OWL FARM

Providing knowledge.

St Peter's · Cambridge NEW ZEALAND

LINCOLN UNIVERSITY TE WHARE WĀNAKA O AORAKI

St Peter's School/Lincoln University
Demonstration Dairy Farm

FARM FOCUS DAY

Wednesday, 25 November 2020

Season Update

Tom & Jo talk about managing peak milk production and feed quality at Owl Farm in a roller coaster spring. We share our strategies to get through summer with dry soils and a predicted La Nina.

Planning for Plantain and Clover success

Join Kyle Gardyne from PGGWrightson Seeds, Hamish Johnstone from Agricom and JB Mikkelsen from Ballance Agri Nutrients as we discuss why we want more Plantain and Clover at Owl Farm, and what we are doing now to set ourselves up for success.

Can you handle the heat?

Practical steps to manage the hot Waikato summer and create comfort for cows and staff with Jac McGowan from DairyNZ.

DairyNZ FARM SOURCE Ballance PGG Wrightson Seeds

Disclaimer:

While every effort has been made to ensure information provided in this handout was true and correct and the time of going to print, Owl Farm takes no responsibility for the use of data outside of the purpose to inform readers of the current situation at Owl Farm for the purpose of the Focus Day.

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CONTENTS

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ST PETER'S SCHOOL & LINCOLN UNIVERSITY
DEMONSTRATION DAIRY FARM

St Peter's Cambridge
NEW ZEALAND

LINCOLN UNIVERSITY
TE WHARE WĀNAKA O AORAKI

OWL FARM STRATEGY

1. **Vision**

   a. **Dairy Farm**
   - To apply proven research, utilising good on-farm practice and scientific monitoring for the farm to be an exemplar in dairy production, financial, environmental and people performance, while maintaining the highest standards of health and safety.

   b. **Students**
   - To encourage more young people into the dairy industry.

2. **Strategic Objectives**

   a. **Dairy Farm**
   - Providing leadership to dairy farmers and the wider community by demonstrating progressive practices that can be achieved on farm.
   - Optimising profit through identifying the appropriate dairy production system for Owl Farm.
   - Achieving a sustainable environmental footprint based on industry good management practice.
   - To attract, train and retain quality employees.

   b. **Students**
   - To provide educational opportunities and exposure to the dairy industry which demonstrates career opportunities to students.

3. **Farm Development Stages**

   a. **Stage 1 Objective (2015/16 – 2017/18)**

   Established credibility by addressing current issues and performance, whilst setting up the farm for future development. During this stage, the farm operated a pasture-based system, with tactical supplementation strategies, based largely on existing infrastructure, to optimise profit while developing a resilient farm system.

   b. **Stage 2 Objective (2018/19 – onwards)**

   Testing and investigating, in conjunction with partners, innovative strategies to lead sustainable profit. The farm system will be developed over years 1-3 and reflect demonstration requirements of industry that are relevant and appropriate at that time point.

DairyNZ FARM SOURCE Ballance PGG Wrightson Seeds

HEALTH AND SAFETY

Welcome to Owl Farm. We are a fully operational, commercial dairy farm with several potential hazards to both visitors and staff. Many of these hazards cannot be eliminated while also providing access to visitors, therefore all staff and visitors MUST watch for potential hazards and act with caution.

St Peter's School / Owl Farm Hazard Notifications

- Children are the responsibility of their parent or guardian
- Normal hazards associated with a dairy farm
- Other vehicle traffic on farm roads and races
- Races may be slippery

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

Emergency Contact Information

In the event of an emergency, ensure the scene is safe and raise the alarm to get Owl Farm staff and emergency services to assist.

Emergency Services

- **Fire, Police and Ambulance** **111**
  1716 Cambridge Road, follow Hanlin Road through the school to the farm

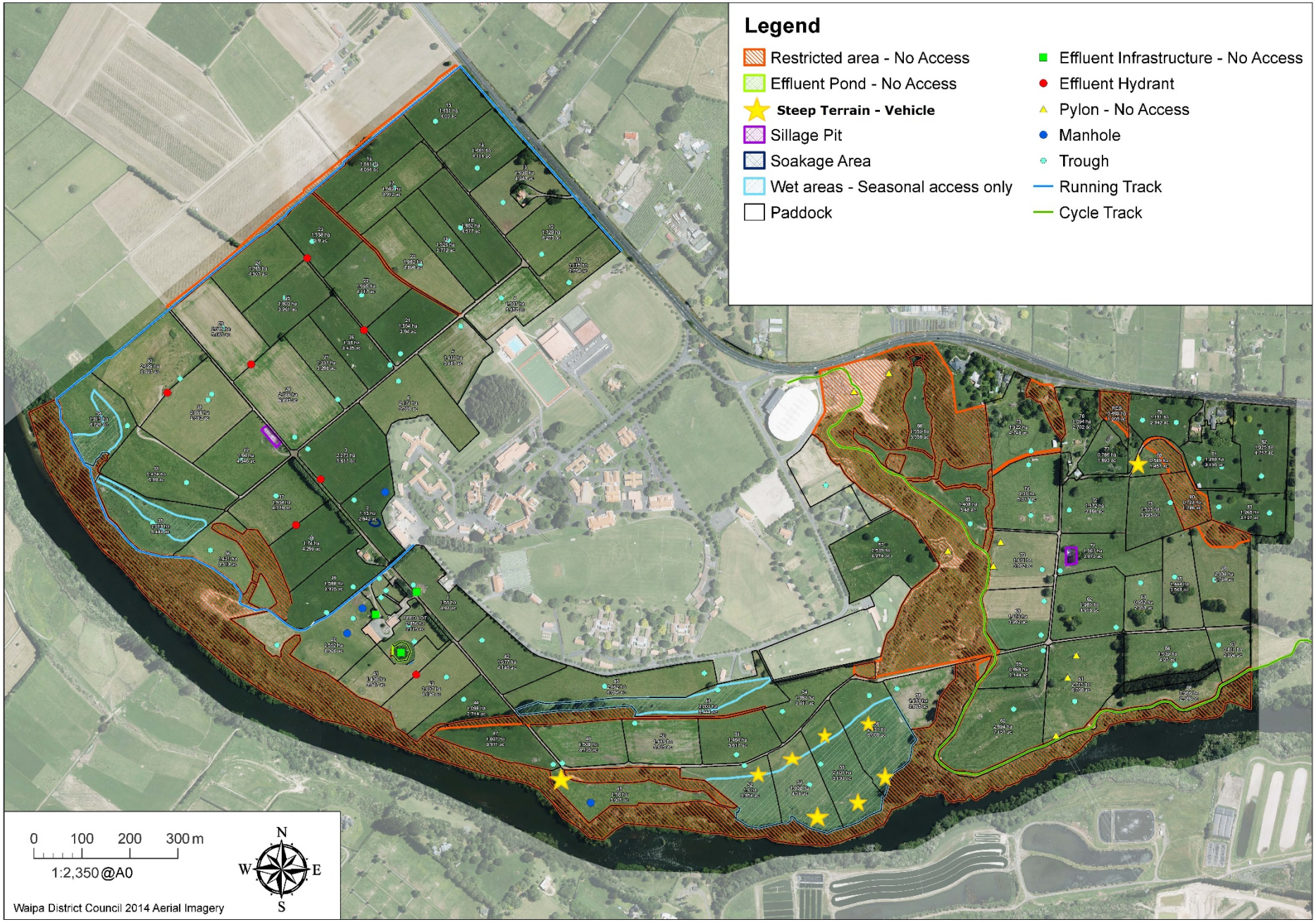
Farm Staff

- Jo Sheridan – Demonstration Manager 021 712 680
- Tom Buckley – Farm Manager 021 058 4916

Safety Equipment Location

- First Aid Kits Dairy Shed and Vehicles
- Fire Extinguishers Dairy Shed and Tractor
- Defibrillator Main Office and St Peter's Medical Centre

By entering Owl Farm and signing in at registration, you are acknowledging your understanding of any potential hazards and agree to take personal responsibility and act in such a manner as to protect yourselves and others also on-farm.


Legend
Restricted area - No Access
Effluent Pond - No Access
Steep Terrain - Vehicle
Sillage Pit
Soakage Area
Wet areas - Seasonal access only
Paddock
Effluent Infrastructure - No Access
Effluent Hydrant
Pylon - No Access
Manhole
Trough
Running Track
Cycle Track
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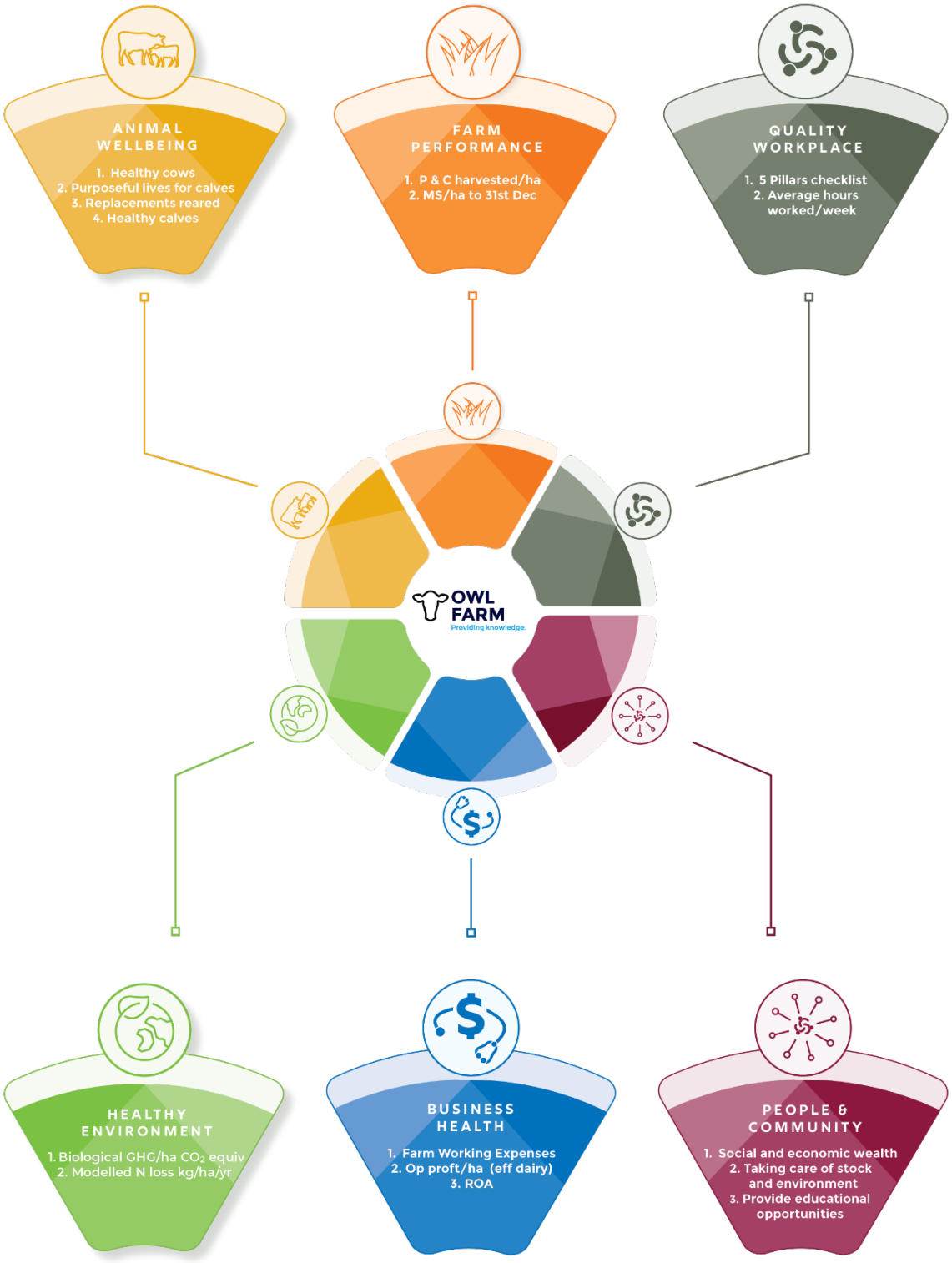
1:2,350 @A0
N
W
E
S
Waipa District Council 2014 Aerial Imagery

