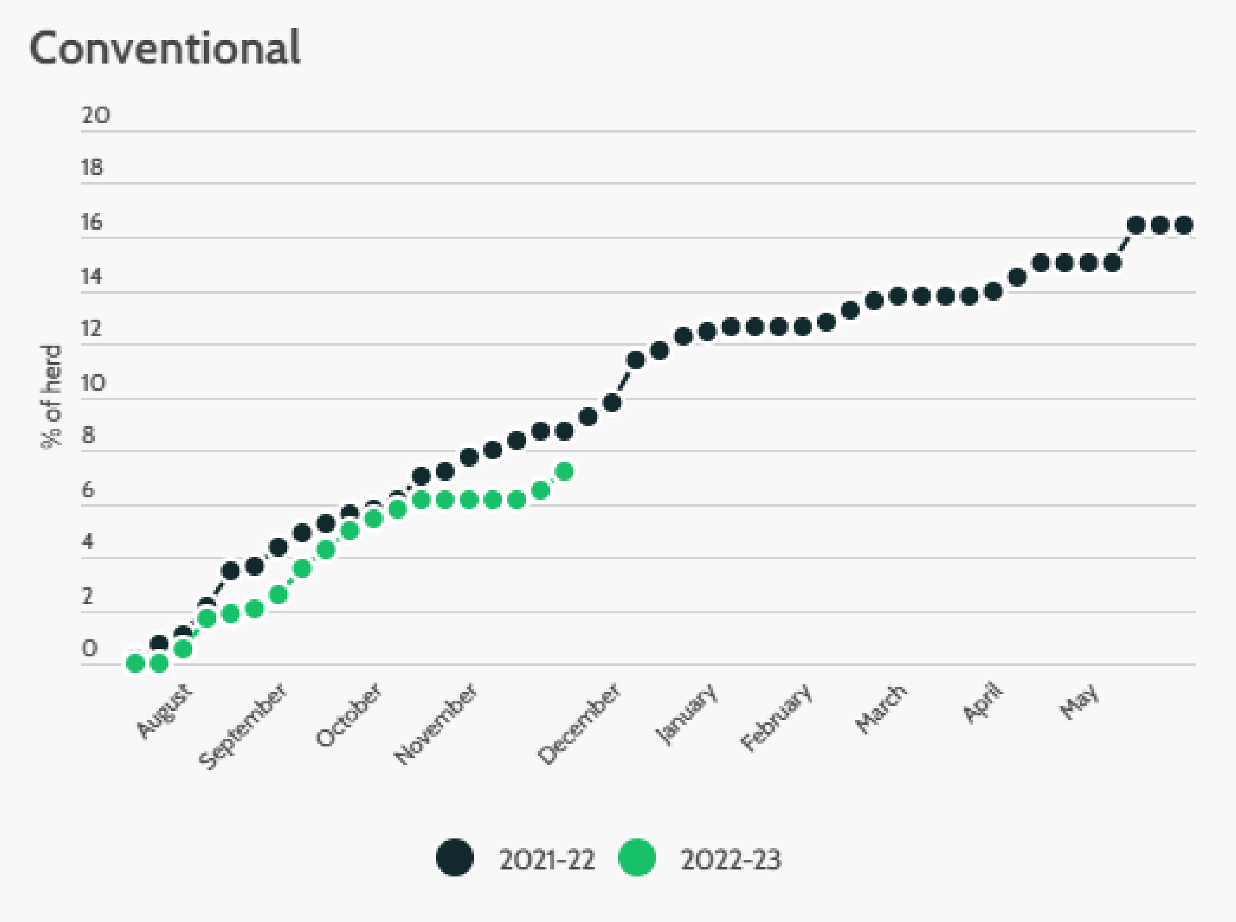
Regenerative
3000
2500
2000
1500
1000
500
0
m3 / ha
August
September
October
November
December
January
February
March
April
May
2021-22
2022-23



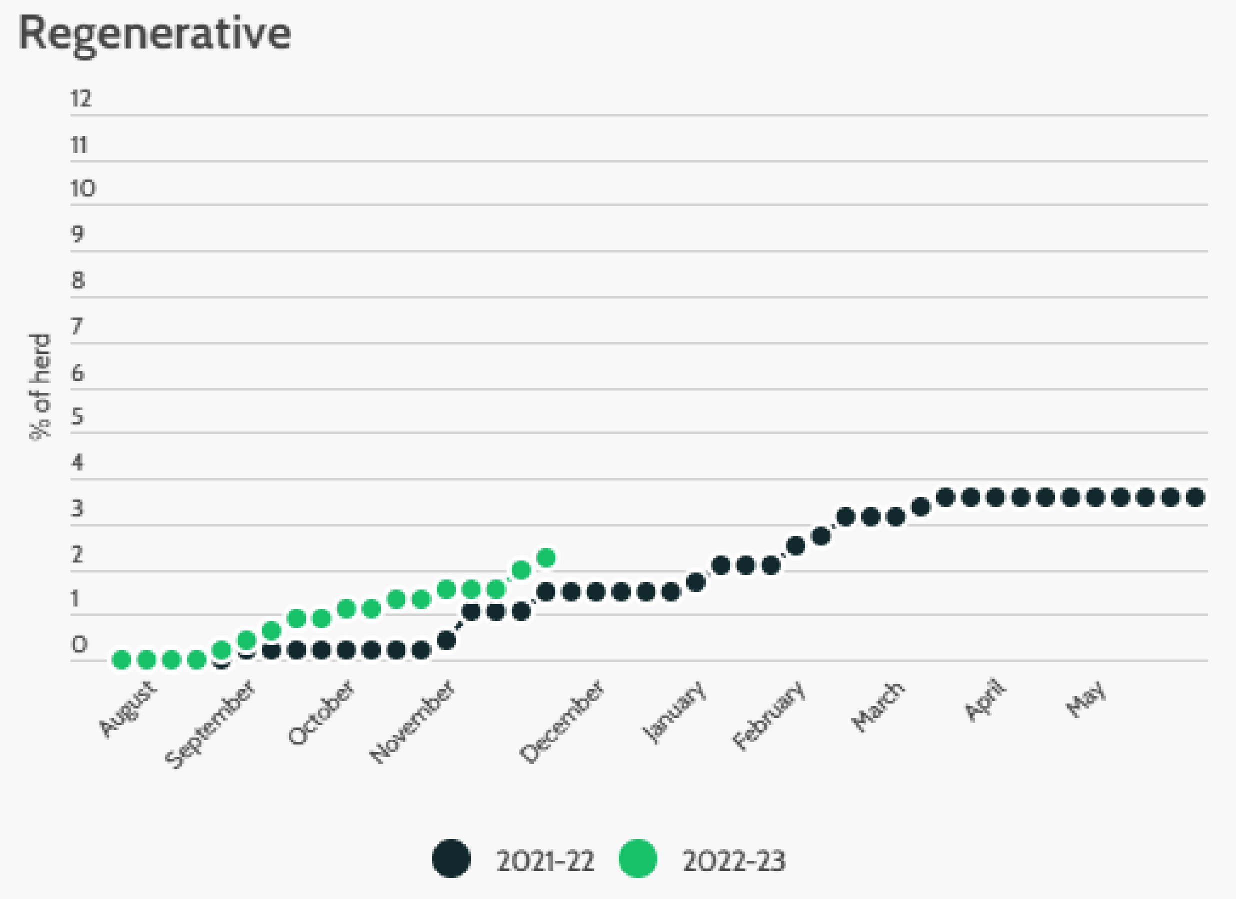
Conventional
3000
2500
2000
1500
1000
500
0
m3 / ha
August
September
October
November
December
January
February
March
April
May
2021-22
2022-23

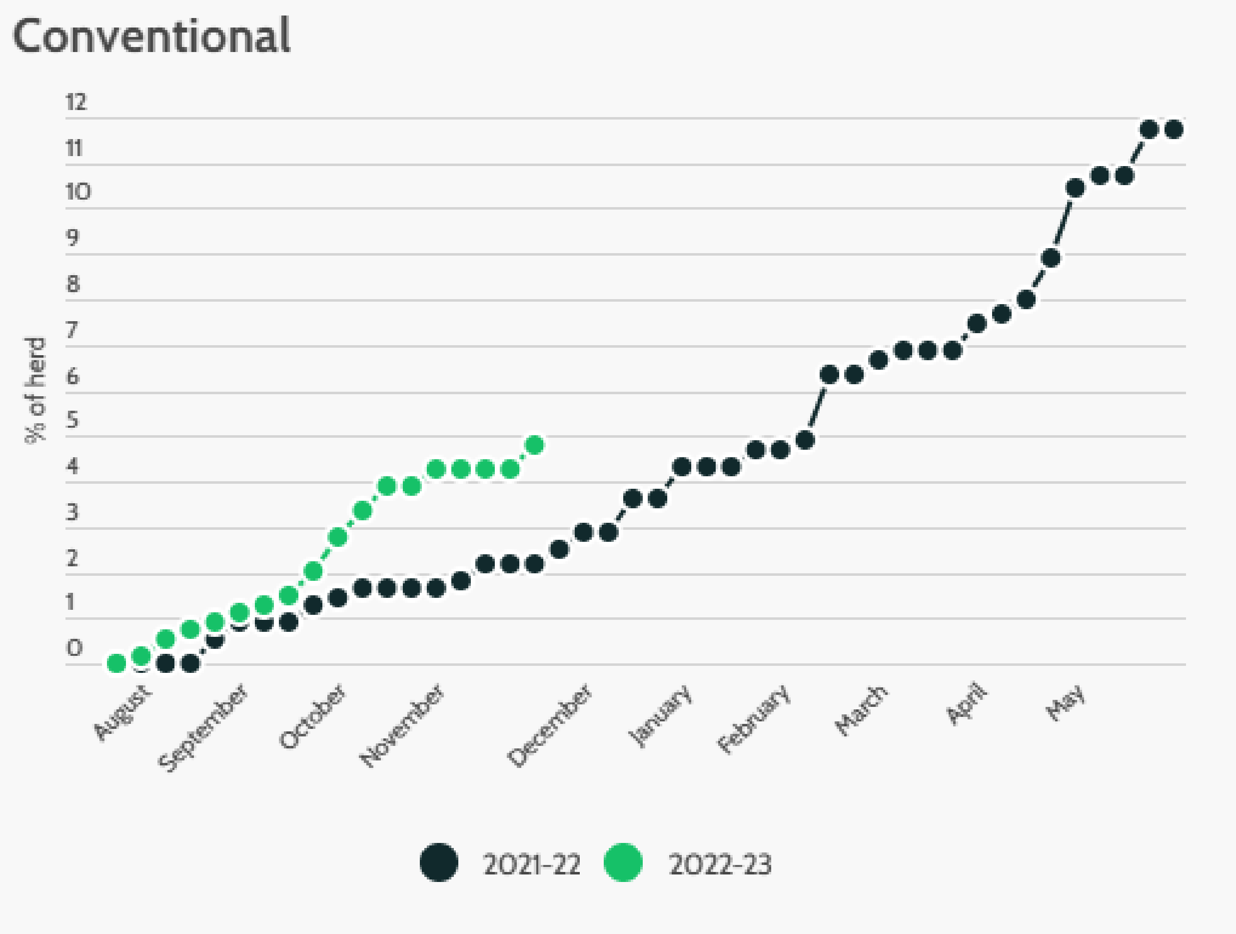
Mastitis


Regenerative
20
18
16
14
12
10
8
6
4
2
0
% of herd
August
September
October
November
December
January
February
March
April
May
2021-22
2022-23

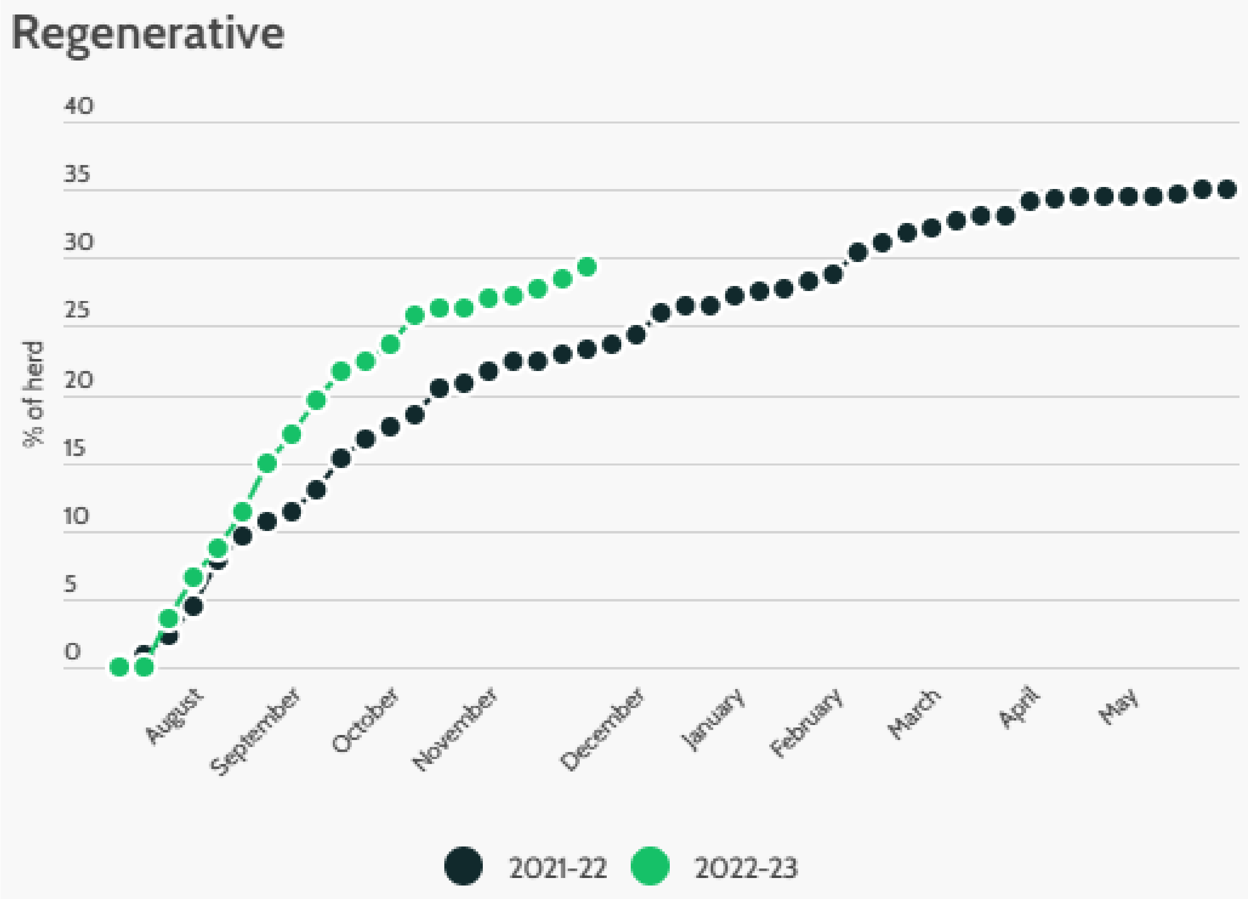

Conventional
20
18
16
14
12
10
8
6
4
2
0
% of herd
August
September
October
November
December
January
February
March
April
May
2021-22
2022-23