OWL FARM WAGON WHEEL KPIS – STAGE 2



OWL FARM MULTI-YEAR SNAPSHOT

	Year	2017-2018	2018-2019	2019-20
Physical Info	Total farm area	164	164	164
	Effective area (ha)	148	147.3	147.5
	Effective area leased (ha)	18	18	22
	Leased run off (ha)	5	3+12	5+5
	Cows wintered	441	419	421
	Peak cows (1 Nov)	418	406	405
	Peak stocking rate cows/ha	2.82	2.76	2.75
Production	Total kg MS	168,169	169,359	167,185
	MS/cow	402	417	413
	MS/ha	1,136	1,150	1,133
	MS/ha from homegrown feed	978	1,013	931
	MS as % liveweight	86.5%	89.7%	86%
	Average SCC	146,000	172,000	162,000
Feed and Inputs	Feed grown T DM/ha	17.5	15.7	13.9
	Feed harvested T DM/ha (actual kg)	13.6	14.1	12.2
	Feed harvested T DM/ha (@11MJ ME/kg DM)	13.7	13.2	
	Supplements imported T DM/ha	2.3	2.1	3.0
	Supplements imported T DM	335	306	440
	% diet imported	11%	11.8%	25%
	% of farm cropped & harvested (silages)	33%	93%	45%
	Nitrogen applied/effective ha	150kg	150kg	139kg
Financials	Gross farm revenue/kg MS (including stock/dividend)	$7.56	$6.86	*$7.62*
	Cash farmgate milk price/kg MS (Dairybase)	$6.39	$6.43	
	Accrued farmgate milk pric /kg MS	$6.66		
	Stock sales/kg MS	$0.54	$0.43	*$0.37*
	Dividend/kg MS	$0.36	$0.00	*$0.00*
	FWE/kg MS	$4.28	$4.41	*$4.96*
	OPEX/kg MS (inc dep^{n} & feed inv)	$4.59	$4.72	$5.46
	EFS/ha actual payouts (cash milk rev) Dairybase	$3,096	$2,482	*$2,405*
	EFS/ha actual payouts (accrued milk rev)	$3,446	$2,395	
	EFS/ha @ $6.00 farmgate milk price (no div)	$2,102	$1,922	
	Opening debt/kg MS held	$21.23	$23.02	*$21.61*
Enviro	Estimated N loss kg/ha	35	35	33
	Estimated P loss kg/ha	0.8	0.9	0.8
	GHG loss/ha Overseer FM kgCO_2e/ha	11,900	11,740	11,264
	Biological GHG/ha (methane + nitrous oxide)	9,824	9,361	9,030
	N conversion efficiency	24%	24%	25%
	Cowshed	36 Rot	36 Rot	36 Rot
	Feed infrastructure	NIL	NIL	NIL
	Herd BW/PW	112/135	119/153	159/186
	Industry BW/PW	72/93	64/73	93/117
	Effluent storage	*New lined pond*		
	% farm effluent applied to	51 ha 34%	51 ha 34%	51 ha 34%

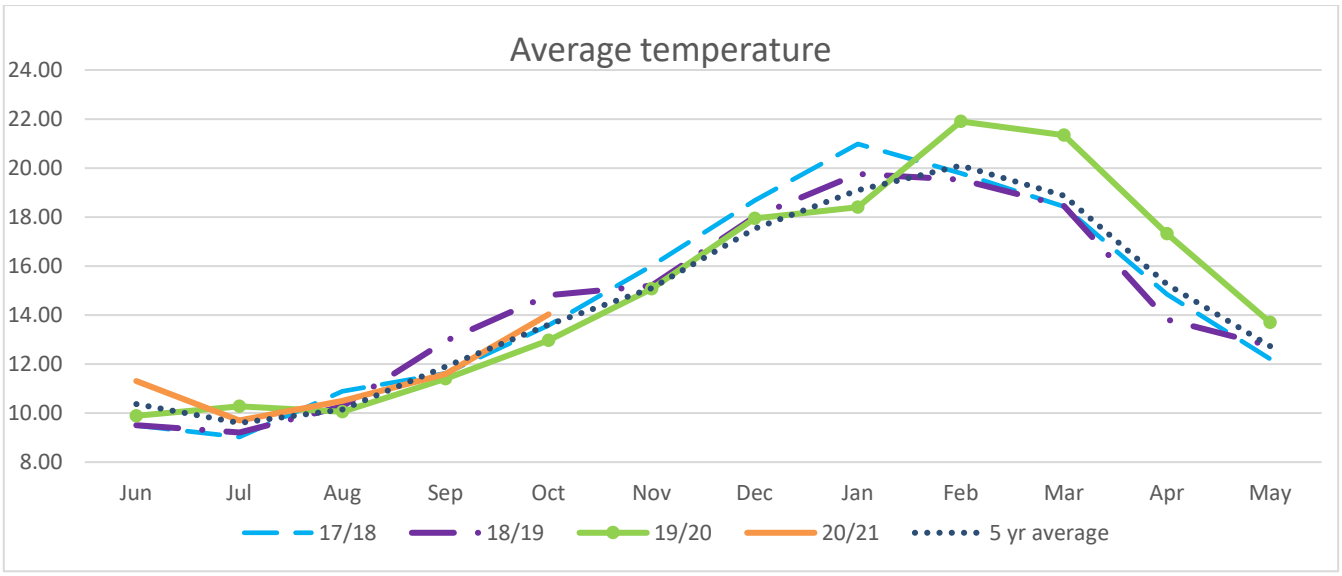
**Estimates in italics*

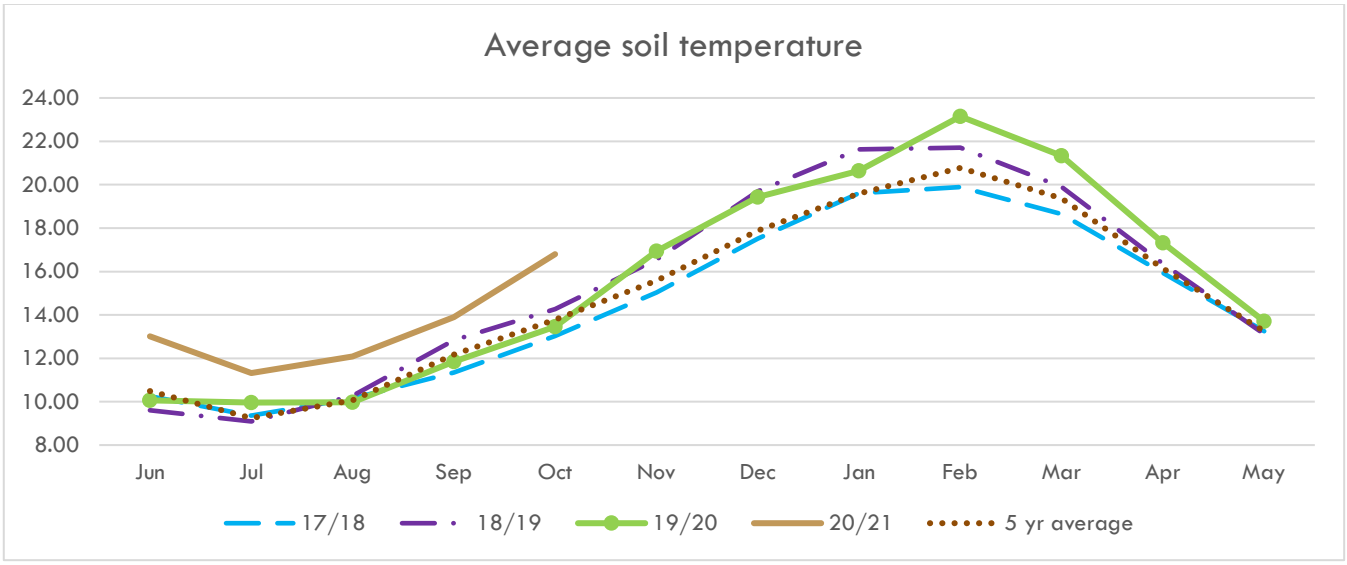
FARM PERFORMANCE

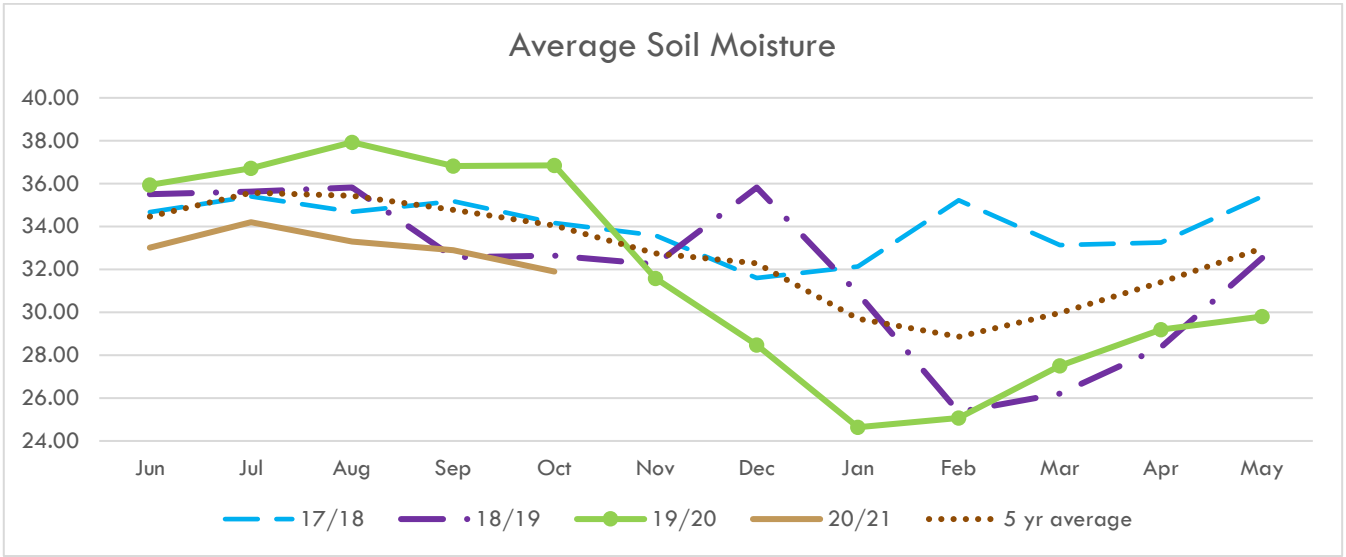
We started the 2020 season with a warm dry winter and early spring. Good grazing conditions have seen excellent feed utilisation, less pasture damage, and less wear and tear on machinery. Although air temperatures have been somewhat average, the significant trend is much higher soil temperatures and lower soil moisture levels. This is supported by low rainfall with only 376 ml to the end of October. These early indicators prompted us ensure that crops went in early: chicory (for calves) on 22nd September, kale on 5th October and turnips 20th October while there was suitable soil moisture for germination and early growth. Even with such a warm spring we have grown less feed this year and harvested less silage (118 t DM this season vs 190 t DM budgeted). Covers have remained within our target of 2000-2300 kg DM/ha except for the first week of November when we shut up 25 ha for silage. Feed quality has remained high all spring with our November feed test returning an average 12.3ME. The cows have responded well with higher per cow production in September and October. Our response to the lower pasture production has been to bring forward the November fertiliser application and update the feed budget which indicated we needed to secure extra silage from off farm (138 t DM).

	Season to date 31/10/2020	2017-2018	2018-2019	2019-2020	2020-2021
Stock	Milking Platform	148	147	147	144
	Cows on farm	428	411	407	410
	Peak cows	418	406	405	405
	Peak stocking rate	2.82	2.76	2.75	2.81
Production	Total kgMS Season to date to factory	75,653	76,973	78,100	75,962
	MS/cow Season to date	181	190	193	188
	MS/ha Season to date	510	523	530	528
	MS/ha from homegrown feed to date	424	468	499	490
Feed and Inputs	Average Pasture Cover 1 June	2,256	2,430	2,516	2,517
	Pasture growth rates total TDM/ha	7.1	6.6	7.0	6.8
	Actual pasture grown to graze and harvest as silage excl area sprayed out in crop	6.4	6.3	7.1	6.4
	Total pasture supply TDM/ha	6.4	6.3	7.1	6.4
	Yield of Crop grown per total farm /ha	0.0	0.0	0.0	0.0
	Winter homemade silage on hand fed	0.2	0.8	0.6	0.1
	Imported Supplements fed/ha	1.3	0.8	0.4	0.5
	Total Feed supply TDM/ha	7.9	7.9	8.2	6.9
	Homegrown grass eaten TDM/Ha (grown this year)	5.0	4.7	5.4	4.9
	Homegrown silage grown and eaten this year	0.0	0.0	0.0	0.0
	Crop eaten per total farm/ha	0.0	0.0	0.0	0.0
	Homegrown feed EatenTDM/ha (grown this year)	5.0	4.7	5.4	4.9
	Silage harvested TDM/ha Season to date	0.1	0.4	0.7	0.4
	Total Homegrown feed Harvested TDM/ha	5.0	5.1	6.0	5.3
	Winter homemade silage on hand eaten	0.2	0.6	0.5	0.1
	Imported Supplements Eaten TDM/ha	1.0	0.6	0.4	0.4
	Total Feead eaten this year (includes only silage fed) TDM/ha	6.2	5.9	6.2	5.4
	% Feed eaten grown on farm	83%	90%	94%	93%
	Feed conversion Eff (kgDM/kgMS eaten)	12.1	11.4	11.7	10.2
	Nitrogen Applied/effective ha	91	68	63	72