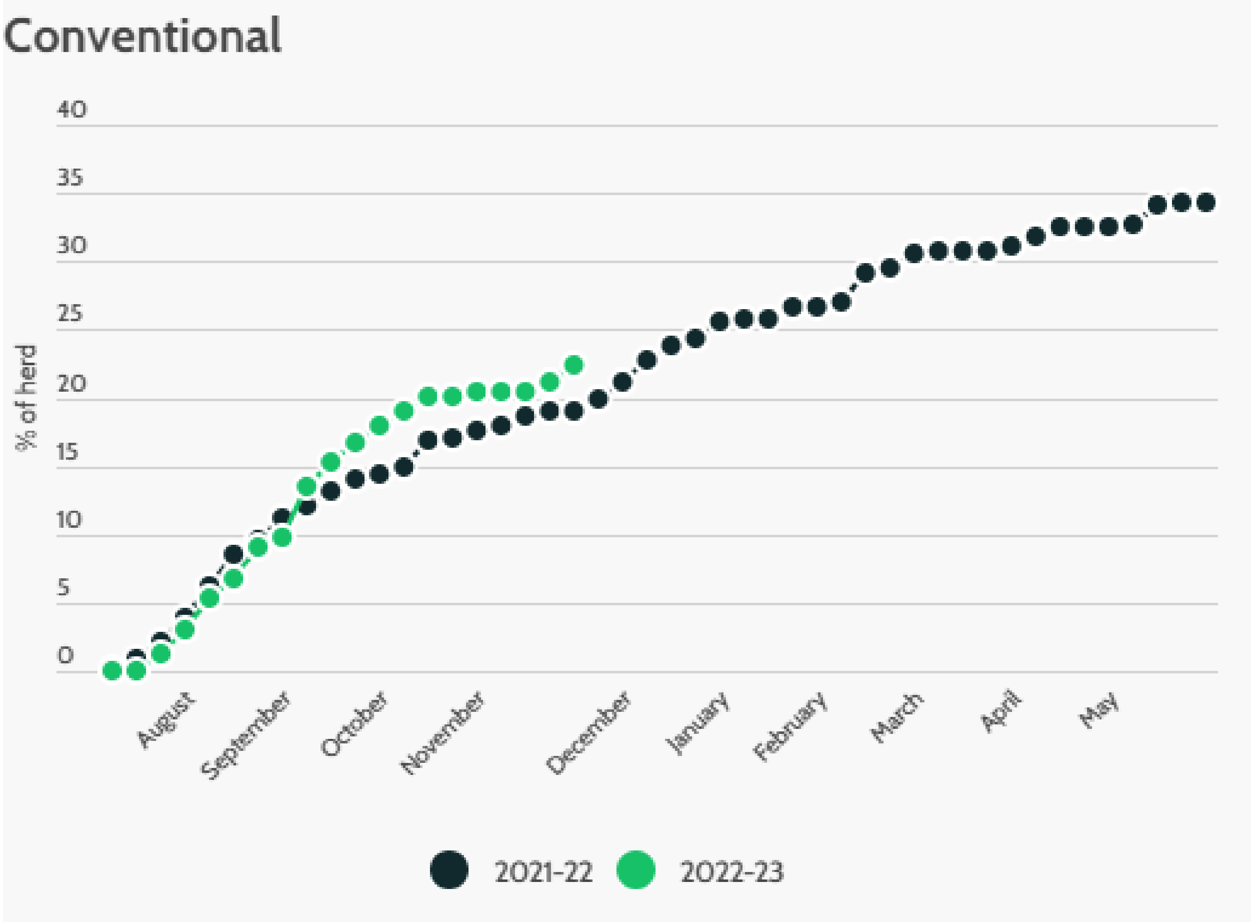
Lameness


Regenerative
% of herd
12
11
10
9
8
7
6
5
4
3
2
1
0
August
September
October
November
December
January
February
March
April
May
2021-22
2022-23


Conventional
% of herd
12
11
10
9
8
7
6
5
4
3
2
1
0
August
September
October
November
December
January
February
March
April
May
2021-22
2022-23

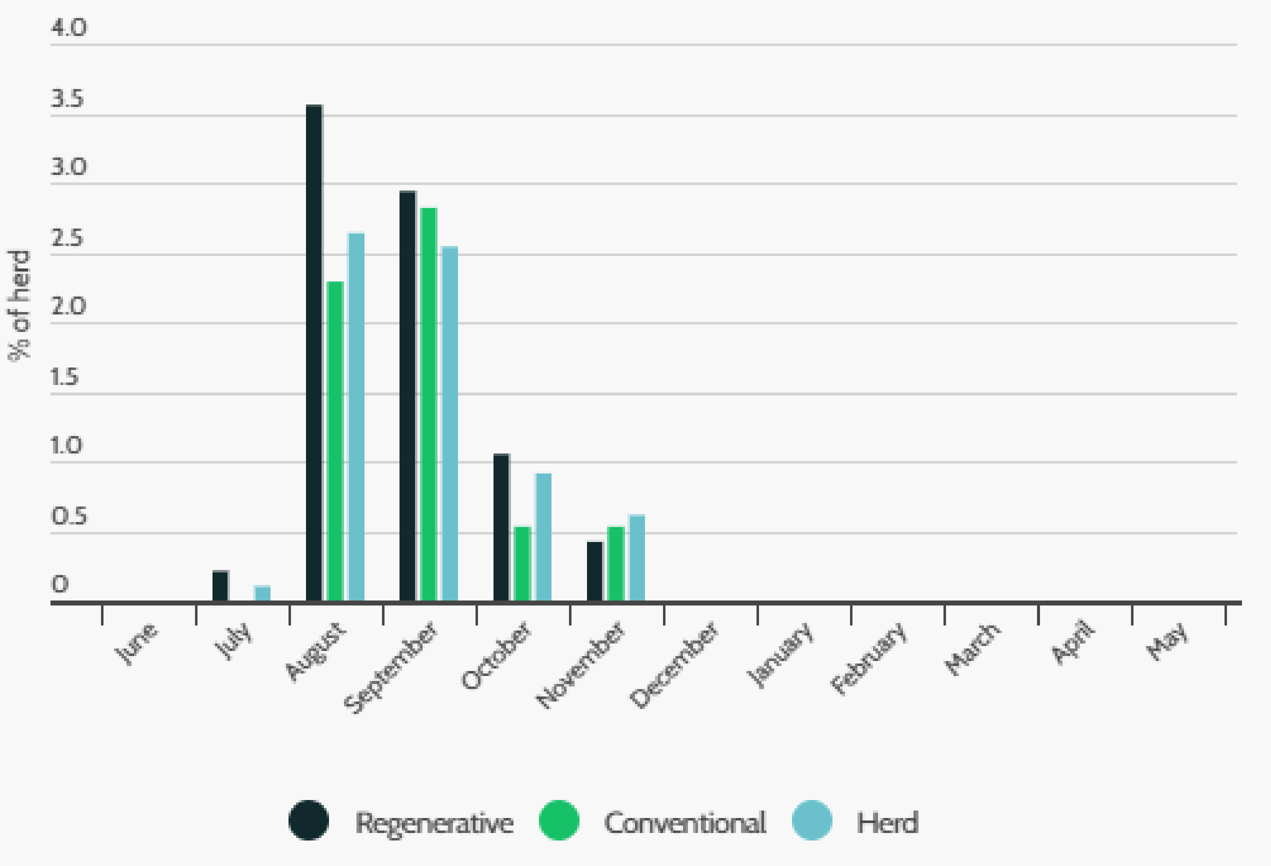
Animal Health Cases



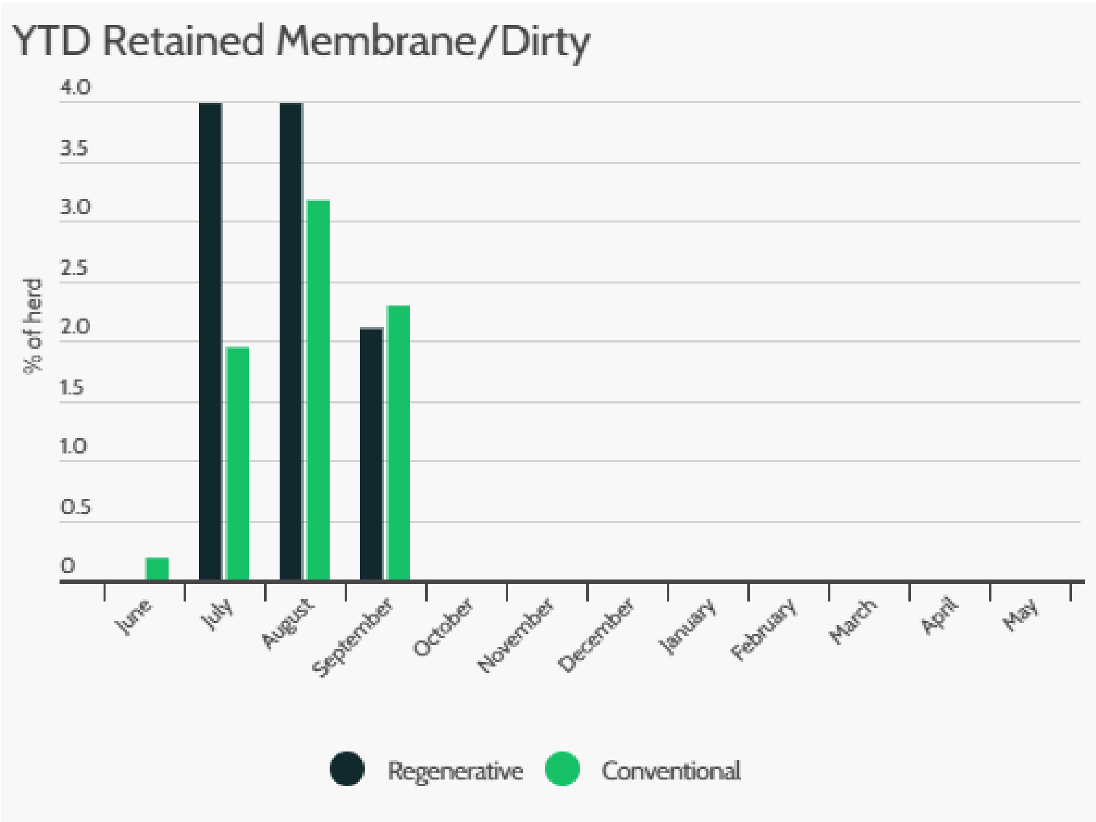


Animal Health Infovet Graphs

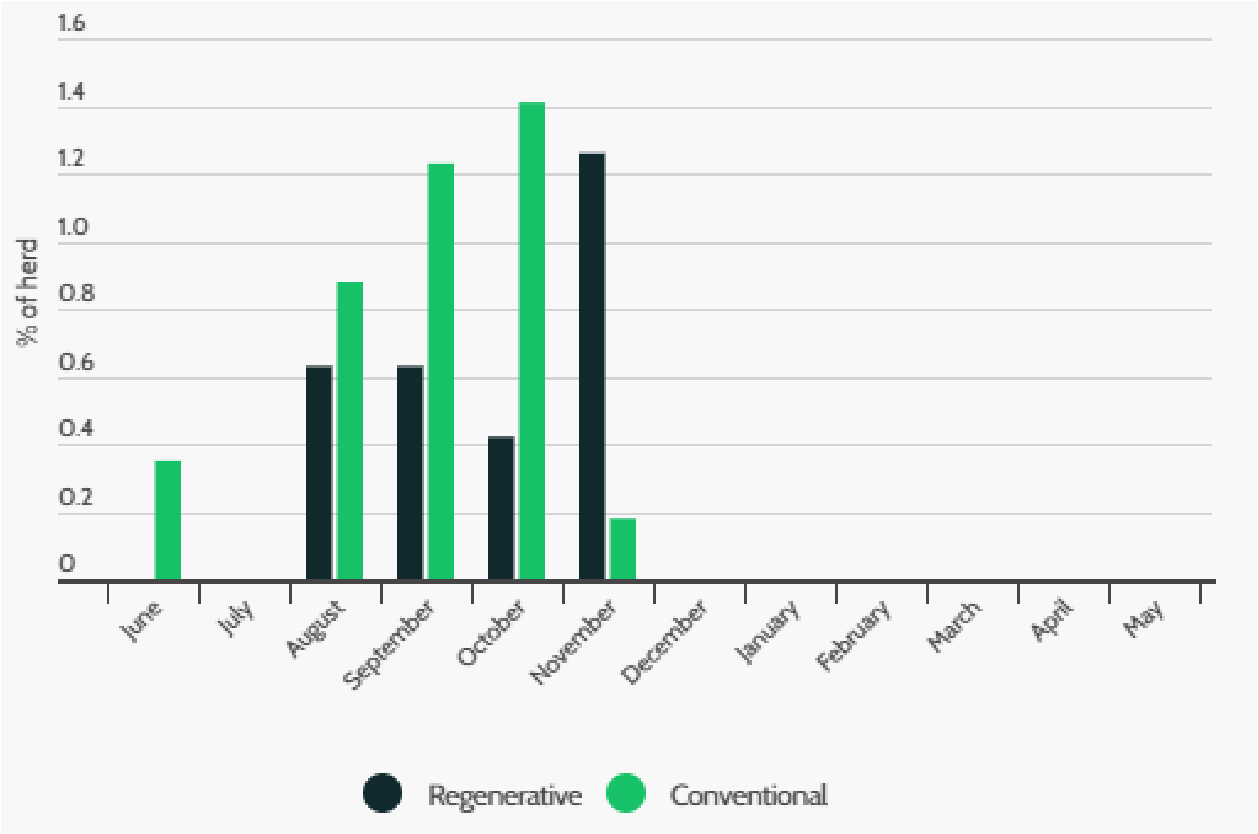
Mastitis Monthly Incidence



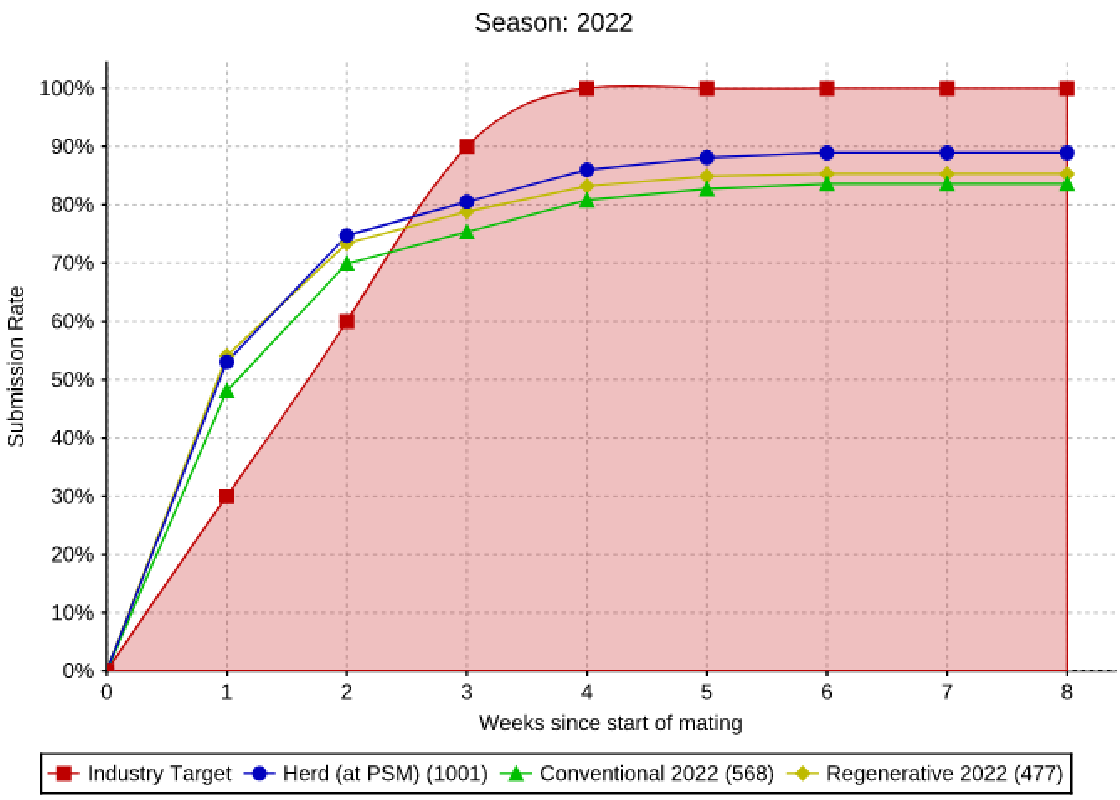
Retained Fetal Membranes



Lameness/Musculo-skeletal



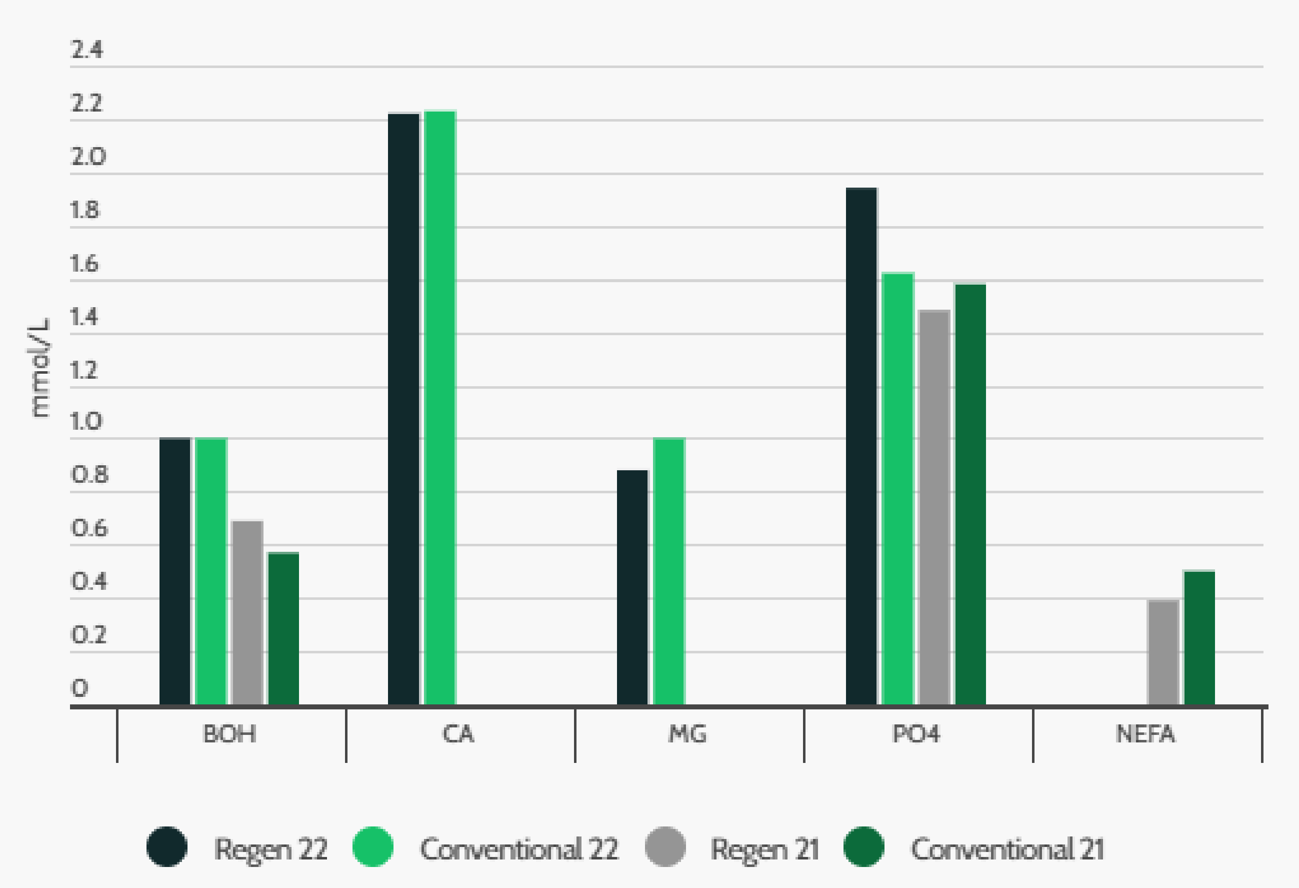
Submission Rates

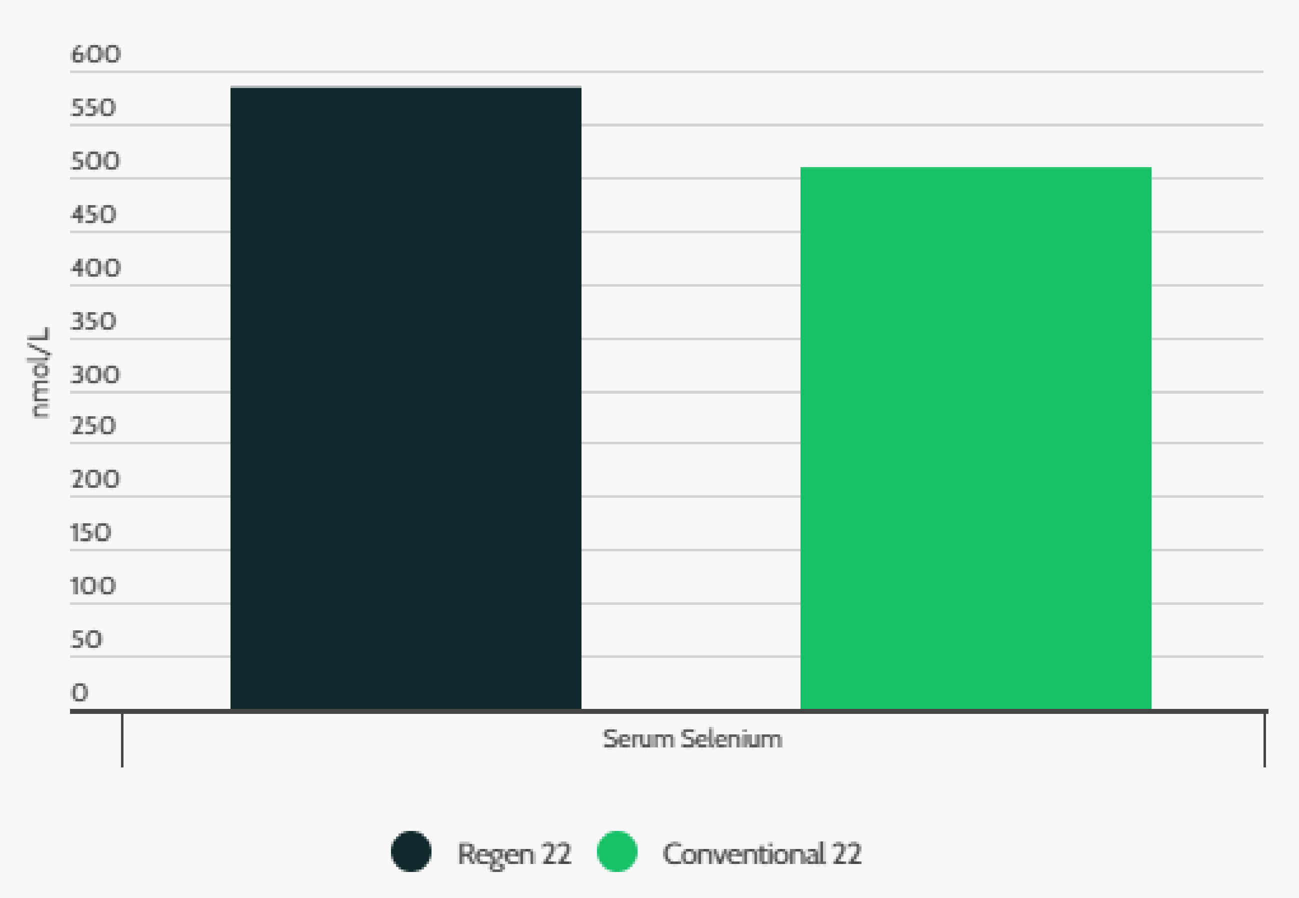


For those groups that are "at PSM" the report includes all animals present at PSM, even if they have since left the group, died, or been sold or culled.
Excluded are animals that had already died, or been sold or culled before PSM.

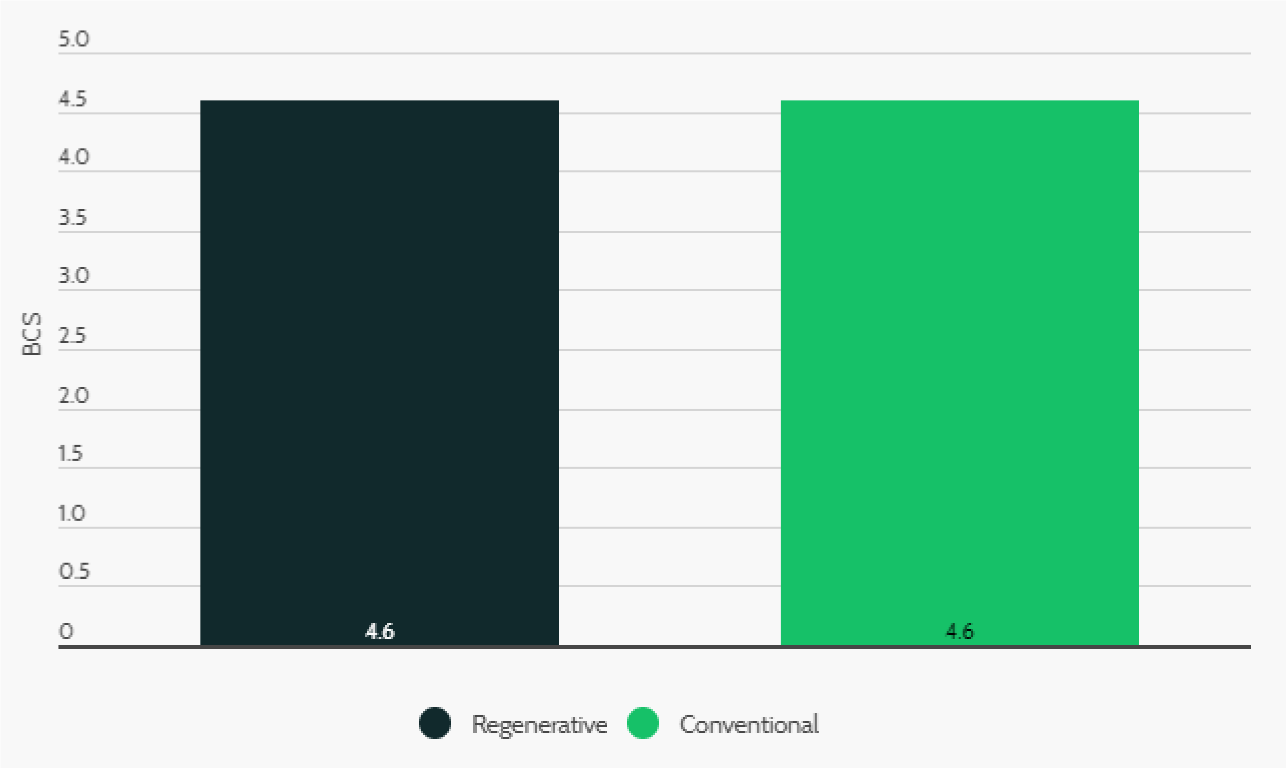
Graph shows cows whose first mating event for the season was prior to 8 weeks after PSM.

Bloods – August 2022

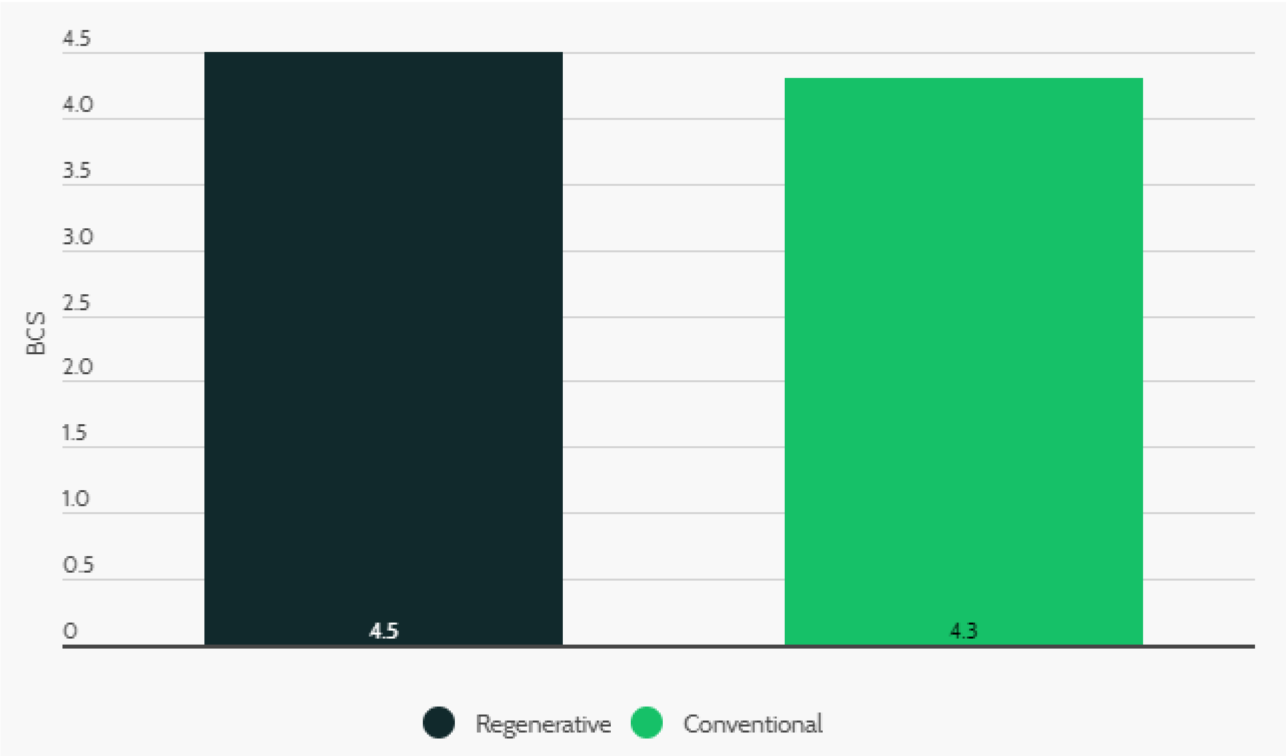




Body Condition Scores – August 2022



Body Condition Scores – November 2022



Diet Decoder – October 2022

We use 5th Agri Business's Diet Decoder model to get a deeper look at the quality of feed we are providing both the regenerative and conventional herd. Below is a summary of the data we receive, though the report is more in detail. Contact Clare at environment@alignfarrms.co.nz if you would like to see a full report. Diet is a key factor in the wellness and productivity of cows and the Diet Decoder is an excellent way to gain understanding of where you could improve.

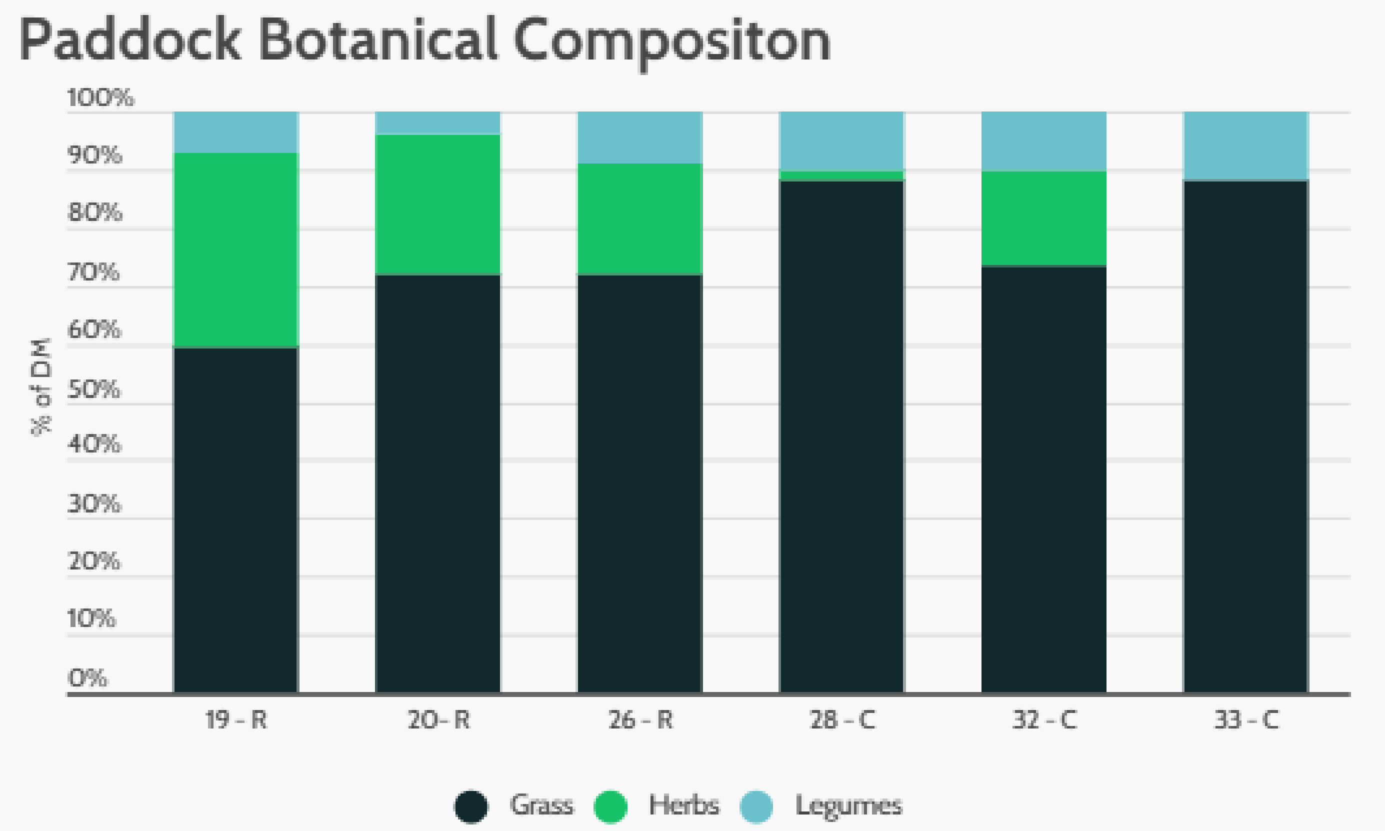
Five times a year we coordinate our animal health monitoring with herbage sampling to compare bloods and BCS with the current diet they are consuming, so adjustments can be made as required. We are sampling winter (1st week of July), Pre-Calving (first week in August), Pre-Mating (last week of September), Summer (1st week of February) and Autumn (End of April).