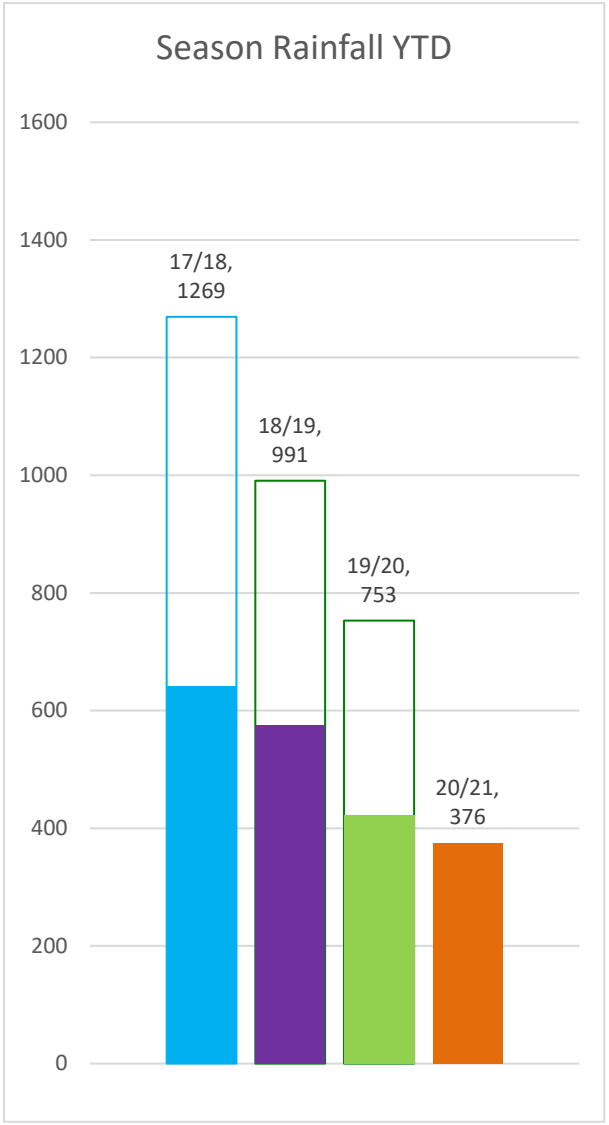
CLIMATE

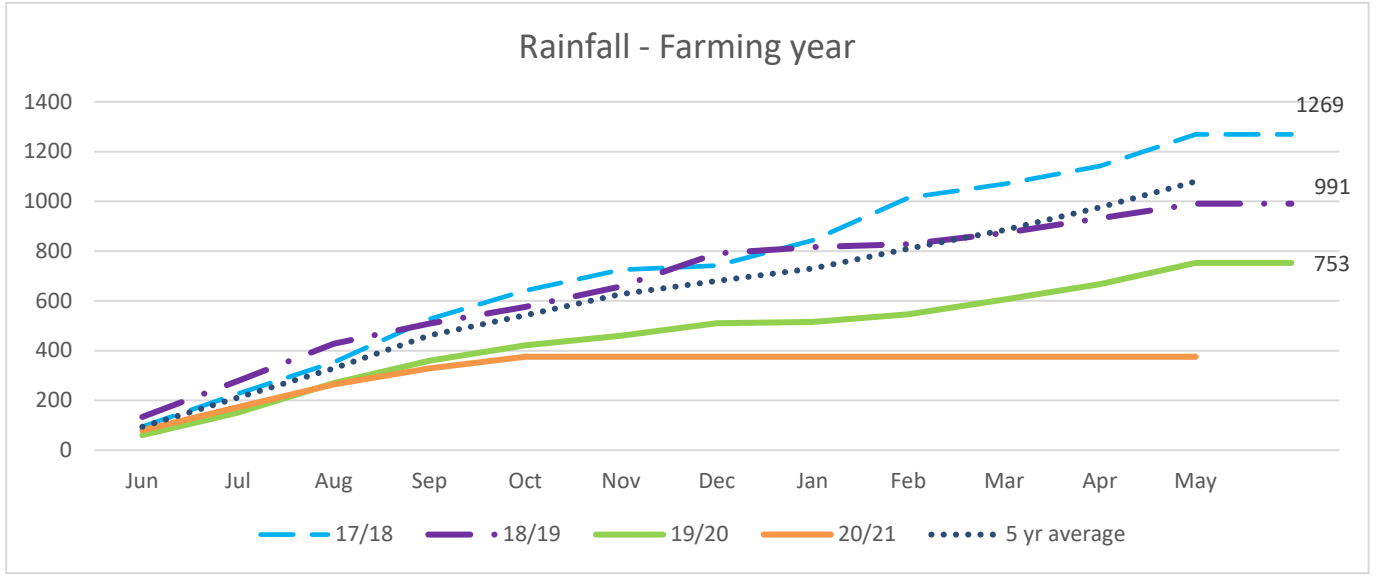

Average temperature
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
17/18
18/19
19/20
20/21
5 yr average

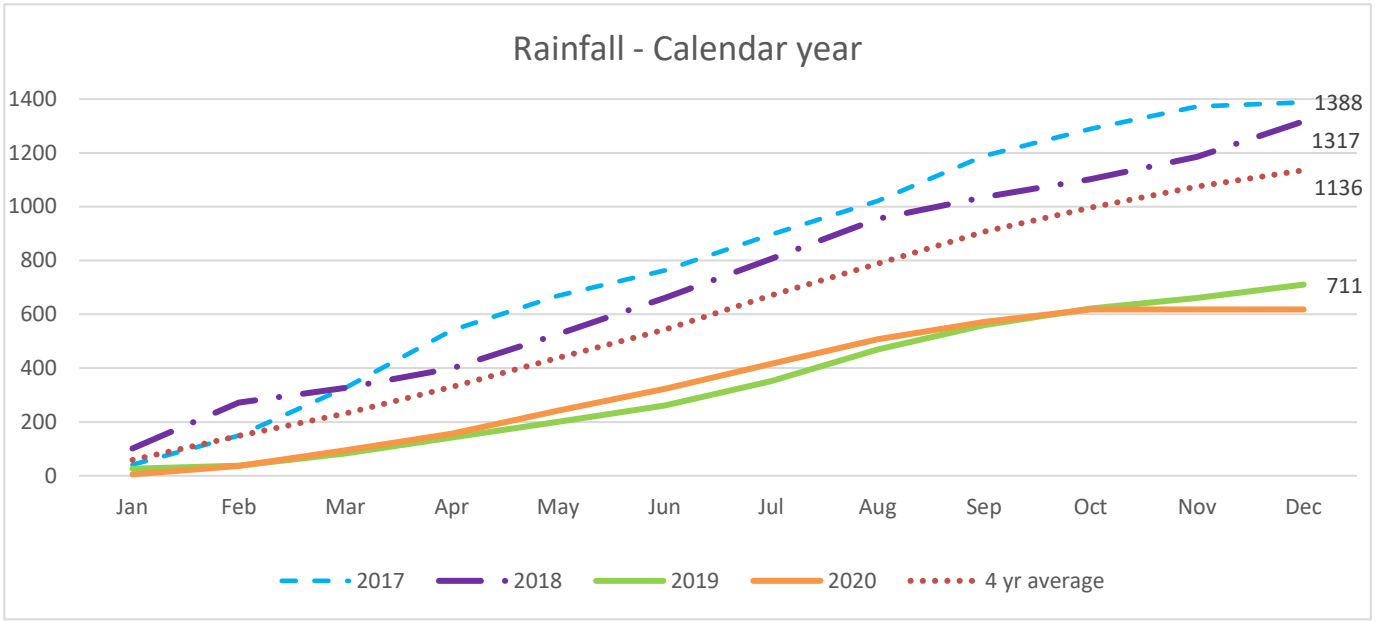

Average soil temperature
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
17/18
18/19
19/20
20/21
5 yr average


Average Soil Moisture
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
17/18
18/19
19/20
20/21
5 yr average

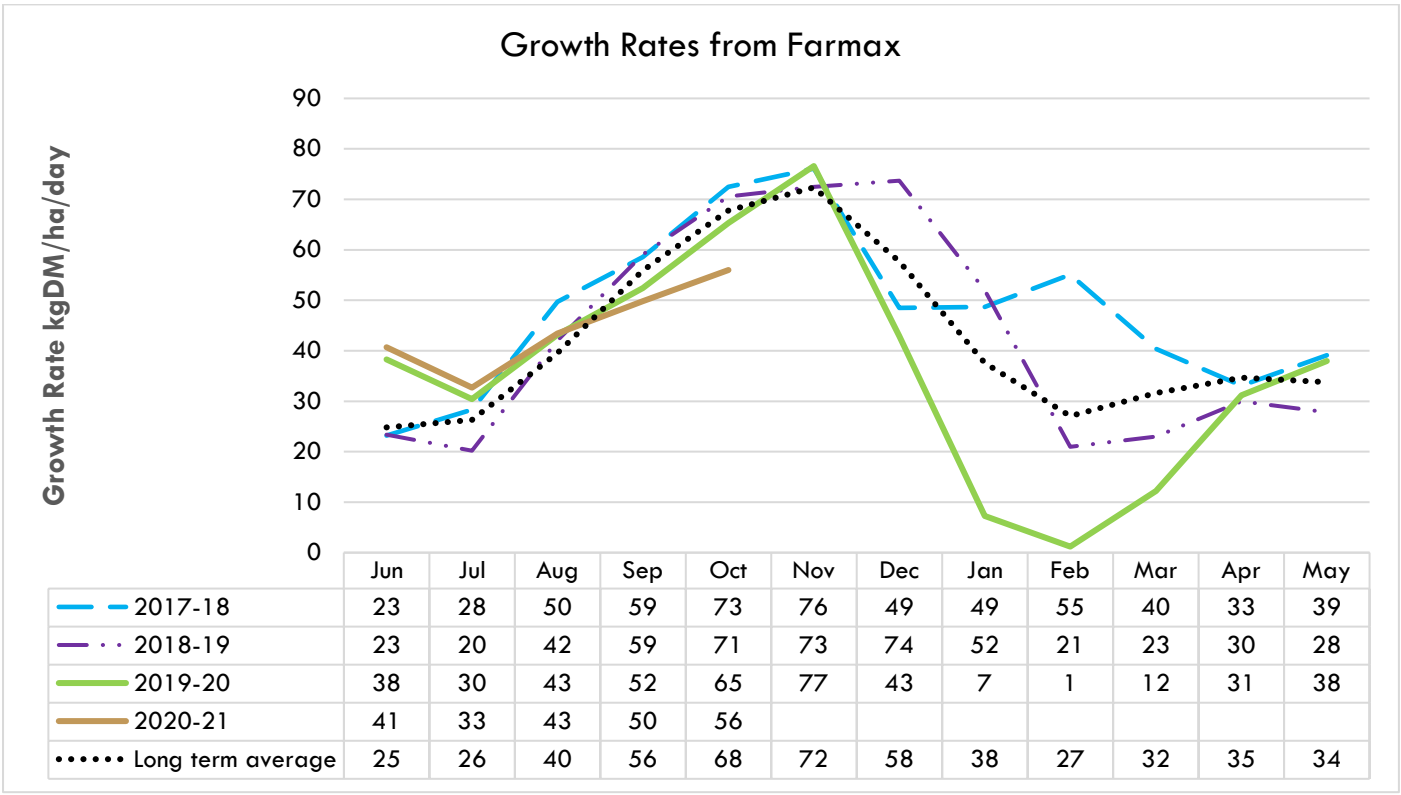
RAINFALL


Season Rainfall YTD
1600
1400
1200
1000
800
600
400
200
0
17/18, 1269
18/19, 991
19/20, 753
20/21, 376


Rainfall - Farming year
1400
1200
1000
800
600
400
200
0
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
1269
991
753
17/18
18/19
19/20
20/21
5 yr average

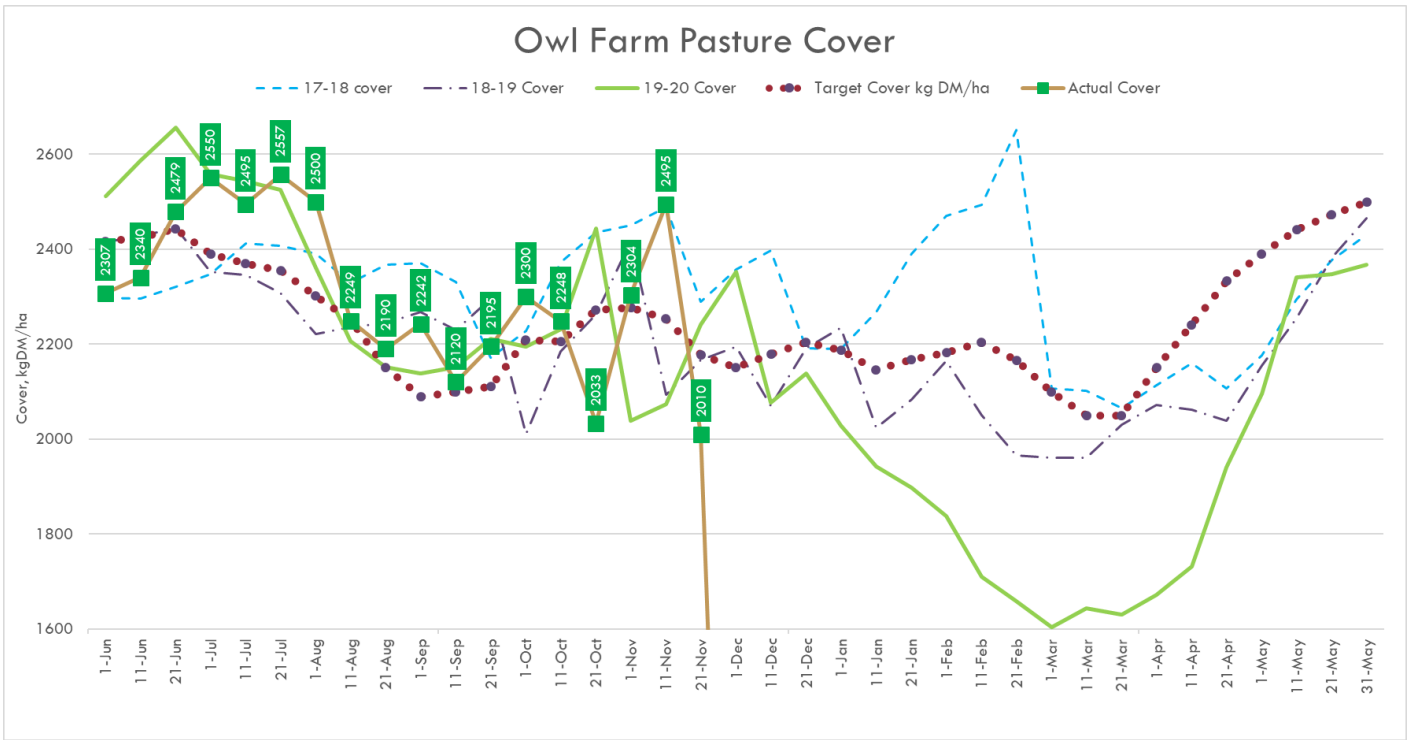

Rainfall - Calendar year
1400
1200
1000
800
600
400
200
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
1388
1317
1136
711
2017
2018
2019
2020
4 yr average