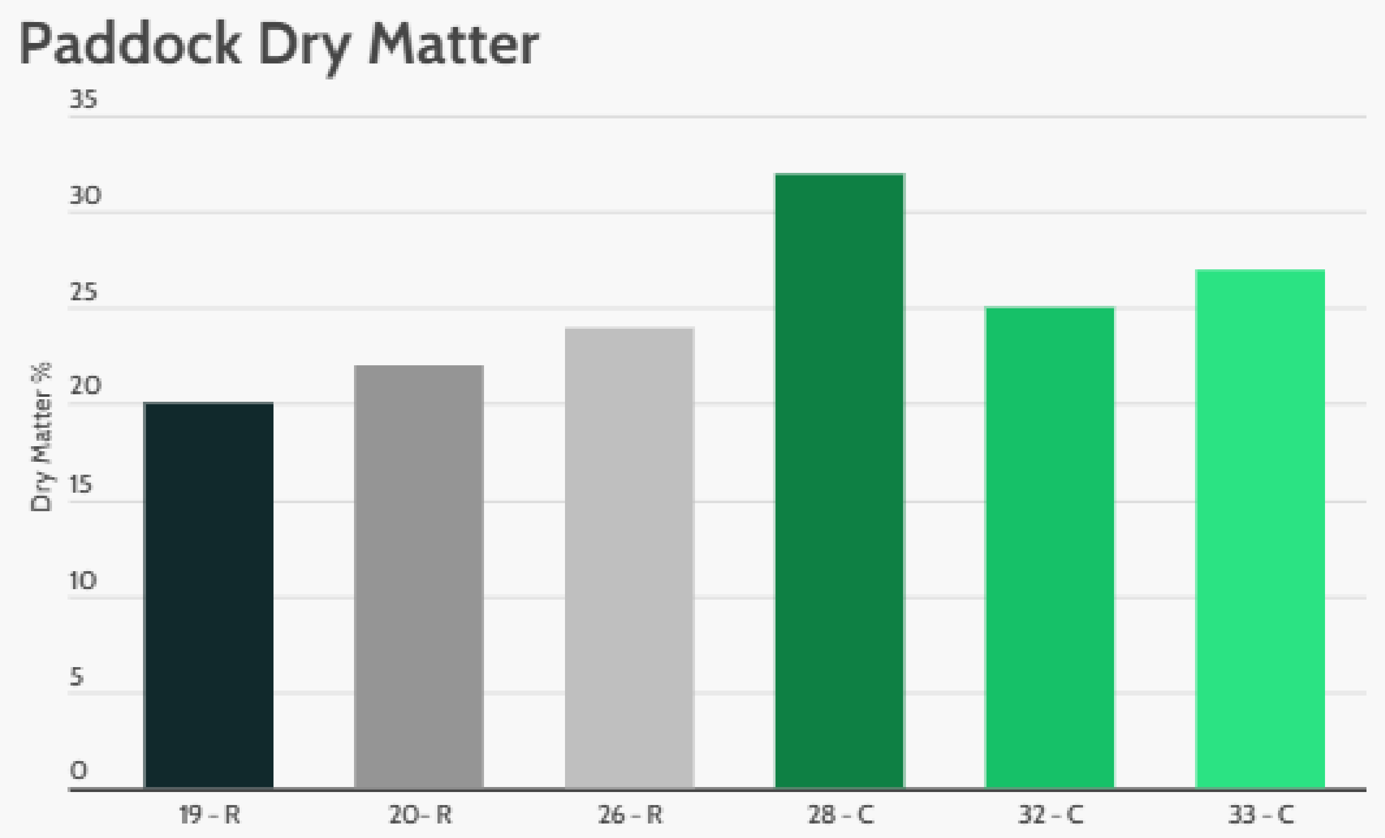
	Variable	Target Range	Conventional
Non Mineral Dietary Compositon	Crude Protein (% DM)	18-22 (% DM)	17.3
	Neutral Detergent Fibre (% D	35-45 (% DM)	34.6
	Sugars (% DM)	n/a	13.5
	Starch (% DM)	Max 25	9.5
	Fat (%DM)	3-5 (% DM)	3.3
	Metabolic Energy (MJ/kgDM)	11-13 (% DM)	12.5
Macro Minerals Profile	Phosphorus - P (% DM)	0.25-0.4 (% DM)	0.31
	Potassium - K (%DM)	2.5-3.0 (% DM)	2.1
	Sulphur - S (%DM)	0.21-.29 (% DM)	0.27
	Calcium - Ca (%DM)	0.6-1.0 (% DM)	0.57
	Magnesium - Mg (%DM)	0.26-0.30 (% DM)	0.17
	Sodium - Na (%DM)	0.15-0.3 (% DM)	0.17
	Chlorine - Cl (% DM)	0.25-1.19 (% DM)	0.51
Trace Minerals Profile	Iron - Fe (ppm)	100-250 ppm	362.0
	Manganese - Mn (ppm)	50-150 ppm	74
	Zinc - Zn (ppm)	30-50 ppm	15.98
	Copper - Cu (ppm)	10-40 ppm	4.2
	Molybdenum - Mo (ppm)	0.3-0.87 ppm	1.16
	Cobalt - Co (ppm)	0.3-9.9 ppm	0.23
	Selenium - Se (ppm)	0.3-0.49 ppm	0.03
	Iodine - I (ppm)	0.4-0.99 ppm	0.19

- Deficient
- Insufficient
- Satisfactory
- Excessive
- Toxic

	Variable	Target Range	Regenerative
Non Mineral Dietary Compositon	Crude Protein (% DM)	18-22 (% DM)	22.1
	Neutral Detergent Fibre (% D	35-45 (% DM)	30.4
	Sugars (% DM)	n/a	11.5
	Starch (% DM)	Max 25	9.2
	Fat (%DM)	3-5 (% DM)	3.6
	Metabolic Energy (MJ/kgDM)	11-13 (% DM)	12.5
Macro Minerals Profile	Phosphorus - P (% DM)	0.25-0.4 (% DM)	0.41
	Potassium - K (%DM)	2.5-3.0 (% DM)	2.7
	Sulphur - S (%DM)	0.21-.29 (% DM)	0.38
	Calcium - Ca (%DM)	0.6-1.0 (% DM)	0.76
	Magnesium - Mg (%DM)	0.26-0.30 (% DM)	0.21
	Sodium - Na (%DM)	0.15-0.3 (% DM)	0.14
	Chlorine - Cl (% DM)	0.25-1.19 (% DM)	0.69
Trace Minerals Profile	Iron - Fe (ppm)	100-250 ppm	112
	Manganese - Mn (ppm)	50-150 ppm	76
	Zinc - Zn (ppm)	30-50 ppm	23.6
	Copper - Cu (ppm)	10-40 ppm	8
	Molybdenum - Mo (ppm)	0.3-0.87 ppm	0.80
	Cobalt - Co (ppm)	0.3-9.9 ppm	0.09
	Selenium - Se (ppm)	0.3-0.49 ppm	0.02
	Iodine - I (ppm)	0.4-0.99 ppm	0.1

Botanical Sample – November 2022





Annual Pasture Growth

We graphed the cumulative grass growth of each paddock on the farm, for the full year and in 4-month intervals. Our conventional paddocks are green, our regenerative paddocks with diversity are black, and our regenerative paddocks that are still in ryegrass/white clover are blue. We did put a small amount of synthetic N on these blue paddocks as growth was so dismal in the first few rounds.

Paddock 3 : 8 kgN/ha

Paddock 4: 16 kgN/ha

Paddock 5: 31 kgN/ha

Paddock 6: 16 kgN/ha

This equated to 5.5 kg/ha of synthetic N applied to the entire regenerative side. The diverse paddocks received 0.9 kgN/ha in the form of fish hydrolysate.

The conventional paddocks received 161 kgN/ha.

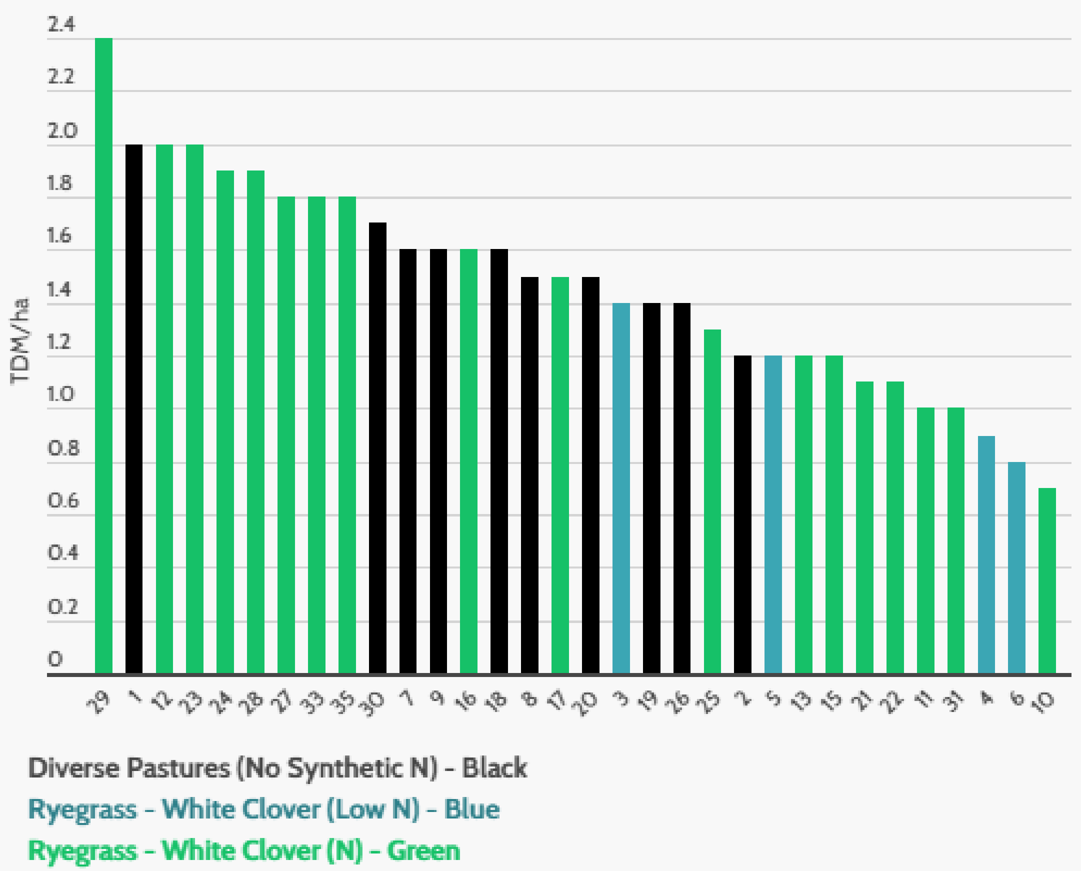
From the full season perspective, 3 of the bottoms 5 are blue paddocks, and all four are in the bottom quarter. We had very poor performance in these paddocks and that makes sense due to the lack of diversity or conventional amounts of urea to make them perform. This graph gives us additional confidence in diverse pastures without synthetic N, as they are 2 of the top 5 so there is definitely some interesting possibilities in this space.

By splitting the graphs into spring, summer and autumn it is easy to see the variation that occurs throughout the season and why the diverse pastures have increased our pasture curve in the summer months.

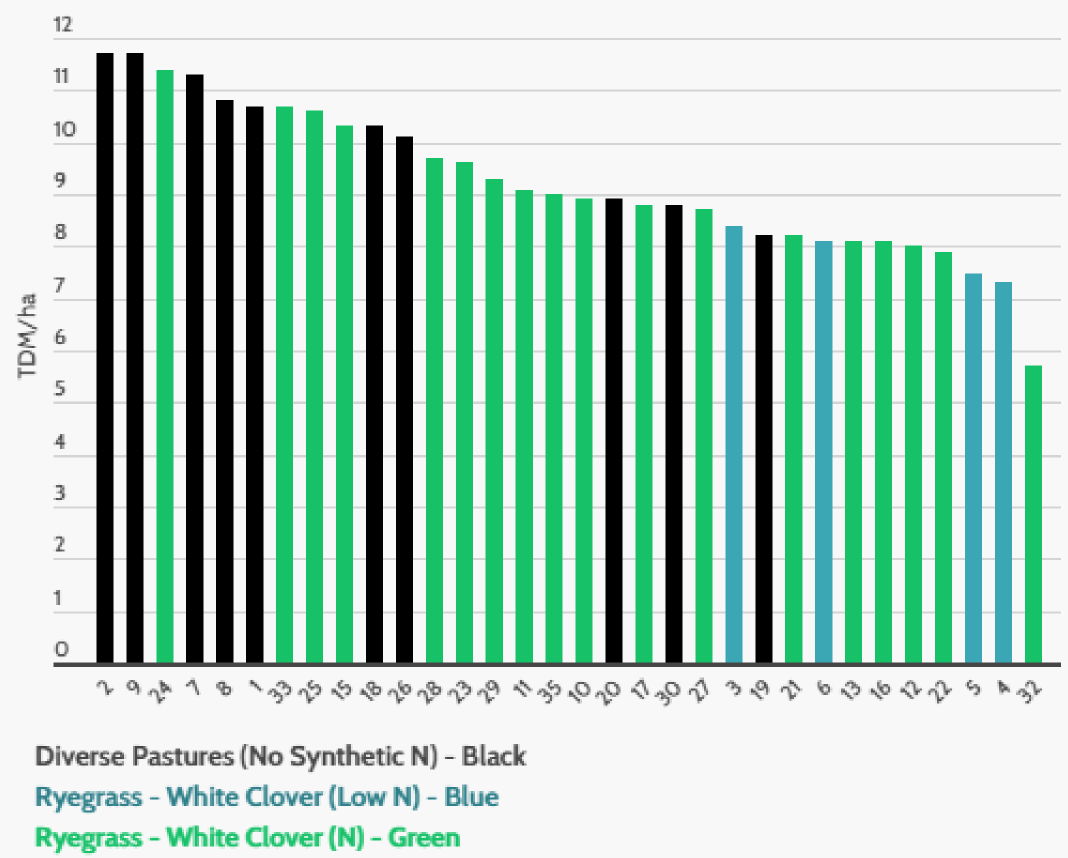
The diverse paddocks perform adequately in the spring, superbly in the summer and under performed in the autumn. The regenerative paddocks that were in ryegrass white clover were in the bottom quarter consistently. We intended to keep 1 or 2 paddocks like this for the remainder of the trial just to observe what happens for interest's sake, but currently we would not recommend farmers drop out their nitrogen without increasing diversity first.

Annual Growth Per Paddock

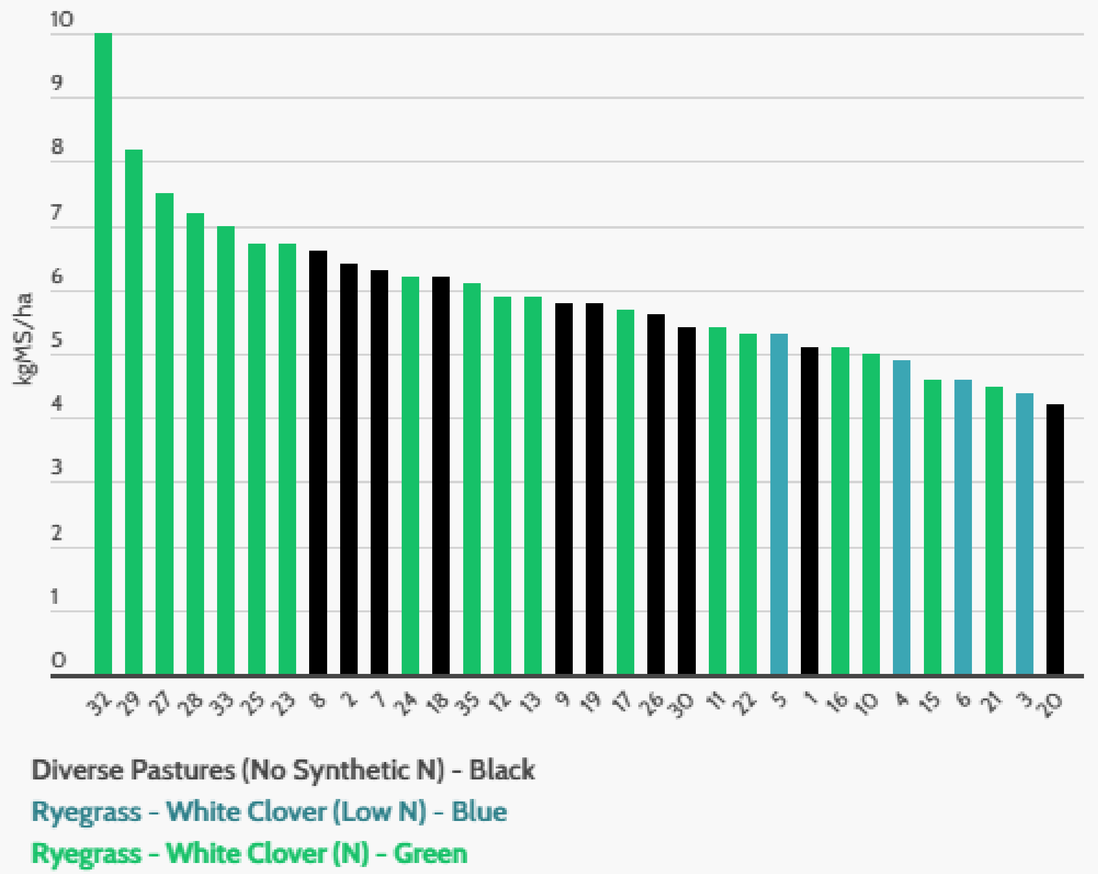
Spring (July-October) Growth Per Paddock



Summer (November-February) Growth Per Paddock



Autumn (March - June) Annual Growth Per Paddock



Fertiliser

Our soil fertility levels started sub average, in 2017 we had Olsen P's from 14-30 and PHs – sub 5.9 @ 75mm depth. This was based on historic management, re-development of paddock shape and earthworks and managing costs through the low payout years. Our major issue since the beginning has been compaction, tight soils, unable to breathe thus very reliant on N inputs to produce. Our P levels are in similar range now as we have invested money into Ca, K and trace elements or our low hanging fruit essentially. Each year we work to a set budget and we best move within the parameters we can. We have taken a lot of $ from N to spend in other areas and we believe we are seeing better performance from doing so. Our soils have shifted from being as reliant on inputs as they once were, they are in a much better biological state than 2018. In most cases we have gained OM over a 5 yr trend on both sides of the trial. K has gone from double digits in ppm to triple digits. We have plenty of room to improve on both sides but the Regen side is stacking up significantly more viable if we can maintain current positive trends in fertility. Mehlic III's have gone from mid 40's to consistent 70-80's, we are able to sustain plant & animal demands.

Combined Regen Crop Stimulants 148ha:

Liquid/foliar:	**Rate**	**Cost/ha**	
Fish hydrolysate	8l/ha	$14	
EM	5l/ha	$11	
Calcinit	10kg/ha	$10	
Seaweed extract (powder)	0.1kg/ha	$2	
Fulvic Acid	0.2kg/ha	$1.6	
Cobalt	0.1kg/ha	$3.5	
*Molybdenum	50grams/ha	$0.5	
Boron (DOT)	1.2kg/ha	$4.8	
Total		$47.5	$285
Spreading			$207
Total foliar			**$426**

Solid/granular:	**Rate**	**Cost/ha**	
FosSul (9%P, 4.8%S)	170kg/ha	$109/ha	
Phosta K (30%)	80kg/ha	$48/ha	
			$157
Spreading			$24
Total (liquid + solid)			**$607/ha**

Other notes:
*Moly only once
*SOA + pig manure: tools on select pdks that haven't been planted into diverse pastures yet (transition tool)
*EM moved to $2.42/L so moved $1.1/ha

Conventional 148ha

Liquid/foliar	Rate	Cost/ha	
9 x rounds of Urea	30-45kg/ha	$40-60/ha	$450/ha
2 x Trace rounds			
Fulvic Acid	0.2kg/ha	$1.6	
Cobalt	0.1kg/ha	$3.5	
Copper	0.5kg/ha	$5.5	
Zinc	1kg/ha	$3.7	
Seaweed	0.05kg/ha	$1.1	
*Molybdenum	50grams/ha	$0.5	
Boron (DOT)	1.2kg/ha	$4.8	
Total traces		$21/ha	$42/ha
Spreading			$207/ha
Everything foliar $450+$207+$42 =			**$700/ha**

Solid/granular	Rate	Cost/ha	
SOP (vari)	60kg/ha	$88	
Serpentine Super 2-3x(vari)	120kg/ha	$126	
			$214/ha
Spreading			$36/ha
Total (liquid + solid)			**$950/ha**

Other notes:

-Lime (1t/ha) whole farm $57.5/ha or $17k whole farm

-variable hectares for P and K means some areas not all hectares applied. For the accuracy of field day we have worked on applicable hectares.

Agrownomics
Soil Fertility & Health

Soil Trends

Year	Area Name	TEC	pH (conductivity test)	Organic Matter	Sulphur	Available Phos	Estimated N Release	Calcium ppm	Magnesium ppm	Potassium ppm	Sodium ppm	Aluminium ppm
		Soil Elements						**Macro-Nutrients (ppm)**				
Overall Percentage Change		20.0%	-6%	2%	8%	26%	100%	5%	36%	133%	11%	0%
Change from previous year		33%	-3%	3%	0%	16%	1%	21%	68%	67%	52%	40%
Target		**15**	**6.2**	**10**	**20**	**60**	**75**	**4670**	**481**	**455**	**154**	**0**
2022	12	11.68	6.1	4.37	14	59	69.0	1515	165	142	41	811
2021	12	8.81	6.3	4.26	14	51	68.0	1256	98	85	27	579
2020	12	8.62	6.0	3.80	16	43	65.0	1089	160	113	37	620
2019	12	9.87	6.2	3.94	14	61	65.0	1361	112	106	38	686
2018	12	9.73	6.5	4.27	13	47	0.0	1440	121	61	37	808

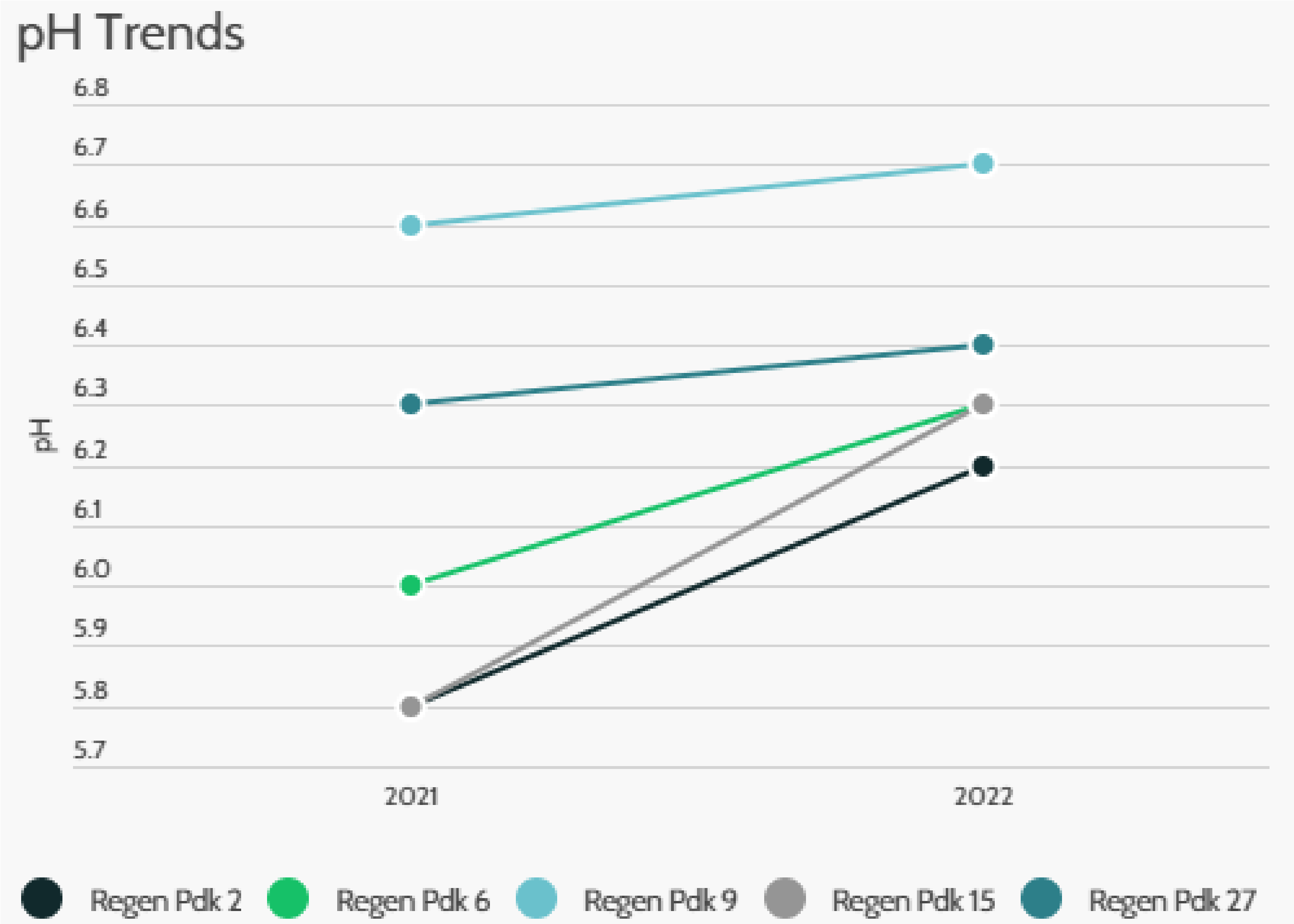
Year	Area Name	Calcium	Magnesium	Potassium	Sodium	Hydrogen	Bulk Density	Boron	Iron	Manganese	Copper	Zinc
		Base Saturation (%)						**Micro-Nutrients (ppm)**				
Overall Percentage Change		-12%	14%	94%	-7%	80%	100%	-14%	7%	0%	58%	101%
Change from previous year		-9%	27%	26%	15%	29%	3%	97%	44%	17%	170%	101%
Target		**70**	**12**	**3.5**	**2**	**12**	0.7	**1.00**	**100**	**20**	**2.50**	**5.00**
2022	12	64.85	11.77	3.12	1.53	13.5	1.07	0.65	277	21	2.46	3.07
2021	12	71.28	9.27	2.47	1.33	10.5	1.04	0.33	192	18	0.91	1.53
2020	12	63.17	11.21	3.36	1.87	15	0	0.32	201	14	1.43	1.44
2019	12	68.95	9.46	2.75	1.67	12	0	0.69	253	19	2.28	2.01
2018	12	74	10.36	1.61	1.65	7.5	0	0.76	260	21	1.56	1.53