GROWTH RATES



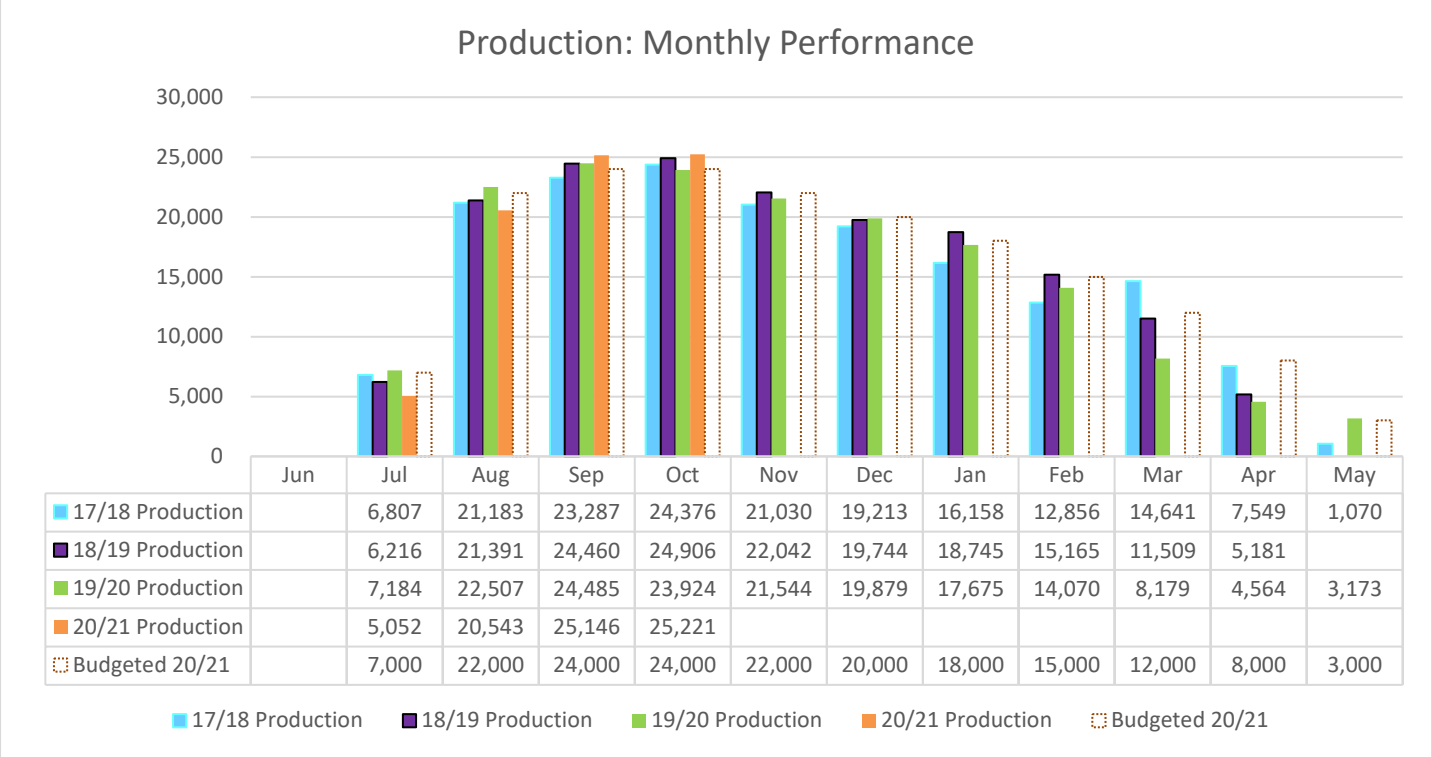
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
2017-18	23	28	50	59	73	76	49	49	55	40	33	39
2018-19	23	20	42	59	71	73	74	52	21	23	30	28
2019-20	38	30	43	52	65	77	43	7	1	12	31	38
2020-21	41	33	43	50	56							
Long term average	25	26	40	56	68	72	58	38	27	32	35	34

PASTURE COVER

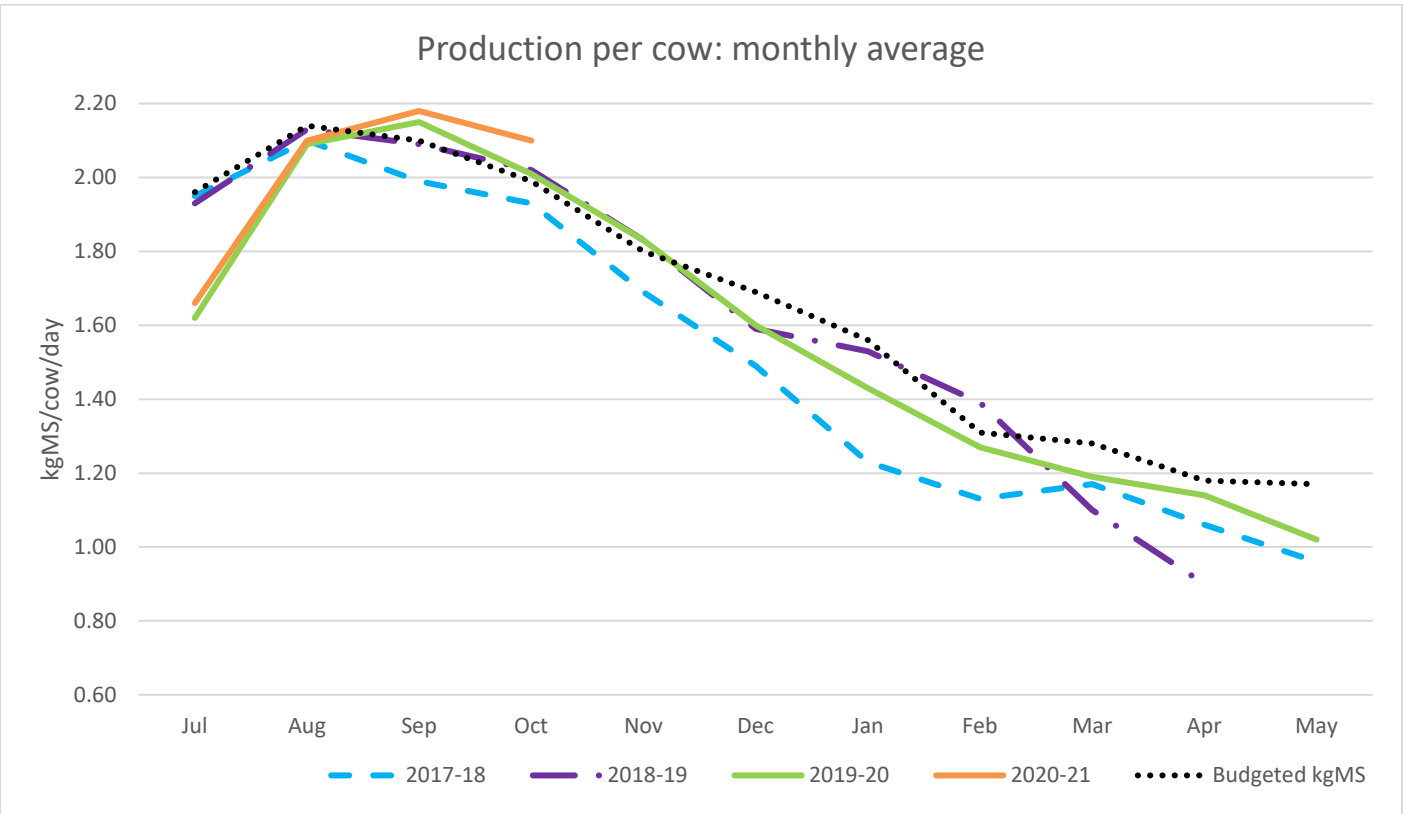


PRODUCTION

As at 18/11/2020 the herd had produced 88,592 kg MS which is 3% behind last season's production. For the month of November, we are tracking 4% behind. Production has dropped off significantly in November and latest herd test results showed cows averaging 1.69 kg MS/cow/day with 150 L/day still being used for calf milk.

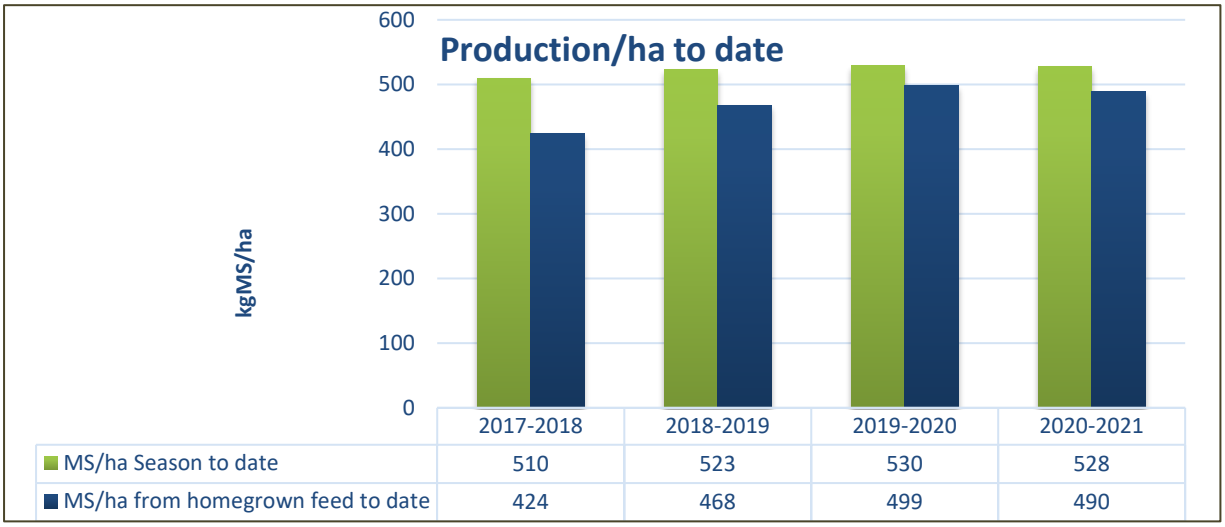


	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
17/18 Production		6,807	21,183	23,287	24,376	21,030	19,213	16,158	12,856	14,641	7,549	1,070
18/19 Production		6,216	21,391	24,460	24,906	22,042	19,744	18,745	15,165	11,509	5,181	
19/20 Production		7,184	22,507	24,485	23,924	21,544	19,879	17,675	14,070	8,179	4,564	3,173
20/21 Production		5,052	20,543	25,146	25,221							
Budgeted 20/21		7,000	22,000	24,000	24,000	22,000	20,000	18,000	15,000	12,000	8,000	3,000



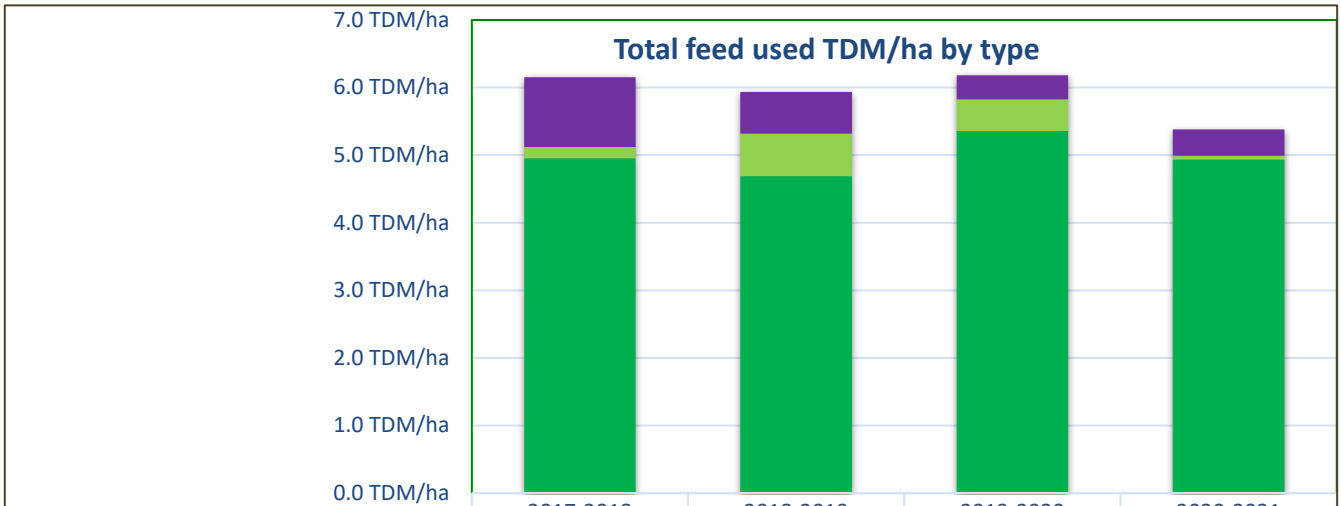
MS/HA FROM HOME-GROWN FEED

Even though production/ha season to date is similar to last season (we have less land this season) we have produced slightly less of it from our home-grown feed due to lower pasture grown compared with last season. This year we have used approx. 12 t sorghum silage and 13 t DM hay for the springer cows to manage energy intake. We have fed 10 t wet weight of Calcimol Molasses and 52 t DM of PK to the Colostrum and Milkers.