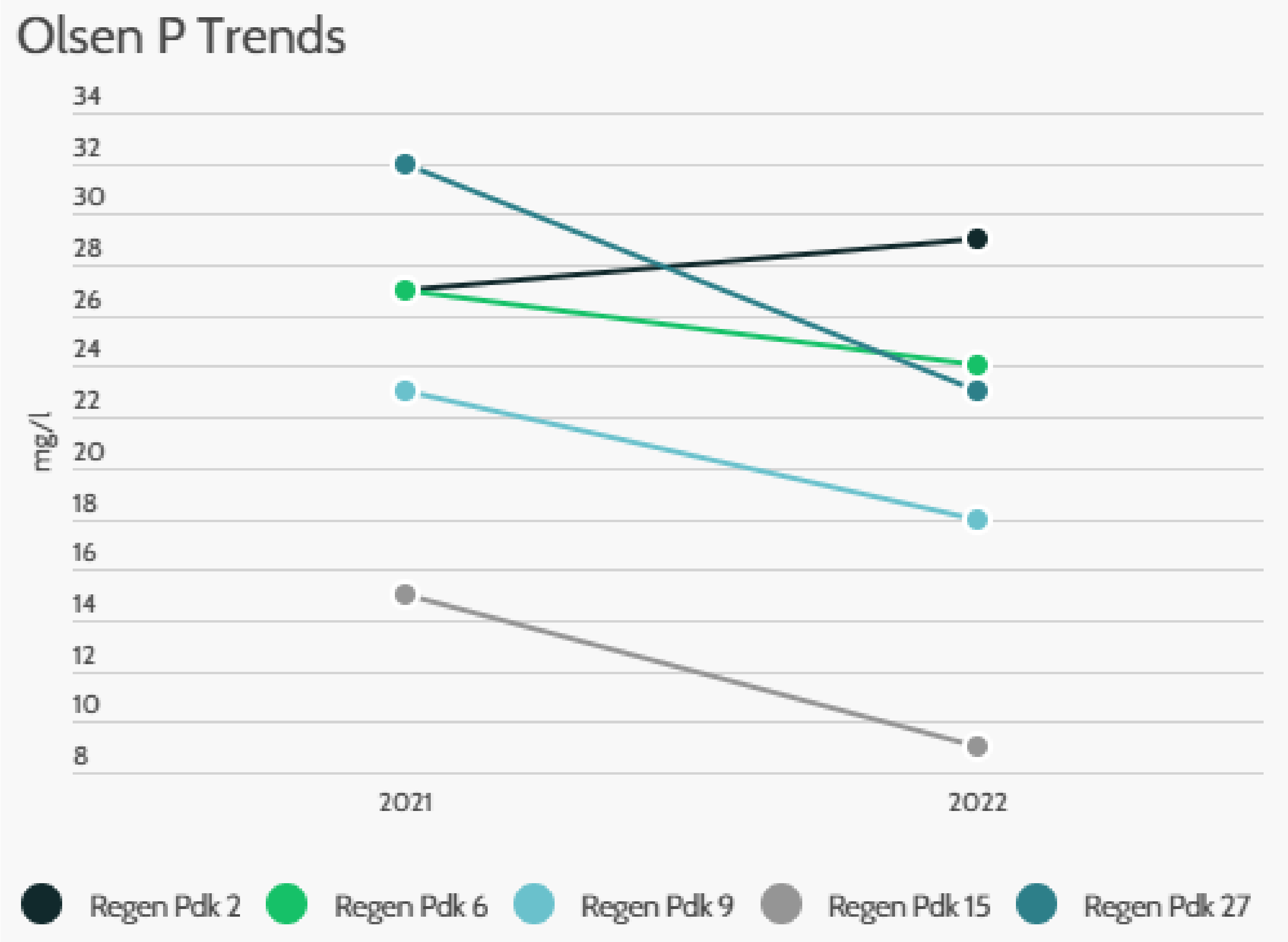
Agrownomics
Soil Fertility & Health

Soil Trends

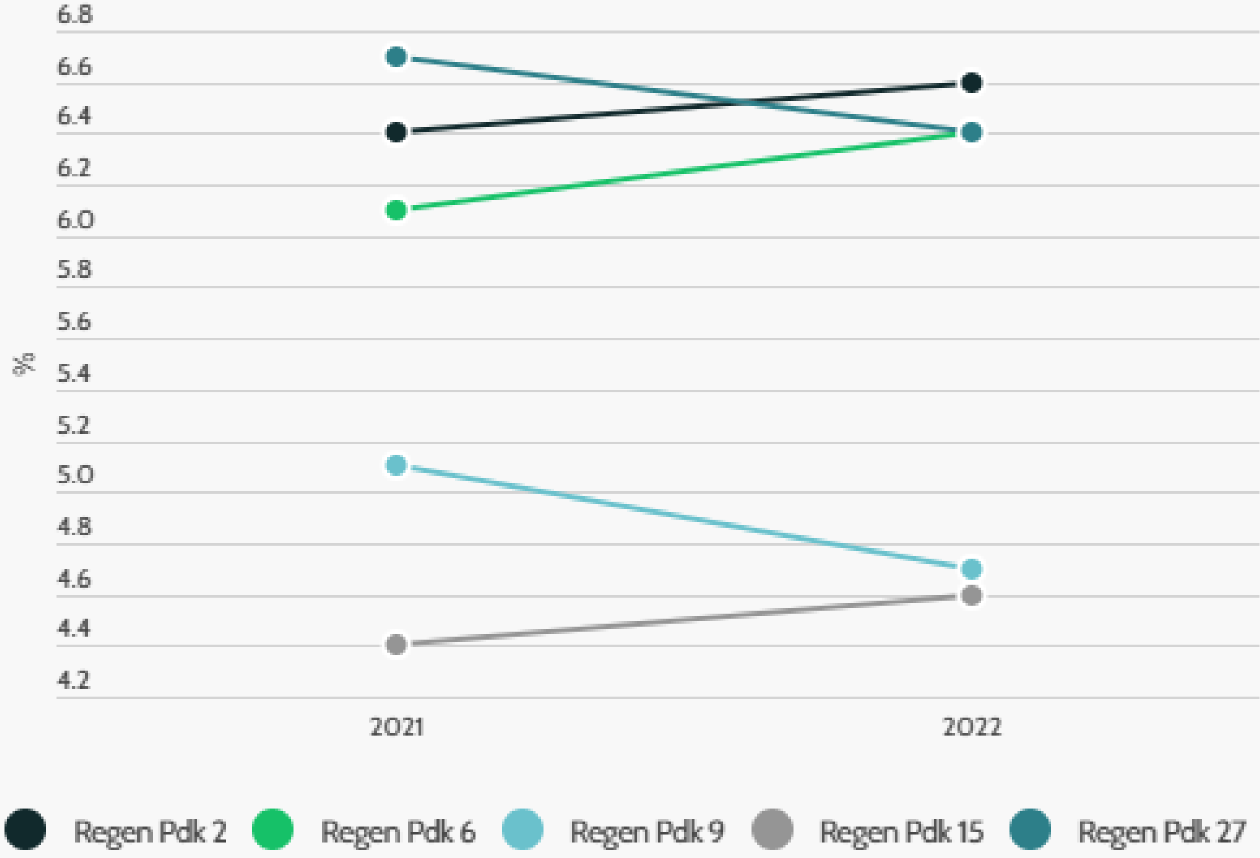
		Soil Elements						Macro-Nutrients (ppm)				
		TEC	pH (conductivity test)	Organic Matter	Sulphur	Available Phos	Estimated N Release	Calcium ppm	Magnesium ppm	Potassium ppm	Sodium ppm	Aluminium ppm
Overall Percentage Change		42.0%	2%	10%	50%	46%	100%	42%	62%	64%	31%	14%
Change from previous year		42%	0%	17%	75%	17%	5%	38%	68%	71%	56%	53%
Target		15	6.2	10	20	60	75	4670	481	455	154	0
Year	Area Name											
2022	19	15.05	6.1	6.41	21	82	79.0	2033	203	77	42	838
2021	19	10.61	6.1	5.46	12	70	75.0	1477	121	45	27	546
2020	19	10.30	6.2	5.86	13	76	76.0	1373	155	80	38	606
2019	19	10.18	5.8	5.94	14	53	77.0	1204	125	86	39	688
2018	19	10.60	6.0	5.85	14	56	0.0	1428	125	47	32	737

		Base Saturation (%)						Micro-Nutrients (ppm)				
		Calcium	Magnesium	Potassium	Sodium	Hydrogen	Bulk Density	Boron	Iron	Manganese	Copper	Zinc
Overall Percentage Change		0%	14%	15%	-8%	-10%	100%	8%	6%	13%	20%	33%
Change from previous year		-3%	18%	20%	9%	0%	11%	106%	39%	50%	92%	50%
Target		70	12	3.5	2	12	0.7	1.00	100	20	2.50	5.00
Year	Area Name											
2022	19	67.54	11.24	1.31	1.21	13.5	1.04	0.64	263	18	1.25	2.23
2021	19	69.6	9.5	1.09	1.11	13.5	0.94	0.31	189	12	0.65	1.49
2020	19	66.65	12.54	1.99	1.6	12	0	0.74	207	11	0.67	1.69
2019	19	59.14	10.23	2.17	1.67	21	0	0.74	224	12	1.52	1.87
2018	19	67.36	9.83	1.14	1.31	15	0	0.59	249	16	1.04	1.68

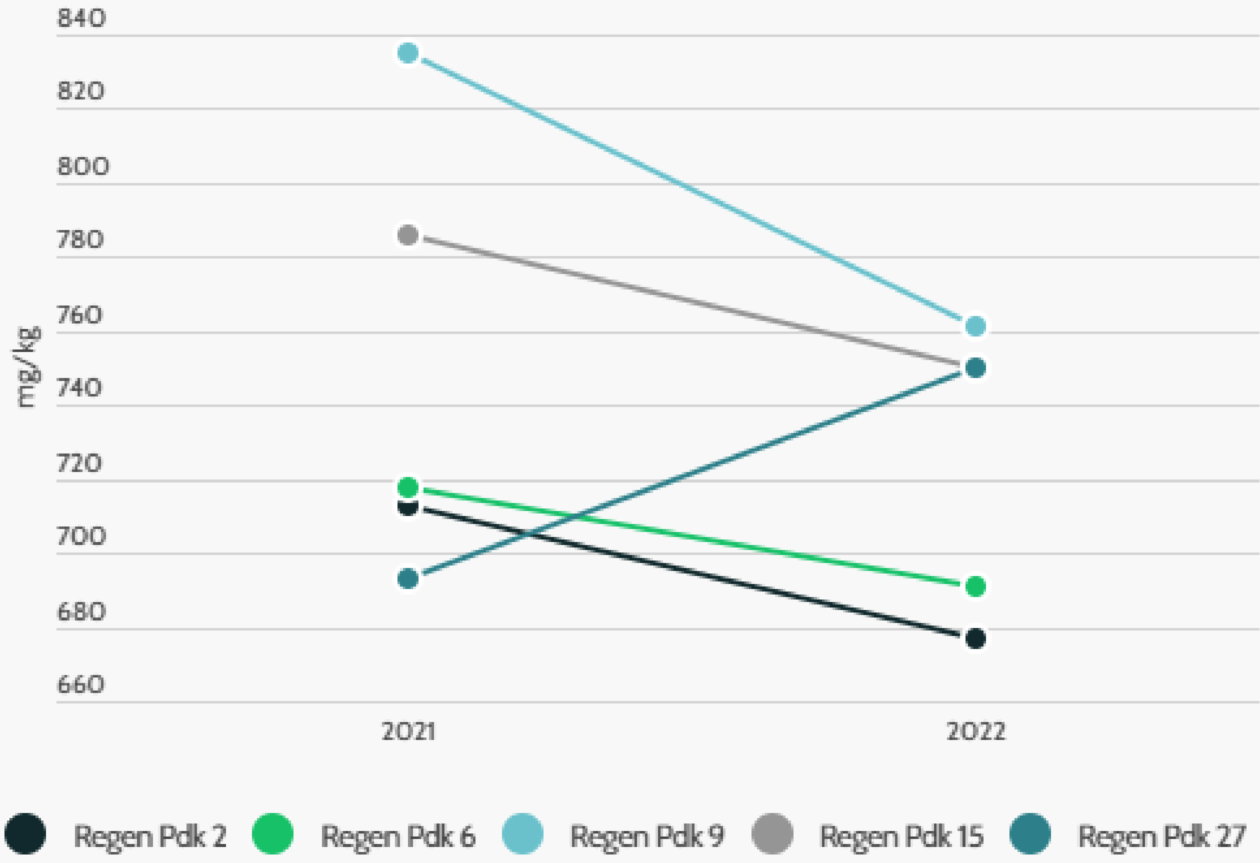

pH Trends
6.8
6.7
6.6
6.5
6.4
6.3
6.2
6.1
6.0
5.9
5.8
5.7
pH
2021
2022
Regen Pdk 2
Regen Pdk 6
Regen Pdk 9
Regen Pdk 15
Regen Pdk 27


Olsen P Trends
34
32
30
28
26
24
22
20
18
16
14
12
10
8
mg/l
2021
2022
Regen Pdk 2
Regen Pdk 6
Regen Pdk 9
Regen Pdk 15
Regen Pdk 27