	2017-2018	2018-2019	2019-2020	2020-2021
MS/ha Season to date	510	523	530	528
MS/ha from homegrown feed to date	424	468	499	490

FEED SUPPLY AND DEMAND GRAPH



	2017-2018	2018-2019	2019-2020	2020-2021
Imported Supplements Eaten TDM/ha	1.0	0.6	0.4	0.4
Crop eaten per total farm/ha	0.0	0.0	0.0	0.0
Homegrown silage grown and eaten this year	0.0	0.0	0.0	0.0
Winter homemade silage on hand eaten	0.2	0.6	0.5	0.1
Homegrown grass eaten TDM/Ha (grown this year)	5.0	4.7	5.4	4.9
Total Feed eaten this year (includes only silage fed) TDM/ha	6.2	5.9	6.2	5.4
% Feed eaten grown on farm	83%	90%	94%	93%

CROP PLAN

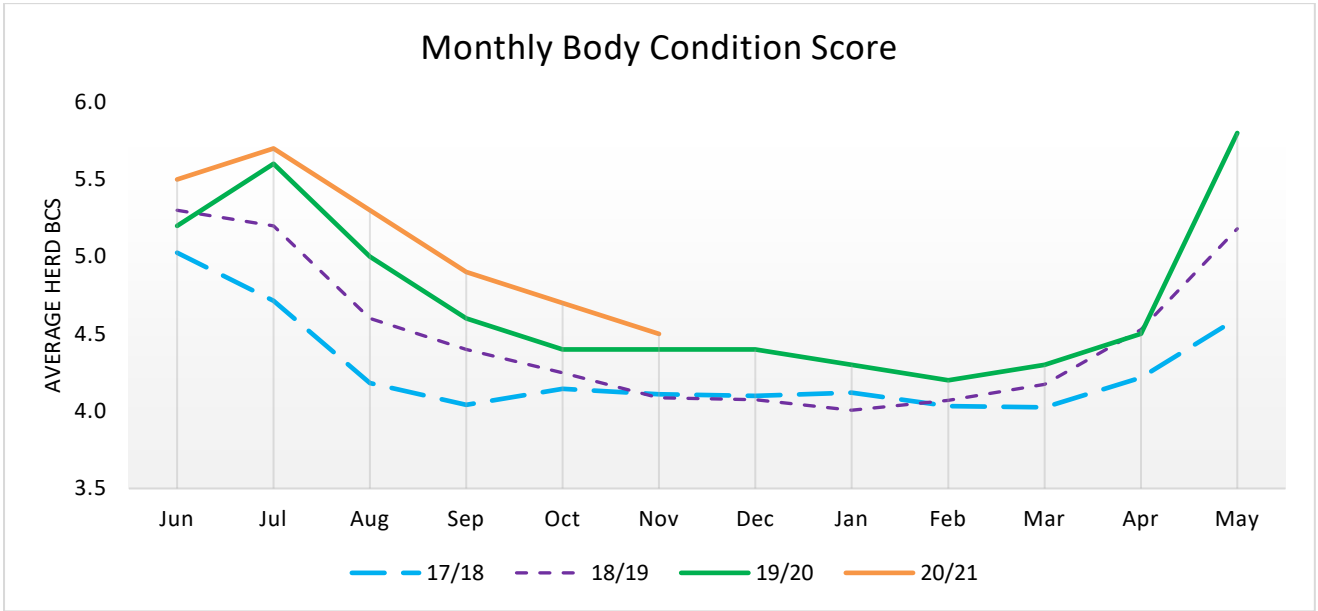
Changes to this season's crop plan include growing an extra 1 ha of kale, because it fits well with our system and will cover any expected shortfall in summer feed. We have also opted to grow 4.7 ha of chicory to graze weaners on at our runoff lease block.

Ha	Variety	Sow date
4.71 (runoff)	Puna II Chicory	22nd September
4.47	Firefly clean crop Kale	5th October
6.55	Toto Clean crop Turnip	20th October

ANIMAL WELLBEING

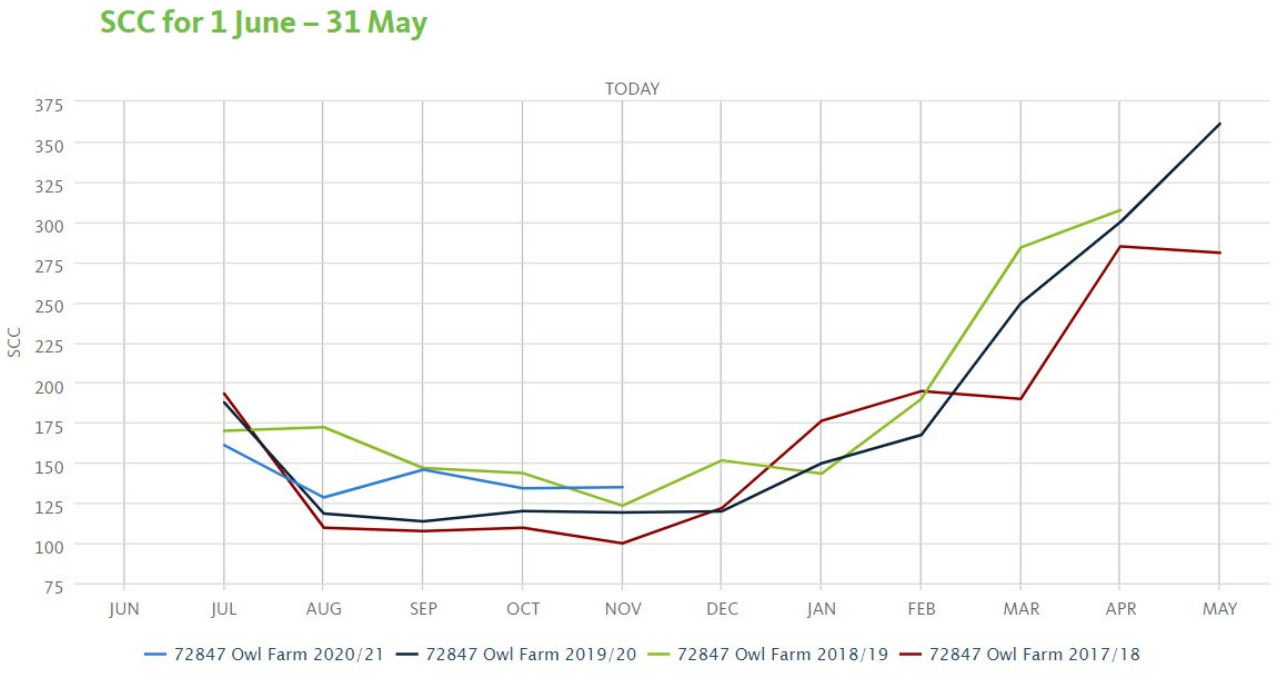
BODY CONDITION SCORE

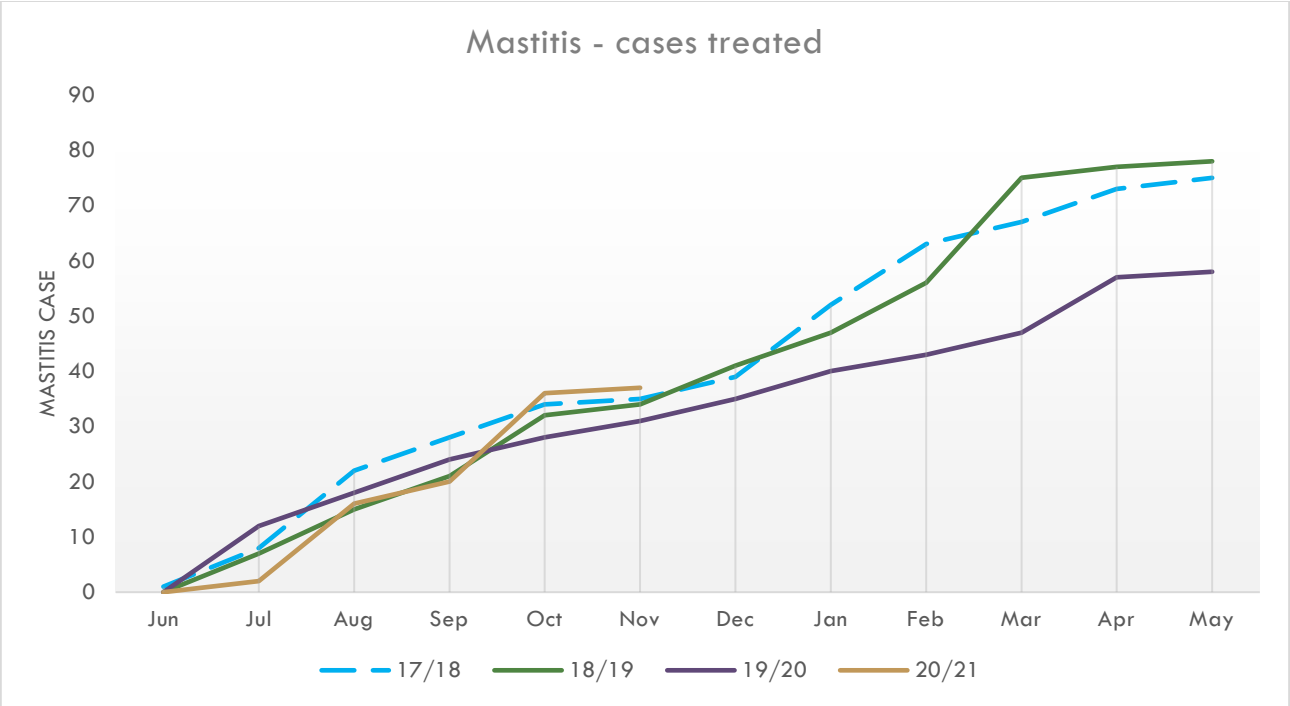
Dry-off decisions made through last summer have ensured that cows started the season exceeding BCS targets. Even though BCS has been higher than ever all winter/spring, they still dropped 0.8 BCS from Planned Start of Calving to Planned Start of Mating. They have continued to lose BCS through to November which was expected with the high volumes of milk continued to be produced through September and October on predominantly all-pasture diet.



SCC (SOMATIC CELL COUNT)

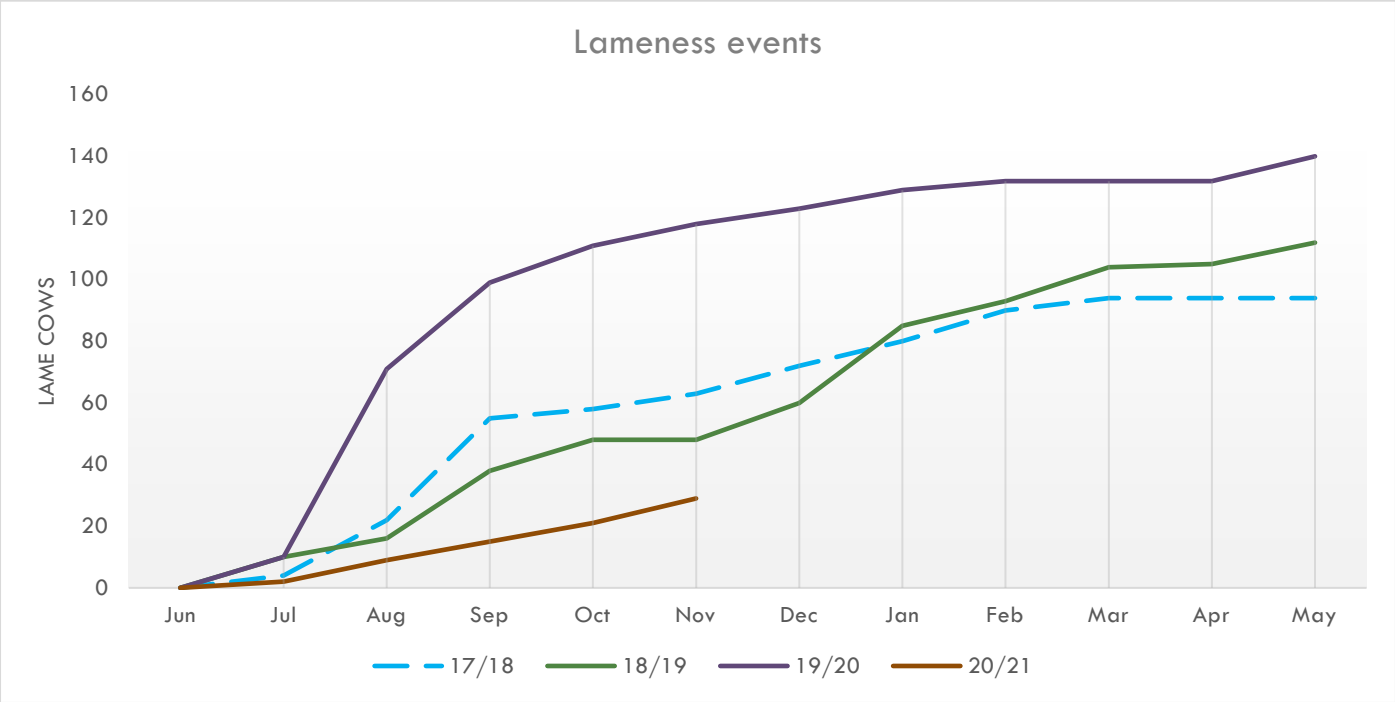
Keeping cows in the colostrum herd for an extra few days (to provide milk for calves) this season, has enabled more time to be spent on checking milk and udder quality prior to entering the main herd. Cows are always stripped and paddle-tested before entering the main herd, with any marginal cows staying in the colostrum mob a little longer until they are clear. We have used whole herd stripping on occasion when needed.





LAMENESS

More cows were identified as lame last year compared with previous years, partially due to our lower tolerance levels to draft out a cow and check feet or rest them. A lame case is recorded if a cow is drafted out of her herd regardless of the treatment. The number of cows treated with antibiotics for lameness last season was 26, or 6.5%.



This is a critical area for animal welfare and performance, so we enlisted the help of our Healthy Hoof provider, Bill Hancock from Cambridge Vets, and recorded film footage of cow movement on the yard to contribute to our review.

Key actions undertaken so far for the 2020-21 season include:

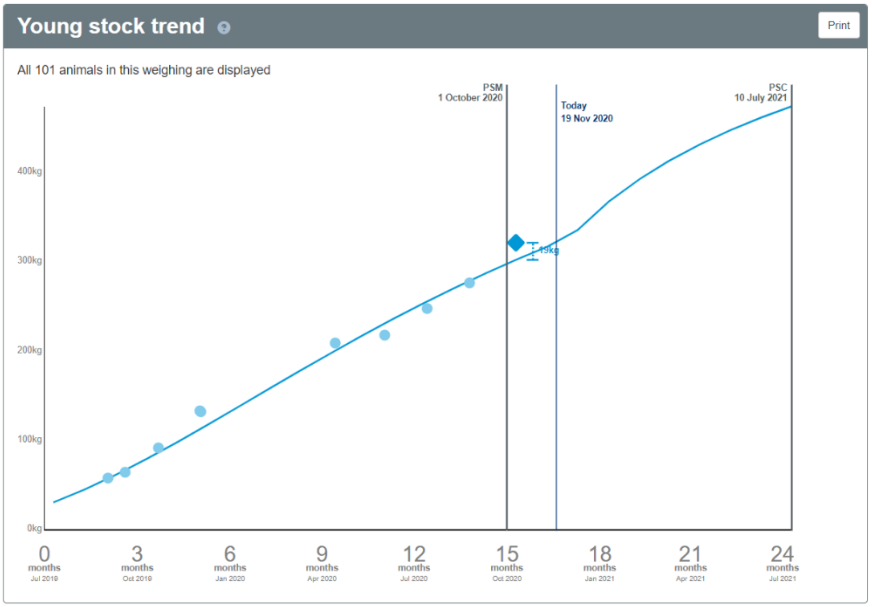
1. Install mirror for backing gate operator
2. Only use the backing gate to take the space behind half the herd that is already facing the entry to the platform. This allows the remaining cows to turn around (in their own time after entry to the yard) before the backing gate takes the space behind them.
3. Update recording board at lameness treatment area to align with DairyNZ Healthy Hoof app, including which hoof and potential issues
4. Trial Batt-latch time release gate openers to reduce pressure on movement to the shed.
5. Investment of over $30,000 on race work last autumn to remedy some sharp stony race surfaces

We have significantly reduced the incidences of lameness this season, with only 7.1% of cows recorded as lame to date compared with 29% last season. So far this season only 6 cows have been treated with antibiotics for lameness.

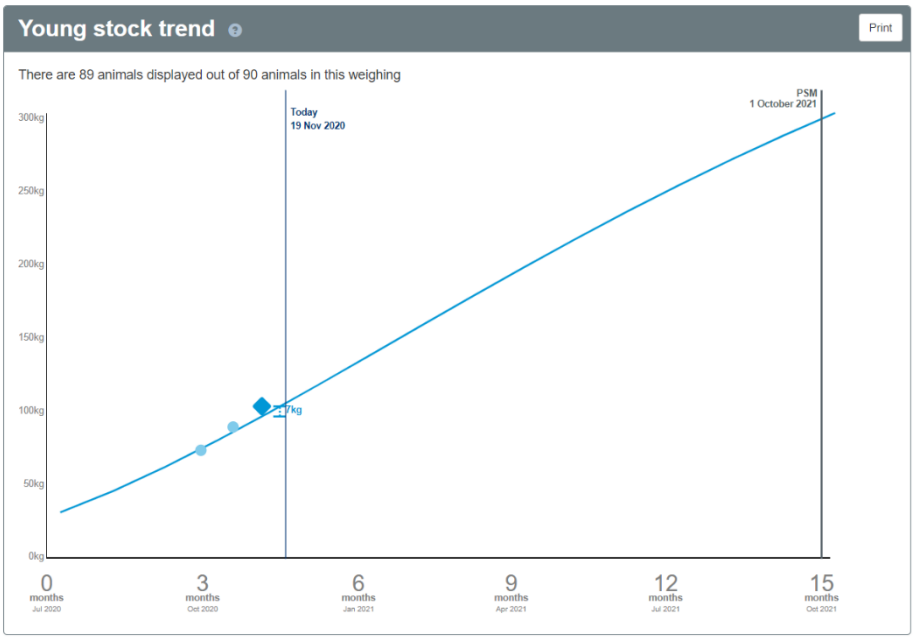
LIVESTOCK GROWTH

A team effort including investing in extra supplements has got the R2s back on track weighing an average of 321 kg on 10th October. Calves weighed 104 kg on the 5th November. They will spend the summer on Chicory, PK and grass silage on a leased area beside the milking platform.

2019 REPLACEMENT HEIFERS



2020 REPLACEMENT HEIFERS



BUSINESS HEALTH

Early season cashflow monitoring shows that income is ahead of budget even though milk production is tracking behind. This can be explained by:

(a) final payments from 2019-20 season

(b) dividend payment from Fonterra and LIC

(c) we are ahead in stock income due to 4 culls removed in October and excellent calf survival and income received

Expenses are tracking on a par with budget but with some category variations:

(d) wages are tracking below budget due to a vacancy during the spring for our part time FA. We expect to use this allocation to cover regular time off and extended annual leave in the autumn.

(e) this underspend in breeding reflects the timing of budget allocation. Expect to see these costs come through in November.

(f) purchased in 138 t DM of standing grass silage to cover the feed budget deficit we were predicting with less grass grown and less silage made. This also includes silage for the calves and a replacement for some PK in the system to better manage FEI. We expect that with all our feed secured for the season including 100 t PK at $306/t landed we will underspend on the combined total of purchased feed and silage made.

(g) extra feed purchased to get R2s up to weight for mating and yarding costs for synchrony programme were both unbudgeted costs. R1 heifers will be grazed at home so this category will be a significant underspent by the end of the year. Grazing calves will show as cropping cost along with an estimated 30 t DM of purchased feed (PK and silage).

(h) lower vehicle use in the spring time will probably catch up during November for mowing and the summer when we start to feed out.

(i) and (j) timing of expense relative to budget. Expect both of these to catch up by year end.

Owl Farm - For Year Ended: May 2021

OWL FARM
Providing knowledge.
ST PETER'S SCHOOL & LINCOLN UNIVERSITY DEMONSTRATION DAIRY FARM

St Peters Cambridge

LINCOLN UNIVERSITY

INCOME	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Total	Budget YTD	Variance YTD	Budget Full Year	
Milk Solids KG	-	5,052	20,543	25,146	25,222	75,963	77,000	(1,037)	175,000	
Milk	67,990	71,112	142,595	163,790	124,793	**570,282**	565,076	5,206	1,210,382	a.
Dividends	-	-	-	7,781	9,308	**17,090**	-	17,090	-	b.
Cattle	-	1,187	12,942	6,717	13,094	**33,940**	27,400	6,540	70,770	c.
Other Income	-	3,930	-	-	-	**3,930**	-	3,930	-	
Total Income	**67,990**	**76,229**	**155,537**	**178,289**	**147,196**	**625,241**	**592,476**	**32,765**	**1,281,152**	

EXPENSES	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Total	Budget YTD	Variance YTD	Budget Full Year	
Wages	10,940	10,163	18,406	14,253	12,146	**65,909**	75,295	(9,386)	182,508	d.
Animal Health	7,933	9,770	2,524	4,809	680	**25,715**	24,500	1,215	57,000	
Breeding	315	225	535	280	16,410	**17,765**	32,332	(14,567)	39,851	e.
Dairy Shed and Electricity	219	1,537	1,959	1,976	1,672	**7,363**	9,950	(2,587)	24,040	
Purchased Feed	4,446	9,227	8,022	39,991	23,586	**85,272**	54,865	30,408	85,075	f.
Grazing - Replacement Heifers & Calves	-	5,226	5,226	12,758	5,226	**28,435**	21,000	7,435	70,600	g.
Fertiliser	(981)	-	7,490	16,002	13,095	**35,606**	33,570	2,036	65,053	
Gibberellic Acid	-	-	-	-	-	**-**	-	-	-	
Fertiliser Spreading	-	-	677	3,196	1,853	**5,726**	5,600	126	5,984	
Freight	-	606	119	522	-	**1,247**	155	1,092	3,619	
Cartage	48	-	993	1,444	1,725	**4,210**	5,679	(1,469)	8,855	
Weeds and Pests	-	335	-	-	-	**335**	1,444	(1,110)	2,500	
Consultancy	-	-	-	-	-	**-**	-	-	4,000	
Silage	-	-	-	2,060	6,022	**8,082**	10,000	(1,918)	47,450	
Cropping	-	-	-	3,270	5,283	**8,553**	5,000	3,553	10,750	
Regrassing	2,700	-	-	4,800	-	**7,500**	4,800	2,700	22,800	
R&M	3,448	6,008	1,868	14,910	1,760	**27,992**	24,650	3,342	103,850	
Vehicle Expenses	2,226	948	2,074	1,400	946	**7,595**	12,295	(4,700)	12,708	h.
General	743	2,607	3,429	3,003	2,935	**12,717**	21,430	(8,713)	50,359	i.
Overheads	1,719	1,719	1,719	5,395	1,719	**12,271**	18,384	(6,113)	47,557	j.
Total Farm Working Expenses	**33,756**	**48,371**	**55,041**	**130,068**	**95,058**	**362,294**	**360,949**	**1,346**	**844,559**	
Net Surplus before Financial Charges	**34,234**	**27,858**	**100,496**	**48,221**	**52,138**	**262,947**	**231,527**	**31,420**	**436,593**	

Financial Charges	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Total	Budget YTD	Variance YTD	Budget Full Year	
Interest Cost	14,106	14,106	14,106	14,106	14,106	**70,530**	56,665	13,865	135,996	
Lease Land	3,103	3,103	3,103	3,103	3,084	**15,497**	20,340	(4,843)	48,816	
Depreciation	8,000	8,000	8,000	8,000	8,000	**40,000**	40,000	-	96,000	
Total Financial Charges	**25,209**	**25,209**	**25,209**	**25,209**	**25,190**	**126,027**	**117,005**	**9,022**	**280,812**	
Surplus (Deficit) after Financial Charges	**9,025**	**2,649**	**75,287**	**23,011**	**26,949**	**136,920**	**114,522**	**22,397**	**155,781**	

PLANNING FOR PLANTAIN AND CLOVER SUCCESS

We have a goal of harvesting 15 t DM/ha of pasture & crop at Owl Farm. In the 18/19 season we achieved 14.1 t DM/ha which dropped down to 12.2 t DM/ha last season during the drought. We want to achieve this goal while reducing our modelled N loss from 33kg N/ha last year. By adding more plantain and clover to the swards we can reduce total N fertiliser use and mitigate some of the N loss from the system.

OWL FARM JOURNEY

1. Annual re-grass strategy to improve feed quantity and quality including clover and broadcast plantain in spring (approx. 10-15% of farm /year) for the last four years.

2. Clean crop brassica system to reduce weed burden on new pastures (last two seasons).

3. Understand current soil fertility levels including Total N (7 block samples plus crop areas taken in Spring 2020).

4. Pasture condition scoring for each paddock to assess current sward health and proportion of plantain and clover carried out now. Recorded against paddock sowing history. Used with pasture yield data to plan re-grass strategy and understand what is thriving out of the seed mixes sown in each paddock.

5. Determine strategy for increasing plantain and clover content during Autumn re-grass plan with agronomist.

6. Collect clover only herbage samples (Nov 2020).

7. Correct any nutrient deficiencies.

8. Modify Farmax feed budget to reflect change in fertiliser use and system evolution to determine risks and strategies to mitigate them.

Next steps:

9. Alter financial budget in March to reflect changes (decreased N fertiliser, more Mo fertiliser if needed, higher seed and re-grassing costs, gibberellic acid)

10. Carry out pasture renovation as advised by agronomist

11. Look after pastures in the early years

Setting up a farm feed system

Selecting the correct pastures to go on your farm is like putting a puzzle together, each piece has its place. However, if a piece is incorrectly inserted the picture might not look as you had hoped.

Ryegrasses in New Zealand are split into five categories: annual, Italian, short rotation, long rotation and perennial. Annuals are short lived, rapid-to-establish ryegrasses, while perennials are at the other end of the spectrum and live longer but are slower to establish. However, it is important to note that no grass lasts forever.

When selecting pastures for your farm it is important to get the large pieces (typically perennial or long rotation ryegrasses) of the puzzle in the correct places. Perennial or long rotation grasses are categorised by their heading date. The heading date is the time in spring when seed heads first become visible in the pasture. Why is this important? Ryegrass has approximately a six week burst of growth prior to the seed head emerging. Once seed heads emerge we see a decline in pasture quality due to more stem, an increase in dead material and less leaf. Having a minimum of two different heading date areas on your farm enables you to more strategically manage pasture growth and quality i.e. no more than 50% of your farm should be in one heading date.