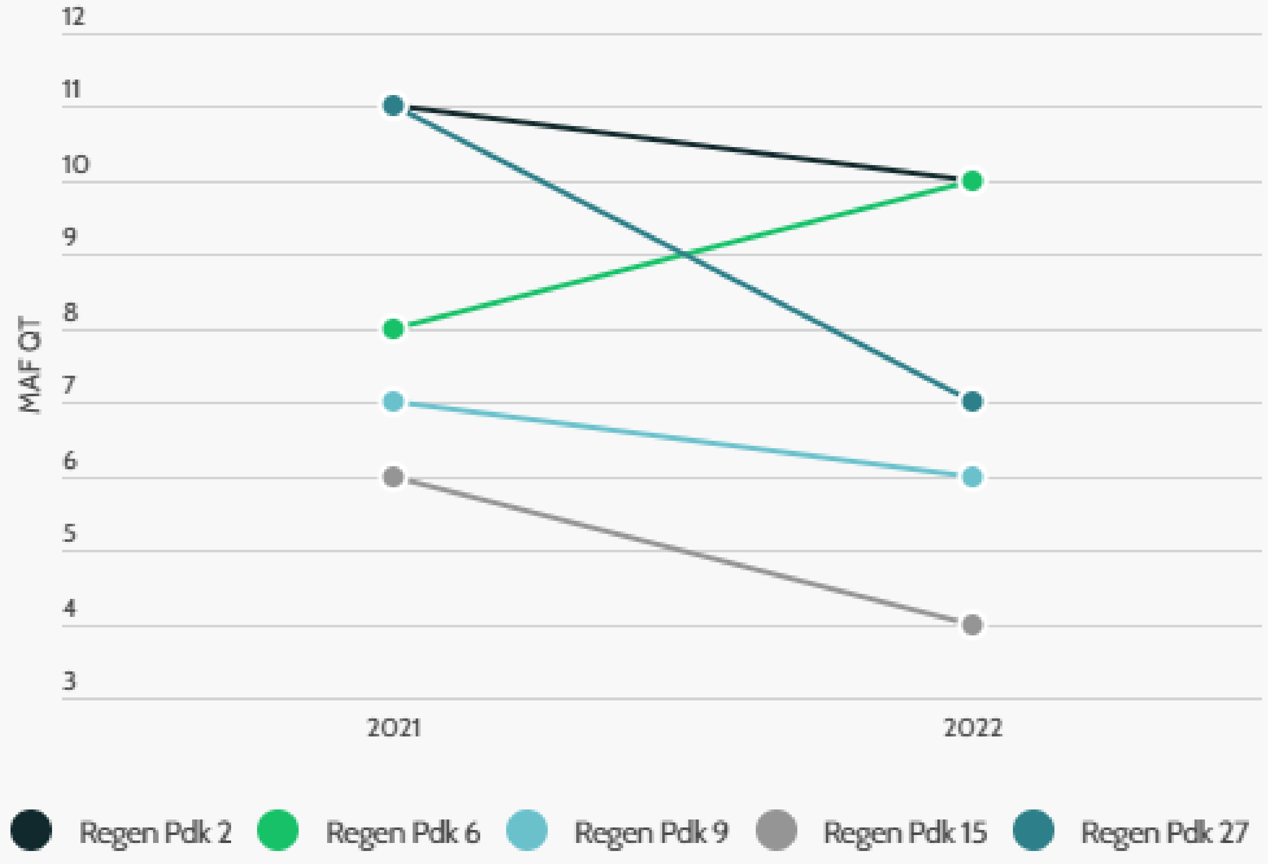
Organic Matter Trends



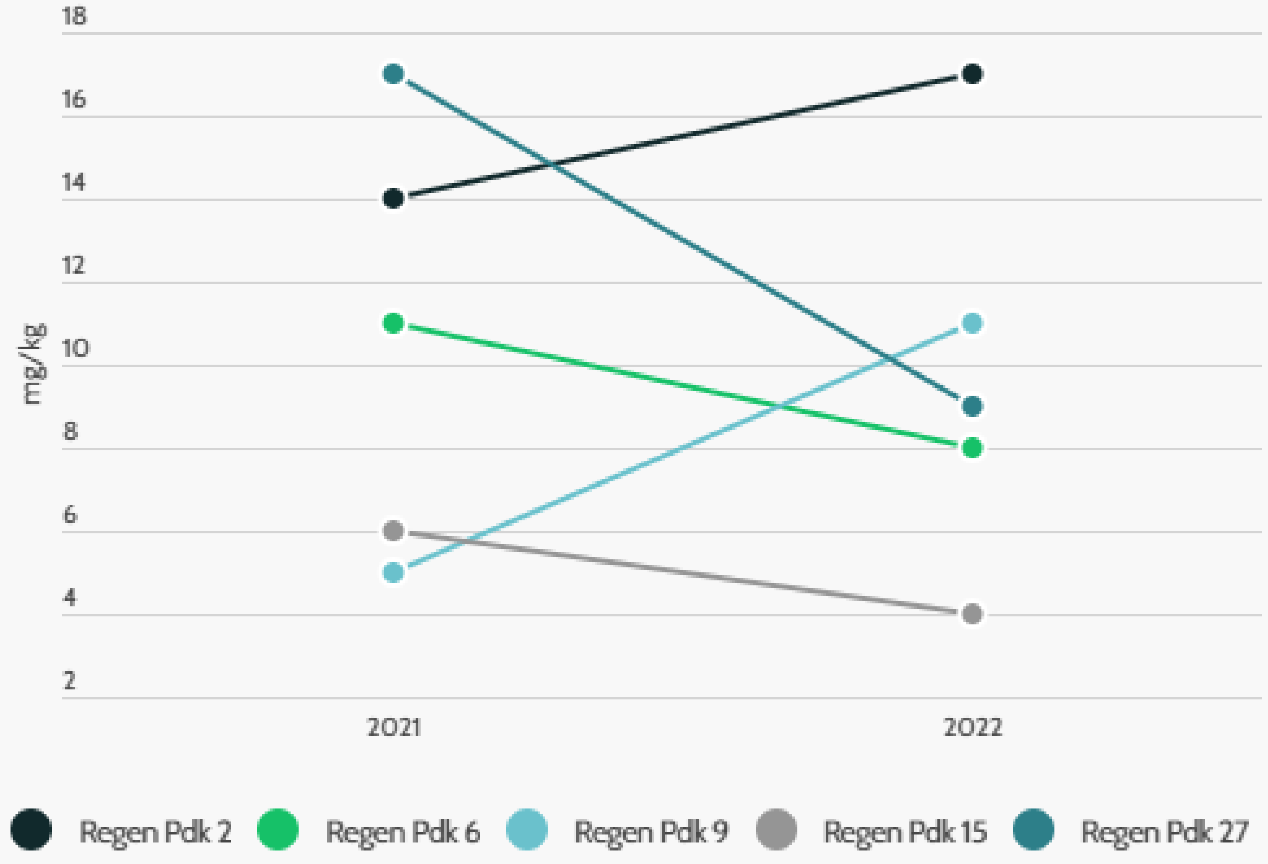
Total P Trends

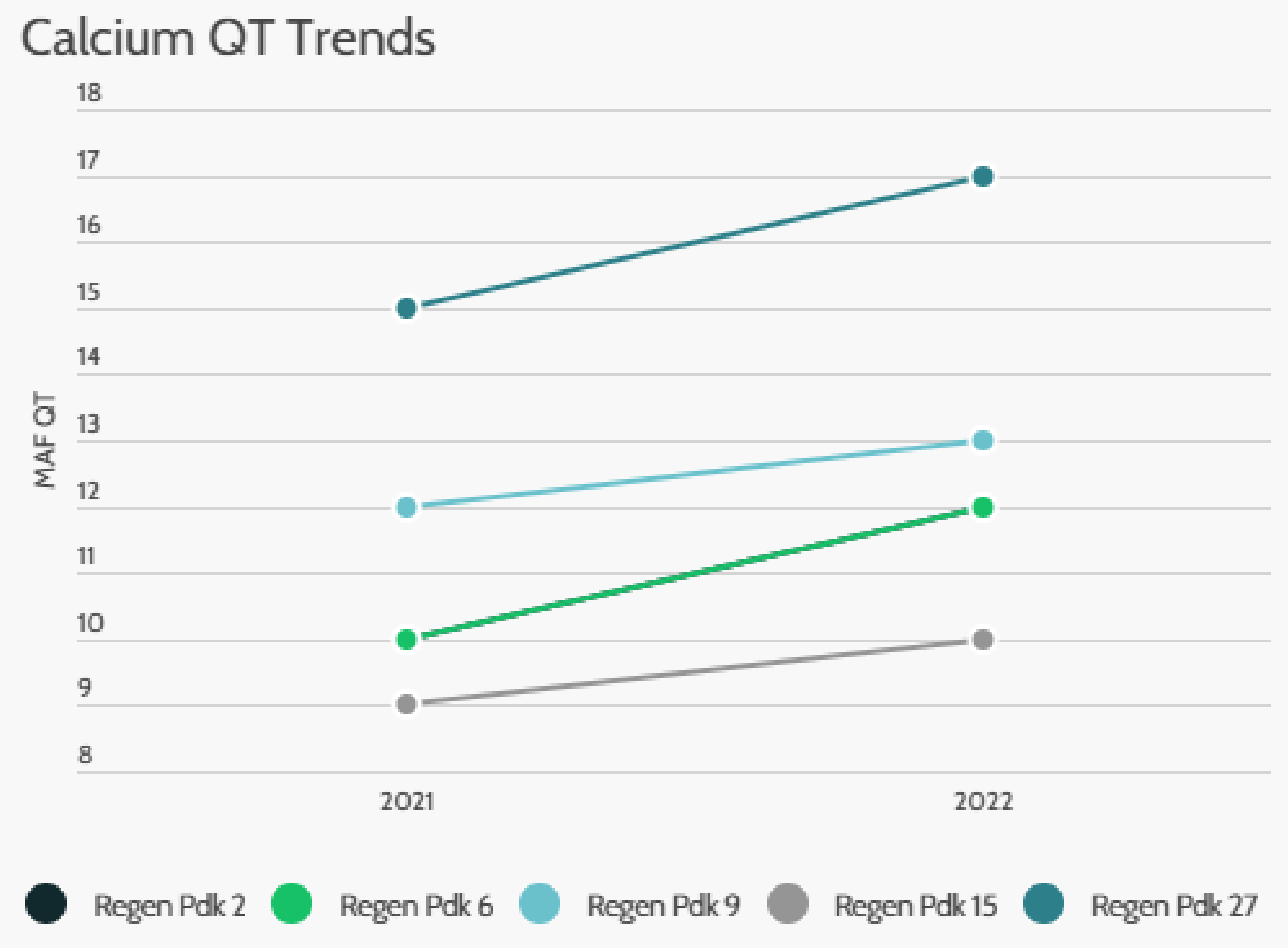


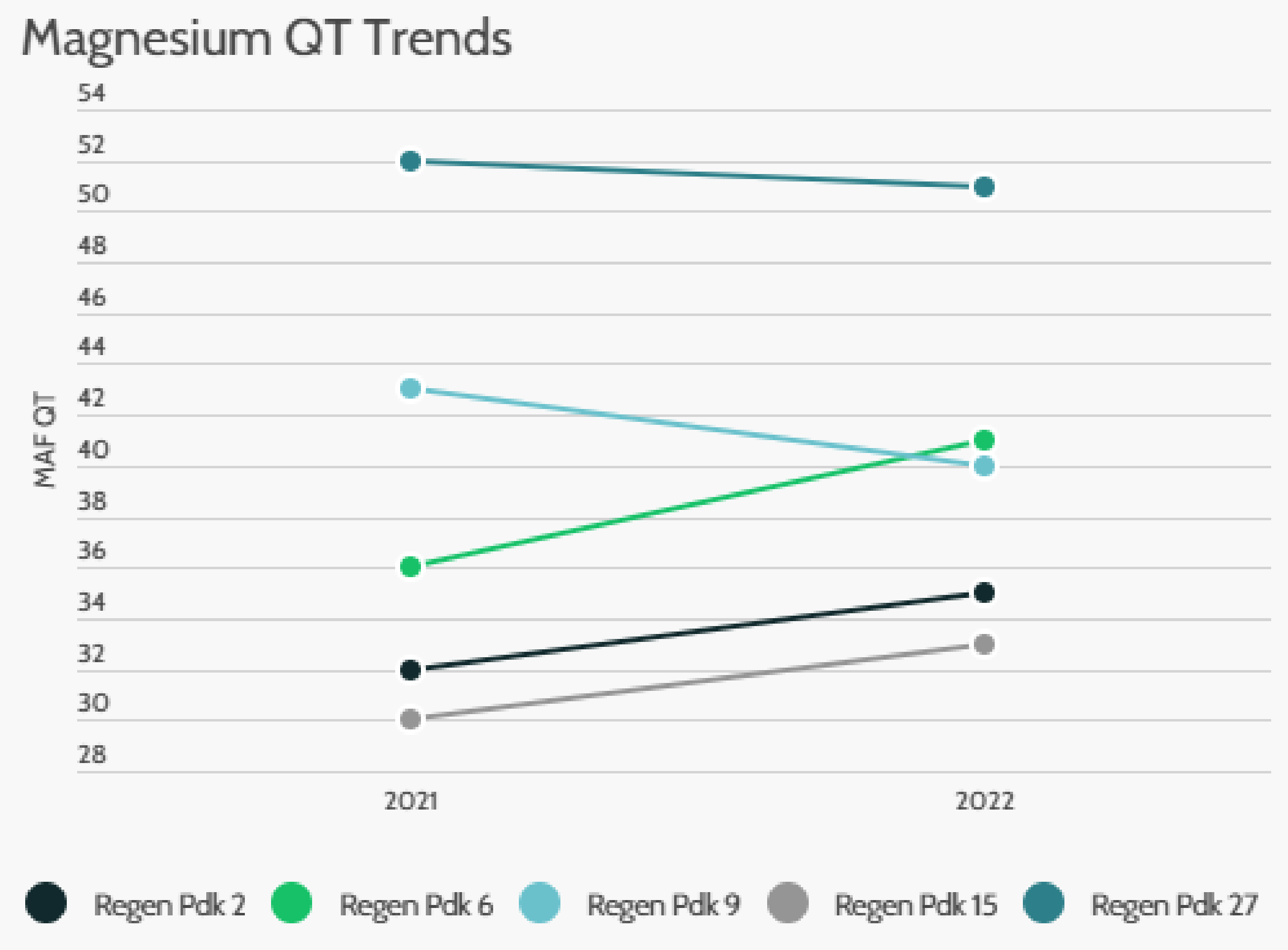
Potassium QT Trend



Sulfate Sulfur Trends




Calcium QT Trends
18
17
16
15
14
13
12
11
10
9
8
MAF QT
2021
2022
Regen Pdk 2
Regen Pdk 6
Regen Pdk 9
Regen Pdk 15
Regen Pdk 27


Magnesium QT Trends
54
52
50
48
46
44
42
40
38
36
34
32
30
28
MAF QT
2021
2022
Regen Pdk 2
Regen Pdk 6
Regen Pdk 9
Regen Pdk 15
Regen Pdk 27

Predictive Actuals 2022-23 Season

		Regen - with Crop	Conventional - Align 141 kg N
	Area (ha)	146	146
Nitrogen	Total Loss (kg)	5216	7573
	Loss/ha (kg/ha)	33	48
	NCE (%)	40	32
	N Surplus	143	229
Phosphorus	Total loss (kg)	185	190
	Loss/ha (kg/ha)	1.2	1.2
	P Surplus (kg/ha)	13	12
GHG (eCO2/tonnes/yr)	Total GHG Emissions	1841	2340
	Methane	1284	1550
	N20	281	434
	CO2	276	357

Alternative Scenarios 2022-23

		Regen - All Pasture	Conventional - 190 kg N
	Area (ha)	146	146
Nitrogen	Total Loss (kg)	5019	8225
	Loss/ha (kg/ha)	32	52
	NCE (%)	39	30
	N Surplus	152	249
Phosphorus	Total loss (kg)	180	190
	Loss/ha (kg/ha)	1.1	1.2
	P Surplus (kg/ha)	13	12
GHG (eCO2/tonnes/yr)	Total GHG Emissions	1836	2396
	Methane	1282	1550
	N20	286	462
	CO2	269	384

VSAs

Visual Soil Assessment is based on the visual assessment of key soil 'state' and plant performance indicators of soil quality, presented on a scorecard. With the exception of soil texture, the soil indicators are dynamic indicators, i.e. capable of changing under different management regimes and land-use pressures. Being sensitive to change, they are useful early warning indicators of changes in soil condition and as such provide an effective monitoring tool. It is worth noting that paddock 5 did not get transitioned to diverse pastures yet and this is planned for this summer. Will be interesting to see the effect next year.

CLAREVIEW VSA	**REGEN**											
Paddock	**5**				**8**				**26**			
Season	20-21	21-22	22-23	Change	20-21	21-22	22-23	Change	20-21	21-22	22-23	Change
Soil Texture	1.7	1.7	1.7	0%	1.5	1.5	1.4	-7%	1.7	1.7	1.7	0%
Soil Structure	1	1.5	1.7	41%	1	1.3	1.5	33%	1.2	1	1.2	0%
Soil Porosity	1.4	1.6	1.7	18%	1.3	1.7	1.4	7%	1.5	1.3	1.7	12%
Soil Mottles	1.8	1.7	1.7	-6%	1.7	1.7	1.7	0%	1.7	1.5	1.7	0%
Soil Colour	1.5	1.5	1.6	6%	1.3	1.35	1.5	13%	1.3	1.3	1.4	7%
Earthworms	24	19	12	-100%	11	34	14	21%	15	28	24	38%
Soil Smell	1.5	1.4	1.5	0%	1.2	1.8	1.6	25%	1.5	1.3	1.6	6%
Root Depth mm	150	185	200	25%	150	170	170	12%	180	150	170	-6%
Surface Relief	1.8	1.6	1.6	-13%	1.5	1.6	1.5	0%	1.2	1.6	1.5	20%
Pentrometer mm	40	75	75	47%	40	75	110	64%	105	80	190	45%
Brix % pasture	5	grazed	4.50%	-11%	0	6%	4%	100%	3.50%	6%	3.5%	0%
>infiltration rate (mm left)	20	25	25	20%	14	25	22	36%	25	25	17	-47%

CLAREVIEW VSA	**CONV**											
Paddock	**25**				**29**				**15**			
Season	20-21	21-22	22-23	Change	20-21	21-22	22-23	Change	20-21	21-22	22-23	Change
Soil Texture	1.7	1.7	1.7	0%	1.7	1.7	1.7	0%	1.5	1.6	1.7	12%
Soil Structure	1.1	1.1	1.6	31%	1.1	1.1	1.1	0%	1.2	1.1	1.6	25%
Soil Porosity	1.3	1.5	1.6	19%	1.1	1.5	1.5	27%	1.3	1.5	1.6	19%
Soil Mottles	1.7	1.7	1.7	0%	1.7	1.7	1.7	0%	1.7	1.7	1.7	0%
Soil Colour	1.3	1.3	1.5	13%	1.8	1.5	1.7	-6%	1.3	1.3	1.5	13%
Earthworms	10	24	6	-67%	11	27	14	21%	3	28	10	70%
Soil Smell	1.5	1.4	1.4	-7%	1.3	1.5	1.4	7%	1	1.4	1.5	33%
Root Depth mm	130	170	170	24%	150	170	170	12%	130	150	160	19%
Surface Relief	1.2	1.65	1.4	14%	1.5	1.6	1.3	-15%	1.4	1.6	1.5	7%
Pentrometer mm	105	70	150	30%	75	75	240	69%	75	70	210	64%
Brix % pasture	n/a	grazed	1%		**n/a**	grazed	4.50%		n/a	8%	2.5%	
>infiltration rate (mm left)	24	25	20	-20%	16	18	20	20%	25	25	10	-150%

Soil Food Web – Annual Changes

Fungi

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Active Fungi µg/g – 2020-21	1.76	4.08	3.05	5.93	9.69	1.19
Active Fungi µg/g – 2021-22	2.37	7.12	3.87	3.39	4.08	4.41
Active Fungi µg/g – 2022-23	1.45	4.81	6.18	4.69	0.65	0.59
% Change Active Fungi µg/g	-18%	18.%	102%	-20%	-93%	-50%

In **all paddocks**, the fungal activity is low. Soil's fungal food resources are likely too low. Levels may also be depleted due to possible anaerobic conditions due to flooding. We will continue to add fungal foods to help lift these levels, such as good quality humates and fish hydrolysates. Target levels >75.

Fungi play an important role in the opening of soil structure, disease and pest suppression and the cycling of nutrients i.e. calcium.

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Total Fungi µg/g – 2020-21	180.1	200.11	388.05	230.18	169.49	408.24
Total Fungi µg/g – 2021-22	135.02	204.36	284.55	176.49	444.01	234.52
Total Fungi µg/g – 2022-23	477.26	330.97	334.34	216.11	285.39	204.36
% Change Total Fungi	165%	65%	-13%	127%	63%	-50%

For **Paddock 5, 26 and 8** total fungal biomass in good range and fungal diversity appears at excellent level. Some large healthy appearing hyphal formations evident.

For **paddocks 29, 15 and 25** there is low total fungal biomass, foods and biology may be required. Increasing fungal activity builds fungal biomass improving soil structure nutrient cycling and disease suppression. Fungal diversity appears at good level. Hyphal formations small to medium length.

Target levels >300 µg/g.

Bacteria

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Active Bacteria µg/g – 2020-21	27.71	18.36	37.36	21.11	44.09	20.21
Active Bacteria µg/g – 2021-22	92.07	81.29	85.11	97.52	138.4	118.12
Active Bacteria µg/g – 2022-23	1.38	3.19	4.21	2.88	1.73	2.69
% Change Active Bacteria µg/g	-95%	-82%	-89%	-86%	-96%	-86%

Paddock 5, 26, have low bacterial activity. Soil's bacterial food resources probably too low. Levels may also be depleted due to possible anaerobic conditions. Continuing the additions of seaweed type products should help sustainably lift active bacterial levels.

Desired levels are >75.

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Total Bacteria µg/g – 2020-21	344.25	325.59	297.18	307.44	313.61	310.03
Total Bacteria µg/g – 2021-22	501.21	328.11	652.8	502.35	411.53	454.71
Total Bacteria µg/g – 2022-23	302.49	350.91	260.9	300.9	293.1	299.69
% Change Bacteria µg/g	-12%	8%	-12%	-2%	-7%	-3%

Paddock 26 and 15 has Low total bacterial biomass. Feed with seaweed as suggested. Levels may be depleted from anaerobic conditions. Bacteria form the food source for worms, beneficial nematodes and protozoa, thus nutrient cycling.

Paddocks 29 have bacterial biomass just below the desired range, Feed with seaweed as suggested. high total bacterial biomass. However, bacteria are out-competing fungal biomass.

Paddock 5, 8 have good total bacterial biomass. This indicates good diversity. Paddock 29 is also out-competing fungal biomass.

Target levels >300

Organisms Biomass Ratios

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Total Fungi: Total Bacteria – 2020-21	0.52	0.61	1.31	0.75	0.54	1.32
Total Fungi: Total Bacteria – 2021-22	0.27	0.62	0.44	0.35	1.08	0.52
Total Fungi: Total Bacteria – 2022-23	1.58	0.94	1.28	0.72	0.97	0.68
% Change Active TF:TB	204%	54%	-2%	-4%	80%	-48%

Paddock 5, 26, is a fungal dominated soil. Need to build bacterial biomass to create a ratio closer to 1.0. It would be beneficial to continue to feed both bacteria and fungal to ensure biomass is maintained.

Paddock 29 and 15 are too bacterial dominated for optimal pasture production. We need to build fungal biomass to create a balanced ratio with fungal biomass for healthy production. Target for grasslands is around 1:1

Paddock 8 and 25 has correctly balanced total fungal and bacterial biomass for pasture species. However need to continue to build both bacterial and fungal biomass to desired range while maintain the ratio of 1.0.

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Active Fungi: Total Fungi – 2020-21	0.01	0.02	0.01	0.03	0.06	0
Active Fungi: Total Fungi – 2021-22	0.02	0.03	0.01	0.02	0.01	0.02
Active Fungi: Total Fungi – 2023-23	0	0.01	0.02	0.02	0	0
% Change AF:TF	-100%	-50%	100%	-33%	-100%	0%

For **all paddocks**, the overall percentage of active fungal biomass is too low. Target is >0.25

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Active Bacteria : Total Bacteria – 2020-21	0.08	0.06	0.13	0.07	0.14	0.07
Active Bacteria : Total Bacteria – 2021-22	0.18	0.25	0.13	0.19	0.34	0.26
Active Bacteria : Total Bacteria – 2022-23	0	0.01	0.02	0.01	0.01	0.01
% Change AB:TB	-100%	-83%	-85%	-86%	-92%	-86%

For **all paddocks**, the overall percentage of active bacterial biomass is too low. Target is >0.25

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Active Fungi : Active Bacteria – 2020-21	0.06	0.22	0.08	0.28	0.22	0.06
Active Fungi : Active Bacteria – 2021-22	0.03	0.09	0.05	0.03	0.03	0.04
Active Fungi : Active Bacteria – 2022-23	1.05	1.51	1.47	1.63	0.38	0.22
% Change AF:AB	1650%	586%	1738%	482%	73%	267%

Paddock 5 and 26 has fungal dominated soils, becoming more fungal with time

Paddock 8 and 15 has bacterial dominated soil, becoming more fungal over time. A desirable trend in this instance.