Annual, Italian and short rotation ryegrasses can be used to undersow into existing pastures to thicken them up or extend their longevity until they are regrassed or as a pure sward pasture "crop". In areas with high insect pressure, such as Black Beetle, the use of nil endophyte grasses (i.e. annuals/ Italians) undersown into existing swards should be restricted to paddocks that are nearing pasture renewal. Alternatively, they can be used as a pure sward in paddocks that are to be taken out the following spring for crop.

Questions to ask when establishing what your farms perennial or long rotation ryegrass needs are:

- What are the existing pasture cultivars on my farm?
- What are their heading dates?
- What area of farm is planted in them?
- Paddock use (e.g. lambing, sick cow paddock)?

Piece 1: Mid-season heading ryegrass.

- Paddocks close to dairy shed (i.e. a sick cow paddock), paddocks needed in the first 2-3 weeks after calving, and night paddocks
- Lambing/calving area

Piece 2: Late heading ryegrass.

- Feed for early in the season to lift cows towards peak production
- Feed to lift milk yield of lactating ewes and beef cows for improved lamb and calf live weight gain

Piece 3: Very late heading ryegrass.

- Feed for dairy cow mating, to hold cows at peak production and to help slow the rate of drop-off of peak production
- Feed to hold ewe milk production post-peak production period, boost lamb liveweight gains allowing more lambs to be drafted to the works off the ewe

A successful farm feed system:

How to establish and manage pasture successfully

THE BASICS

There is an endless supply of information and advice regarding pasture management, often conflicting and sometimes simply poor advice. However, the core principles of ryegrass performance and persistence are still the same, and these are the areas to concentrate on to do the job well.

New Pasture Establishment

- Plan and prepare for success. Implement a renewal programme which addresses any limiting factors such as drainage, soil fertility, pests and weeds. Grass to grass renewal can work well in some situations, however where factors limiting ryegrass performance are present, a well managed break crop will set up the paddock for new pasture. Take no shortcuts; remember ten seasons from a new perennial pasture is the goal.
- Choose an appropriate cultivar. Where pests are prevalent, an appropriate endophyte is a key consideration. Beyond that, the type of cultivar needs to be right for the paddock (e.g. fertility) and grazing management (e.g. rotational grazing vs set-stocking). The highest yielding cultivar is often not the best choice for a challenging situation. Talk to a retailer or your local PGG Wrightson Seeds Sales Agronomist for recommendations.
- Establishing new pastures is about achieving a satisfactory level of tillering and root mass. From this point, a pasture will be resilient to ongoing grazing requirements and the challenges associated with periods of summer dry or winter wet. In general terms we should have about twenty tillers for each ryegrass plant before we consider it established. A plant with twenty tillers is relatively big, so the drill rows should be practically closed over.
- Allowing new pasture to reach the 2.5-3 leaves stage before grazing will ensure individual plants build up energy reserves required for tillering and root growth. Do not leave new pasture beyond the third leaf stage as low light levels to the base of the canopy will shade new tillers and clover. Using new pastures for silage or hay is not recommended. Grazing to a short, even residual of 1500 kgDM/ha encourages new tillers and clover growth by allowing light into the base of the pasture. This practice of grazing from third leaf down to 1500 kgDM/ha should be carried out until the pasture is fully established. Light applications of nitrogen (N) throughout spring and into early summer will encourage tillering and growth. Broadleaf weeds will compete with tillering ryegrass for space and light, so must be controlled with a herbicide spray.
- Walk new pastures on a regular basis. Assess how far away they are from establishment targets, and plan for the necessary grazing management, fertiliser application and weed control. Check these paddocks again going into summer, and ensure they do not get overgrazed or grazed too often. Consider dropping them out of a round or two to take some pressure off them during the dry period if we expect perennial pastures to last for 8-10 years then we must put in this effort during establishment. In this regard, new pastures are no different to young stock on the farm. If we care for them appropriately we lay the foundation for good production for many seasons. If we don't, they tend to get beaten up!

Ongoing Pasture Management

- Many of the recommendations for new pasture management continue to apply after the establishment period as persistence is all about maintaining tillers and root mass. A well established pasture will be more resilient to typical seasonal stresses and grazing requirements, however a higher standard of ongoing management will extend the lifespan of a pasture considerably.
- Supply ongoing fertiliser requirements according to a soil test and yield targets, and control broadleaf weeds.
- During challenging seasons, timely and appropriate adjustment of stocking rates, grazing residuals and round lengths is essential for recovery and persistence.

Pasture renewal, particularly with modern cultivars and endophytes, presents the opportunity for improved farm productivity. This has been demonstrated in trial comparisons and on many farms throughout the country. Persistence of ryegrass has been maintained in the breeding process, however the cultivar and endophyte options need to be used appropriately to ensure they cope with the modern grazing demands and challenges presented by the seasons. Attention to detail is key and doing the basics really well will deliver results.

Michael Norriss, Programme Leader of Grass Breeding, inspecting ryegrass trials at our Kimihia Research Centre in Lincoln, Canterbury.

How to establish and manage pasture successfully

Droughts and associated pest and weed issues have placed considerable pressure on ryegrass performance and persistence in many regions. Challenging seasons are nothing new to farming, but the current combination of factors in some regions is placing demands on our pastures like never before.

Drought stress

Over recent years some regions have experienced three drought seasons in succession, with some of these droughts extending well into autumn (which is a key recovery and tillering period for ryegrass).

Wet conditions

Heavy rain or prolonged wet conditions have exposed pastures to pugging, opening them up and slowing recovery growth rates.

Grazing pressure

Comparative stocking rates during summer/autumn and production expectations are higher than ever, particularly on dairy farms with high borrowing and staffing levels.

Pest pressure

There can be huge variations in pest populations over different seasons, within different regions and even within different paddocks on an individual farm. Utilise a programme that incorporates a number of different pest management tools, including cultivation, contact insecticide application, slug bait application, seed treatment and endophyte that will provide the best overall pest management strategy.

Weed pressure

Weeds are establishing in open pastures, competing against desirable species for light, moisture and nutrients, and are providing further hosts for pests such as Black Beetle.

New pastures

Due to the above challenges, new pastures are being placed under pressure before they are fully established. Some have failed within the first or second season because they simply never fully established.

Cultivars

Modern cultivars, particularly those with novel endophytes, are highly palatable right to ground level.

In most circumstances, it will be a combination of the aforementioned other factors which have led to poor performance or lack of persistence in pastures. These will differ for each paddock and on each farm. It is important to consider the challenges experienced in each paddock in order to understand why a pasture may be performing poorly or have failed, and to determine changes necessary to deal with the problem.

An example of drought stress.

Establishing pasture.

Sowing guide

High producing pastures can be established through conventional cultivation or no-tillage techniques. Whatever the system chosen the principles remain similar, with sound planning being the key to success.

1. Soil Test

Paddocks selected for renovation should always be soil tested 6-12 months before sowing to identify possible fertility deficits. Consult with a fertiliser representative for specific recommendations based on the soil test results.

2. Species Selection and Endophytes

It is important to choose species and endophyte types suited to specific geographical regions and stock types.

3. Sowing Rates

A guide to sowing rates for individual cultivars is given in the product pages of this book. As a general rule, pastures should be sown at rates of 15-35 kg/ha. The actual rate sown will depend on species used, drilling method, seed treatment and specific local conditions or experience. Successful establishment of perennial ryegrass/white clover pasture is less variable at higher sowing rates e.g. 25-30 kg/ha. For more information showing the benefits of higher sowing rates, see the box at the bottom of this page.

4. Sowing Methods

Cultivation. Pasture species require a fine, firm seedbed for optimum establishment. Excess trash and large clods will diminish results .

No-tillage techniques. Pasture can be successfully established through no-tillage systems. The use of a total vegetation killer preliminary spray, such as glyphosate, will provide the best results. Add a broadleaf herbicide if necessary. A delay between spraying and drilling will aid moisture retention and reduce pest populations.

Drilling. Pastures should be sown at a depth of 10-20 mm (any cultivars that differ from this will be highlighted in this book). The establishment of clovers will be adversely affected by sowing at a depth greater than these levels. Under all cultivation systems the use of harrows behind the drill will improve seed to soil contact.

5. Pest Control

New pastures can be subjected to pest and disease pressure. Several granular insecticides and seed treatments are available to protect the emerging seedlings. This book includes a reference to Superstrike® seed treatments as well as other seed treatments available.

6. Grazing Management

New pastures often benefit from a light grazing at 6-8 weeks after sowing. This encourages the grass plant to tiller and also assists clover establishment by allowing more light into the base of the sward. Ensure that the pasture is consolidated enough so that "pulling" and "pugging" are negated.

7. Subsequent Fertiliser

New pastures benefit from early applications of nitrogen applied from 3-4 weeks. Regular, subsequent applications of fertiliser based on herbage test results will prolong the life and improve the performance of new pasture. Consult with a fertiliser representative for specific recommendations.

What is the most economic sowing rate? And what is the best time for autumn sowing?

Trials undertaken by PGG Wrightson Seeds at Ballarat Research Centre in Australia, show the effect of time and rate of sowing on short term ryegrass yield.

The trial compared the yield of an annual ryegrass sown at 10, 20, 30, 40 and 50 kg/ha at four intervals during the year. Following statistical analysis, the following key findings became evident:

- There was a reduction in dry matter yield of approximately 1300 kgDM for every two weeks that sowing was delayed, irrespective of sowing rate
- For every 10 kg increase in sowing rate from 10 kg/ha to 40 kg/ha, you could expect an extra 500 kgDM of additional feed

Recommendations as a result of this study:

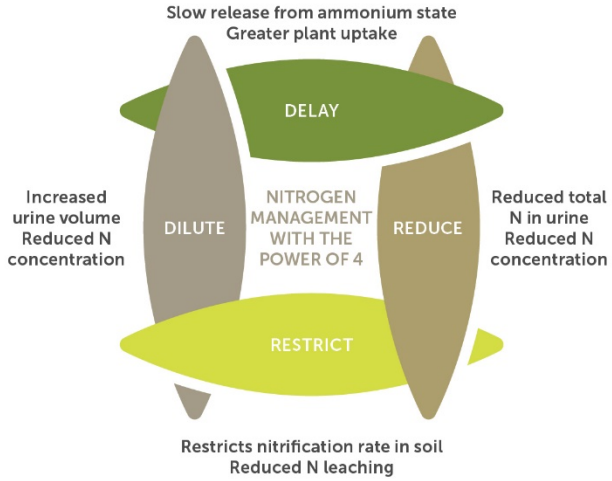
- Sow more seed earlier for maximum productivity of your pastures
- The most cost efficient grass was that sown as early in the season as possible at a sowing rate of between 30-40 kg/ha

Ecotain Environmental Plantain

Ecotain® ENVIRONMENTAL PLANTAIN

BROUGHT TO YOU BY AGRICOM Pastures for Profit®

Ecotain® reduces nitrogen leaching from the urine patch using four independent mechanisms. With the potential to reduce N leaching from the urine patch by up to 89% when combined with other forage strategies, Ecotain is a game changer when it comes to managing N.



1 DILUTE

Ecotain® environmental plantain increases the volume of urine animals produce, which means the N being excreted is in a more dilute form, resulting in a reduced N load in the urine patch.

2 REDUCE

Ecotain reduces the amount of dietary N which is excreted in urine, compared with ryegrass. This reduces the amount of N released into the soil via the urine patch.

3 DELAY

In urine patches from animals grazing Ecotain, the conversion from ammonium to nitrate is delayed. Slower conversion allows plants a greater opportunity to uptake N, significantly reducing the potential for leaching.

4 RESTRICT

The presence of Ecotain plants in the soil reduces nitrification, likely through the effect of a biological nitrification inhibitor.

Agronomic Benefits

- Very similar annual DM quantity and quality to ryegrass pasture
- Increases feed quality and/or supply during summer and autumn
- Improves speed of sward recovery after summer dry
- Improves cool season activity of pasture base
- Suitable as a 2-3 year crop option
- Establishes and competes in perennial ryegrass pastures

Animal Performance Benefits

- Positive impact on milk production when grass quality drops in summer
- Elevated mineral content (Zn, Cu, Se, Mg, Ca, K)
- Has the potential to reduce facial eczema spore levels
- Reduces dag production in sheep
- Liveweight gain benefits with higher dressing out percentage in lambs and cattle

Dairy Performance

- Ecotain can produce over 19 tonnes of drymatter per hectare per year in the Waikato
- First year Ecotain retains high leaf quality through summer relative to unirrigated ryegrass
- When Ecotain is well managed, second and third year stands maintain quality through summer, relative to unirrigated ryegrass.
- When the metabolisable energy (MJ ME) of irrigated ryegrass was poor (9.6 MJ ME) supplementing ryegrass with Ecotain plantain increased cow drymatter intake by 6% and milksolids (MS) yield by 19%
- Ecotain can be successfully used as a deferred late spring feed in dry are as and will return to a quality productive state within one grazing round
- Ecotain is an easy option to include in an undersowing or broadcasting programme

Adapted from Minneé and Lee. (2012). Proceedings of the workshop "Plantain for Northland Pastures". Ecotain is a blend of Tonic and AgriTonic plantain.

Sheep & Beef Performance

Pure stands of Ecotain can be used during lambing to increase lamb and ewe weights at weaning. The key to this use is the unique trait of high winter and early spring growth compared to other plantains.