Paddock 29 and 25 have bacterial dominated soil, becoming more bacterial with time. Not a desirable trend in this instance.

The target range is 1-2.

Protozoa

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Flagelletes – 2020-21	5993.35	5835.11	6255.38	36,414.20	7969.68	7524.9
Flagelletes – 2021-22	18126.02	3664.35	7445.3	7,520.53	6339.91	6038.93
Flagelletes – 2022-23	18823.56	36954.95	19090.23	3611.04	6649.97	36705.08
% Change Flagelletes	214%	533%	205%	-90%	-16%	388%

Paddock 5, 8, 26 and 29 has flagellates at a good level. Amoebae are low and species diversity lacking. Some nutrient cycling potential by these bacterial eating predators. High ciliate numbers indicate possible anerobic conditions.

Paddock 15 and 25 has low protozoa numbers. Limited nutrient cycling potential by these bacterial eating predators. High ciliate numbers indicate possible anaerobic conditions.

The ideal range for flagellates will be > 10,000 per g

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Amoebae -2020-21	36,077	5835	780	7557	38,402	3626
Amoebae -2021-22	181	183	385	6020	2,946	182
Amoebae -2022-23	578	7669	6342	7,492	6649	7617
% Change Amoebae	-98%	31%	712%	-0.8%	-83%	110%

The ideal range for amoebae is > 10,000 per g so **all paddocks,** are too low, with paddock 5 being significantly too low. Improvements have been made from last season.

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Ciliates – 2020-21	360.43	216.63	376.19	182.56	192.52	362.25
Ciliates – 2021-22	601.45	76.64	358.42	75.81	633.16	753.88
Ciliates – 2022-23	376.12	1847.35	381.45	599	830.10	1834.86
% Change Ciliates	4%	752%	1%	228%	331%	407%

All Paddocks have high ciliate numbers which indicates possible anaerobic conditions. Target range is < 133.

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
N Cycling Potential (low end) – 2020-21	112	56	28	112	112	56
N Cycling Potential (low end) – 2021-22	56	56	28	56	28	28
N Cycling Potential (low end) – 2022-23	56	112	84	56	56	112
% Change N Cycling Potential	-50%	100%	200%	-50%	-50%	100%

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
N Cycling Potential (high end) -2020-21	168	84	56	186	168	84
N Cycling Potential (high end) -2021-22	84	84	56	84	56	56
N Cycling Potential (high end) -2022-23	84	168	112	84	84	168
% Change N Cycling Potential	-50%	100%	100%	-50%	-50%	100%

Nitrogen levels dependent on plant needs. Estimated availability over a 3-month period. **Paddock 8 , 26 and 29** have improved availability while **Paddock 5, 15 and 25 have diminished** N cycling potential**.**

Mycorrhizal Fungi

	P 5 – R	P 8 – R	P 26 – R	P 15 – C	P 25 – C	P 29 - C
Endomycorrhizal fungi – 2020-21	53%	74%	34%	37%	62%	44%
Endomycorrhizal fungi – 2021-22	37%	35%	31%	40%	31%	28%
Endomycorrhizal fungi – 2022-23	53%	50%	58%	36%	28%	49%
% Change Endomycorrhizal fungi	0%	-32%	71%	-2%	-55%	11%

Paddock 5 and 26 have very good mycorrhizal colonization. However it is not unusual for pastural systems to have levels closer to 65-70%

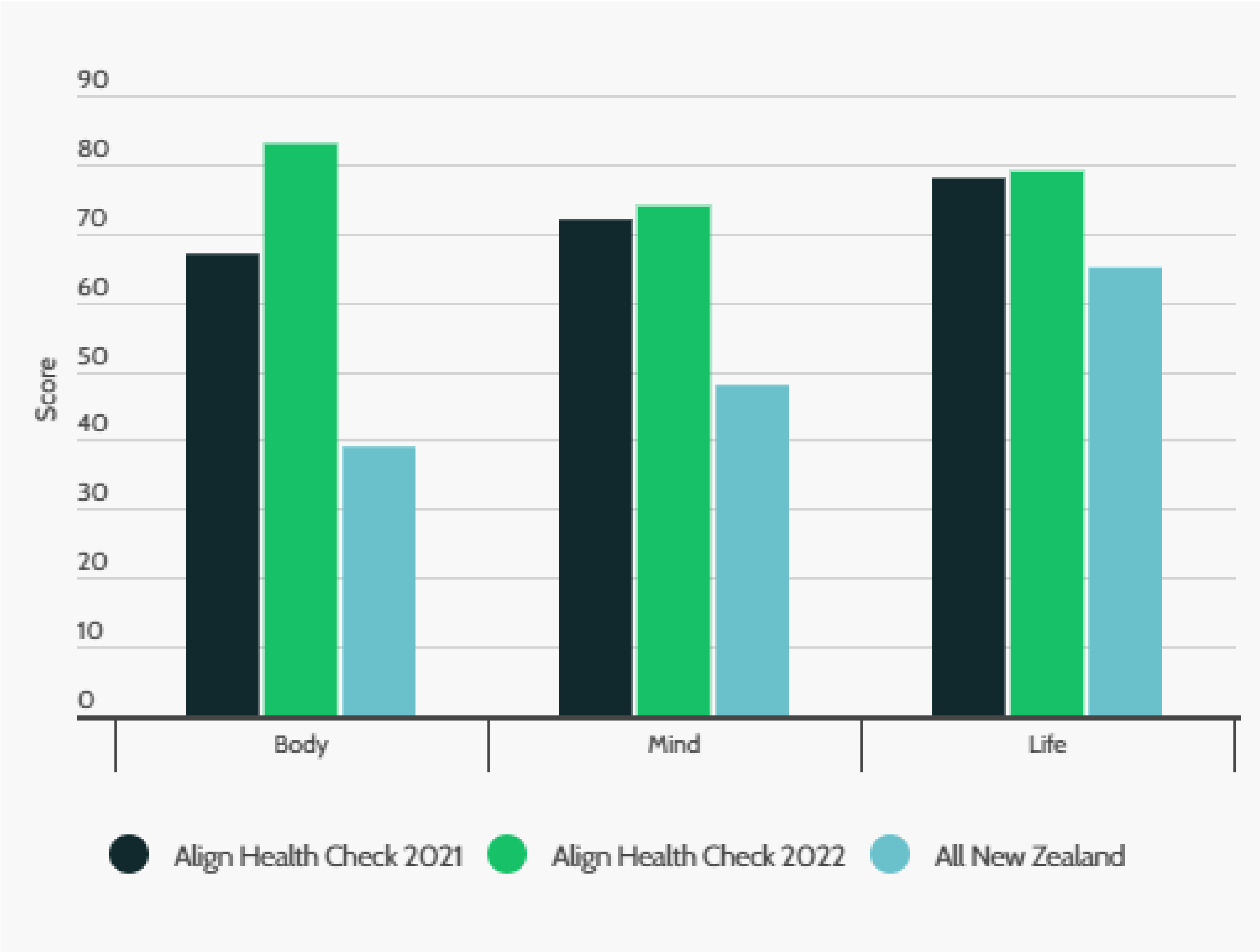
Paddock 8 and 29 has good colonization. However low fungal activity suggests mycorrhiza may not be functioning at optimum levels.

Paddock 15 has adequate colonization. However low fungal activity suggests mycorrhiza may not be functioning at optimal levels.

Paddock 25 has low colonization. Fungal foods may help lift levels and improve vigor of mycorrhizal fungi.

Target range >31%

KYND Graphs



Align is using KYND (Know Your Numbers Dashboard) Wellness App to monitor health and wellness of the team and provide the support that individuals need. The confidential wellness app is a tangible way for them to track, assess and highlight changes they could make to improve their overall wellbeing. We are pleased that our results have improved from 2021 and we aim to continue this trend

Our Advice for Transitioning

Though we are in our fourth season of trailing regenerative practices at Align Farms, we do not believe we have it all figured out, or all the answers. That being said, we do have 4 years of learning under our belt, and we are keen to share our key take-aways for those who have been asking for guidance as they begin their transition.

1. It is crucial that you clearly understand your WHY. Why are you motivated to make these changes to your system? It is helpful to understand what success looks like for you as there are many aspects of the farm system to consider when taking a holistic, regenerative approach, such as animal health, the environmental footprint of your operation or team well-being.
2. Next you should create a timeline of how you will achieve conversion, and then double it to account for all the unknowns and to give your pastures and system time to adapt. Our transition was done as fast as possible so we could get the trial underway in the 2020-21 season. Because we are a multi-farm operation, we were able to transfer cows to another farm and re-grass more of the trial farm in one season than is realistically possible for those who must keep their animals on farm. Don't try to mirror our timeline for these reasons.
3. We encourage you to find like-minded connections or farmer groups that you can learn from, lean on when things are tough, and celebrate successes with. Some individuals can be overly critical of challenging the status quo, so having a support network can help you avoid doubting yourself and your decisions unnecessarily
4. Consider lowing your stocking rate, you may already be at the optimal place, but reducing will have the additional benefit of helping you achieve other environmental objectives
5. When adding diversity, do what is affordable and reasonable. You don't need to have sunflowers to be regenerative and going straight to perennial species may be the better choice if funds are limited and your soil isn't in too bad of shape. We have had success with using a soil primer annual crop then sowing perennials, going directly into perennials, and direct drilling diversity into existing rg/wc paddocks, though we grazed those pastures quite low (as you would with sheep) before direct drilling. We also found drilling without spraying out worked well when there was pugging damage. We want to be able to provide a better blueprint and costings in the future, but we don't have it determined quite yet and wanted to share what we do know.
6. Don't be definitive or rigid with your practices at the beginning of your transition as this will inhibit growth and learning. Every farm is different and even every season on the same farm is different so becoming overly prescriptive will hinder your progress. Things like round length, pasture species used, fertiliser requirements etc may vary year to year depending on a multitude of factors. In our experience, we have found that basing residual length by following the pasture growth curve (shorter on the shoulders, longer over summer) is a good approach.
7. Increase your observation and monitoring, observe, observe, adapt, repeat. In the words of our colleague at Otago University, Frank Griffin: "While the **principles** driving regenerative agriculture are clearly defined, the **practices** of implementation need to be prescribed precisely for each different habitat"
8. For those looking to reduce N fertiliser use, you can read our thoughts on the matter here: https://alignfarms.co.nz/regenerative-info/reducing-n-fertiliser-use/
9. Consider doing the Savoury Institute's Ecological Outcome Verification (EOV) on your farm. This is an outcome-based certification that gives you tangible feedback on what areas you are doing well and where improvements can be made. They take short term and long term measurements, and once you are verified EOV you get access to the Savoury Institute's Land to Market program, which connects conscientious buyers, brands and retailers directly to farms that are verified to be regenerating the land.
10. In our view regenerative agriculture is about continuous improvement so we will continue to learn and develop as the seasons progress

At Align we treat the process as a 3-legged stool, with a Human Capital leg, a Financial Capital leg and Environmental Capital leg. All three need to move at roughly the same pace. It will not be worth being 'green' if your mentally or financially unwell from it, and this applies to all legs of the stool.

Dirty Fork

The Dirty Fork is a recent addition to the Align Farms group that was established in 2021 on Align Clareview and is run by Liz Phillips.

2020, and the events that came with it, lead to us to think more seriously about the health of our team, as well as our food security if global shipping systems were to fail.

This led us to setting a goal to provide 60% of the teams' diet from our land.

While we believe that meat and milk are the most nutritious food available, we also understand the benefits of having a diversity of plants in the diet to feed the gut microbiome (among other things), and thus, the Dirty Fork was born.

We converted 0.3 ha of paddock 36 into a market garden and we are now in our second season of providing our team and the community with nutrient dense, organically farmed food from our land.

They also have access to fresh milk, meat and eggs, giving the management team the confidence that our team is well nourished and in a position to perform at their best.

Last season we offered any remaining produce that the team did not consume to the community via our facebook page and sold out quickly each time. This season we are more established and are in a position to sell to the community every week, so we have launched our website for online orders.

If you are interested in our fresh veggies, order at www.thedirtyfork.co.nz/shop/

Manaaki Whenua CO2 Flux Measurements

Net carbon balance:

The goal of Manaaki Whenua Landcare Research's (MWLR) project is to investigate which of the two pastures has the better net carbon balance. They will try to answer this by quantifying carbon gains and losses year-round. (They are not trying to measure stock changes, which could be done with meaningful accuracy only over periods of a few years.)

The biggest gain of carbon is the net uptake of CO_2 (photosynthesis gains minus respiration losses). This net uptake is measured by our flux station (details below).

The biggest loss of carbon is from biomass removal, i.e. grazing. MWLR will quantify this from our regular monitoring of standing biomass. The second-biggest gain of carbon is from excreta return, which they will estimate as a fraction of the feed intake (grazing plus supplements), taking cow presence time in the paddock into consideration.

Adding all gains and losses up, the net balance can be positive or negative, and this can vary between years. The key goal is to obtain the side-by-side comparison of the two pastures which differ in composition and management, but not in the soil type and the weather they experience.

Motivation:

There is considerable interest in the effects of mixed-species pastures on soil carbon and net greenhouse gas balances. At Ashley Dene, they compared a five-species mix to ryegrass-clover, side by side with similar grazing management and fertiliser inputs. Over 2 years, the ryegrass-clover had net carbon gains, while the mixed sward had net carbon losses. The greenhouse-gas effect of this net carbon difference overwhelmed the difference in nitrous oxide emissions (these were 1/3 smaller for the five-species mix) - see figure in this article:

https://www.landcareresearch.co.nz/publications/soil-horizons/soil-horizons-articles/diverse-pasture-reduces-nitrous-oxide-emissions-but-theres-a-catch/

We see the Clareview project as a follow-up to find out if a far more diverse and Regen Ag-managed pasture also fares worse than a conventional pasture, regarding the net carbon balance, or whether it fares better.

CO2 flux measurements with the eddy-covariance method:

During the day, plants remove some CO_2 from the air by photosynthesis. The air near the ground is thus CO_2-poorer than air higher up. Turbulent movements, i.e. overturning eddies of all sizes, then move CO_2-richer air downwards and CO_2-poorer air upwards. The instruments, at 2 m height, measure both the up- and down movement (vertical wind speed) and the variations in CO_2 concentration caused by these processes.

The measurements are done 10 times per second. For every half hour of these data, the covariance of vertical wind and CO_2 concentration is calculated. This covariance is equal to the net flux of CO_2 during the half-hour.

During the day, this net flux is downwards. During the night, there is no photosynthesis, but there is CO_2 emitted by respiration, from the plants and from soil microbes. So then, the air near the ground is CO_2-enriched, and the flux is upwards.

The flux station is at the boundary of the two paddocks. The fence line is in Southwest-Northeast direction. Thus, for winds from West(ish) to North(ish) directions, the air arriving at the flux station comes over the RegenAg paddock, and we measure a CO_2 flux representative of that paddock. For winds from East(ish) to South(ish), the air comes over the Conventional paddock, and so we measure the CO_2 flux of that. Over time, we gather sufficient data from both that we can calculate net annual CO_2 uptake of each paddock separately.

The weather station next to the flux station is important because it enables us to quantify relationships between the CO_2 fluxes and the weather variables, and these relationships are used when calculating the annual CO_2 balances.

Thank You for Joining Us Today!

We ask that you please fill out a survey via this QR Code

Once completed you can enjoy a lunch from Align Farms cooked by Quigley's Contracting!

Lunch:

Sausage & Patties – From Beef cattle raised on Align Hinterlands

Salads – From the Dirty Fork grown on Align Clareview

All feedback appreciated!

We would like to thank Align Farms valued suppliers and partners for helping us be where we are today, including: 5th Agri Business, AgResearch, Agricultural Consulting, All Agri, BDO, BNZ, Catalyst Agronomy, DairyNZ, EmbroidME, Fert Solutions, Fonterra, Hills Laboratories, J Rive construction, LIC, Lincoln Uni, Manaaki Whenua Landcare Research, Mayfield Transport, Meridian, MHV, Otago University, PGG, Progressive Livestock, Quigley Contracting, Ruralco, Soil Matters, Stocker Solutions, Synlait, Tarbottons Land and Civil, The Other Man, Vetent, Waterforce, Westland Milk and more

For more information about Align Farms and to view our data in more detail, please visit our website www.alignfarms.co.nz

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