- High dressing out percentage in cattle and sheep
- Ideal grass alternative (substitute for creating and maintaining high legume content pastures
- Fast recovery from hot dry summer conditions
- Drymatter production through autumn,winter and early spring similar to perennial ryegrass
- Reduced dag production in sheep
- High mineral supply of copper and selenium

Five different ways to establish Ecotain

New Pasture

DEPLOYMENT

Include 3 kg/ha of Ecotain® in your perennial pasture mix

Include 6 - 8 kg/ha of Ecotain in your Italian or hybrid pasture mix

KEY POINTS

- Adding Ecotain to a new pasture is the most reliable establishment method for maximising Ecotain content in a mixed pasture
- Environmental effectiveness of young pastures is very high
- It will take time to get Ecotain across a farm system as it is limited by farm pasture renewal rate (industry average is 8-14% of farm per annum)

ESTABLISHMENT PROCESS

- Manage all hard-to-kill weeds prior to sowing
- Establish pasture mixes with Ecotain the same as you would a ryegrass/white clover pasture
- As with best practice establishment for white clover, sow at 10 – 15mm in depth
- Apply establishment fertiliser – nitrogen (N) for rapid establishment and phosphate for long-term production (DAP is generally applied at a rate of 200-250 kg/ha at establishment)
- First graze at six weeks following sowing and apply nitrogen after each grazing
- First year Ecotain retains high leaf quality through summer relative to unirrigated ryegrass

Undersow

DEPLOYMENT

Direct drill 4 – 8 kg/ha of Ecotain® into damaged or open pasture with or without Italian ryegrass

KEY POINTS

- Best practice for extending the life of pastures
- Complementary to current undersowing practices
- Ecotain can also be added to perennial ryegrass or Italian ryegrass and clovers for undersowing)

ESTABLISHMENT PROCESS

- Select damaged or open paddocks and then graze prior to undersowing
- Manage all hard-to-kill weeds prior to undersowing
- Some environments may require slug bait and/or treated seed
- Drill at 10 – 15mm in depth

Broadcast

DEPLOYMENT

Broadcast 4 – 8 kg/ha Ecotain® into damaged or open pasture

Prillcote® treated Ecotain seed rate of 8 - 16 kg/ha

KEY POINTS

- Success is based on openness of pasture (proportion of open ground)
- Ideal quick fix for winter and spring damaged pastures to extend their life
- Useful addition when applying fertiliser

ESTABLISHMENT PROCESS

- Select open paddocks and then graze prior to broadcasting
- Manage all hard-to-kill weeds prior to broadcasting
- To avoid banding across the paddock, use Prillcote® treated seed

Ecotain® Dominant

Ecotain® Dominant (with Clover)

DEPLOYMENT

Ecotain Dominant: Sow 12 kg/ha of Ecotain

Ecotain Dominant (with Clover): Sow 12 kg/ha of Ecotain and 4 kg/ha of white clover

KEY POINTS

Ecotain Dominant:

- Provides high and consistent levels of Ecotain content
- Fits very well as a short rotation pasture as a break crop in a pasture renovation programme (similar in use to Italian or hybrid pastures)

Ecotain Dominant (with Clover):

- Increases productivity over Ecotain dominant stands but decreased weed control options
- High per head and per ha performance vs conventional pasture
- Ideal for 2-3 year lactation feeding or an inter-crop restorative phase
- High mineral content and good shoulder season growth
- Suppression of weeds naturally when fertility and establishment optimised
- Ideal tool to break grass weed lifecycles with use of grass specific herbicides
- Less reliance on applied nitrogen and lower kg/DM costs vs Ecotain dominant option

ESTABLISHMENT PROCESS

- Plan to plant pasture when soils are 10-12° C and rising
- Spray out existing pasture
- Apply establishment fertiliser – nitrogen (N) for rapid establishment and phosphate for long-term production (DAP is generally applied at a rate of 200-250 kg/ha at establishment)
- Monitor weeds and if found contact your local retail representative. Clean the tank thoroughly before adding water/chemical, and maintain agitation while spraying. If grass seedlings are also present (e.g. summer grasses), a grass-specific herbicide should be added to the mix
- Apply nitrogen 3-4 weeks after planting, then after each grazing
- First grazing of the whole paddock should occur when plants have seven true leaves (the crop will be about 25 cm high), and aim to leave a 3-5 cm residual

GROWING GREAT CLOVER

FIELD NOTES

Ballance agri-nutrients

Potassium (K) and molybdenum (Mo) are essential nutrients for plant growth. Like all nutrients, they are removed from the farm when animals, milk, wool and crops are sent from the farm, can be transferred around the farm by stock, and can be lost through runoff and leaching. Applications of both potassium and molybdenum in fertiliser help to ensure that deficiencies don't hamper farm productivity.

CLOVER BENEFITS

DAIRY

Optimum clover means pasture production is better. Having enough good quality feed keeps your herd in better condition and supports milk production. Good-quality feed in autumn also helps to carry greater stock condition through winter and into spring. This is important for setting up spring lactation (earlier and higher peak milk production) and improving fertility and conception rates in the subsequent spring mating.

SHEEP AND BEEF

Good-quality feed will help get sheep and cattle into the best condition for mating which supports in-lamb and in-calf percentages. High quality feed in spring supports milk production allowing for good growth rates in lambs and calves. The legume component in pastures is the highest quality feed – high legume content in pastures is important for achieving high animal liveweight gains, allowing stock to be finished earlier.

CLOVER GROWTH

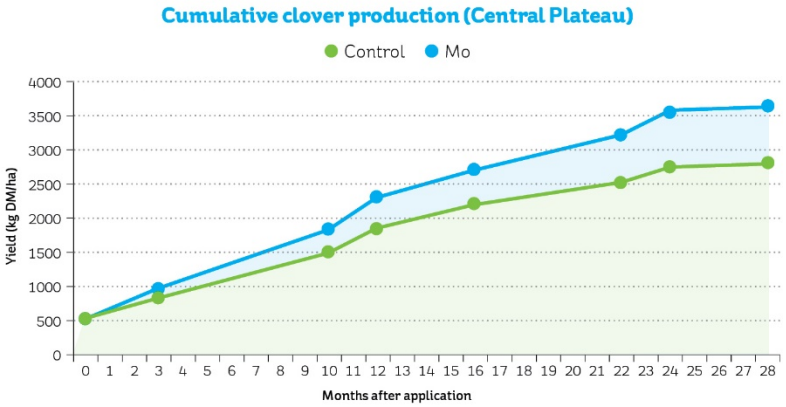
Clover is an excellent source of high-quality feed that is even better than ryegrass. In addition, clover fixes nitrogen from the atmosphere therefore producing even more valuable feed.

However, relative to perennial grasses, clover has a weak, shallow root system, which means it is less efficient than ryegrass at extracting nutrients from the soil. As a result clover is more susceptible to nutrient deficiencies and can struggle to compete with ryegrass in low fertility situations, resulting in poor growth and overall pastoral performance.

Ensuring adequate K and Mo nutrition will help improve the clover content of pastures and increase overall pasture production.

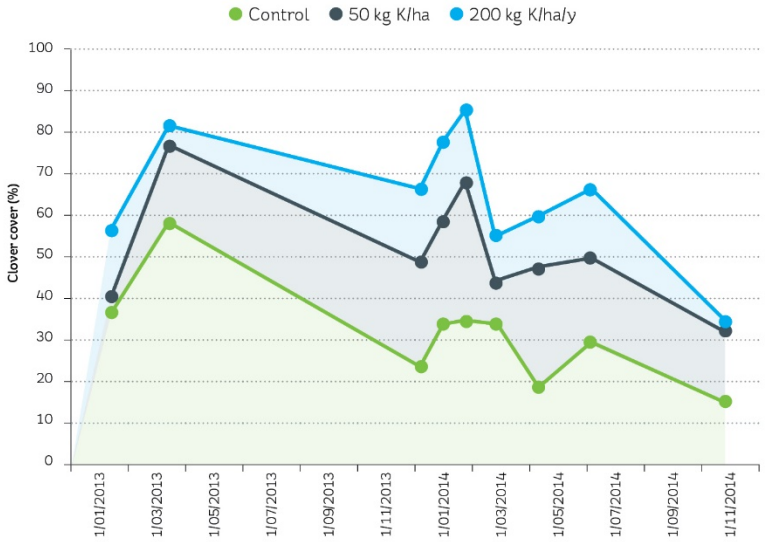
MOLYBDENUM DRIVES CLOVER GROWTH

The graph below demonstrates the importance of applying molybdenum to avoid deficiencies or overcome these in order to maximise clover production. The control clover at the site was strongly Mo deficient (Mo < 0.1 mg/kg and N < 4.5%).



POTASSIUM DRIVES PASTURE GROWTH

This graph shows the positive impact potassium has on clover cover. The below study was conducted on a Southland sedimentary soil non-irrigated sheep and beef pasture (800 mm rainfall/year). The initial soil K fertility was low (QT K = 3) relative to optimum (QT K = 5-8).



DIAGNOSING DEFICIENCY

Herbage testing is the best way to diagnose a clover nutrient deficiency. Clover-only samples are recommended, since clover is more sensitive to soil K fertility and because of the critical importance of Mo to clover N-fixation. However there are some visual indicators to K and Mo deficiency:

MOLYBDENUM

In Mo-deficient clovers, leaves are pale green to yellow; plant growth is reduced, stems are slim and leaves are small. Nodules on legumes are green or colourless, instead of being the normal healthy pink colour. The under performance of clover and lack of N-fixation results in N-deficient pastures, which are then more dependent on N fertiliser.

POTASSIUM

K-deficient clovers can have speckling around the leaf margin or appear yellow / scorched around the edge of the leaf. Deficiencies show up on older leaves first. Generally, pastures deficient in K will have poor clover content and ryegrass will be lacking in vigour. In this situation, clover growth is usually patchy, occurring in old stock urine spots since most K is excreted by stock in urine.

HERBAGE TESTING

Clover is more sensitive to a shortage of Mo and K than grasses therefore a clover-only herbage test is a great way to check if your farm has enough of these two nutrients. While soil testing is an ideal way to determine the levels of the major plant nutrients in the soil, it will not give you an accurate picture for micronutrients like Mo. Micronutrient availability is not well predicted by soil tests as they are present in the soil in such minute quantities, and their availability is heavily influenced by complex interactions with pH, organic matter, mineralogy, soil moisture and presence of other micronutrients. Herbage testing is a great way of complementing soil testing for availability of major nutrients such as potassium. This can help fine tune and check adequacy of fertiliser inputs.

My PasturePlanner
Make the most of your nitrogen

agri-nutrients Ballance

My Pasture Planner

My Pasture Planner (MPP) is a software program that is designed to improve the efficiency of nitrogen (N) use on New Zealand's pastoral farms (dairy, deer, sheep and beef).

MPP was developed through Ballance's Primary Growth Partnership (PGP) research funding, in association with AgResearch.

By using MPP, farmers will be able to better manage the amount of N fertiliser applied to pastures, while still meeting their production goals. This can be achieved by one of the following strategies:

- using less nitrogen fertiliser to achieve existing production goals, by using it strategically on areas that have a higher potential for response
- using existing levels of nitrogen fertiliser to achieve higher production goals, by using it more strategically across the farm unit

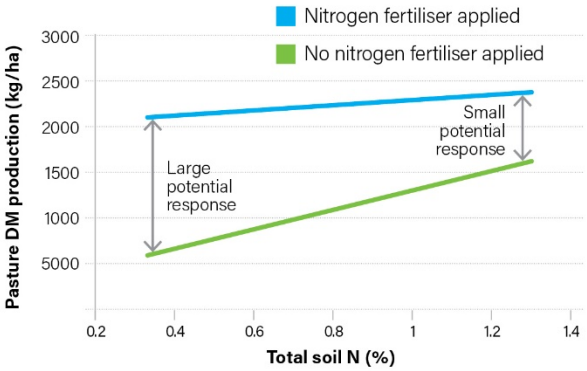


Figure 1: When soil N levels are low, there is greater potential response to N fertiliser, compared to when soil N levels are high.

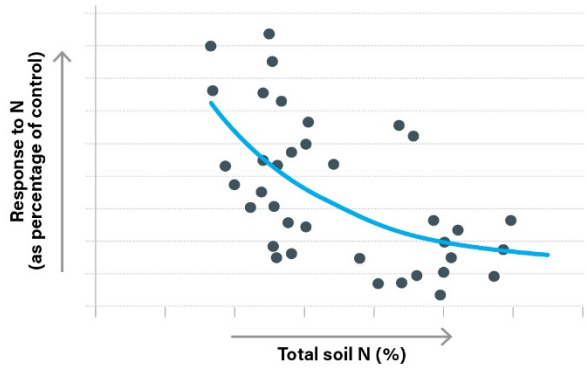


Figure 2: The relationship between soil N levels and pasture response to N fertiliser, combined from a range of research locations across New Zealand.

Scientific basis

Sound science and extensive research underpins the programming that drives MPP. The work is based on the relationship between total nitrogen content in the soil (TN) and pasture production, and how this influences the efficacy of N fertiliser use (Figure 1).

Studies were carried out at locations representative of New Zealand farming conditions, with the majority of the work being conducted in Northland, Waikato and Southland. Research was conducted over a period of 4-5 years. The TN content of the soils was determined, and the pasture response to N fertiliser (50 kg N/ha) measured. The results were used to develop rules that can predict the benefit of N fertiliser under different conditions. An example of these results is shown in Figure 2.

Using MPP

My Pasture Planner is designed to help pastoral farmers develop annual nitrogen plans. The optimisation of nitrogen use is based on the four "R"s; Right Rate, Right Time, Right Place, Right Product. To run MPP, farms will require a MyBallance account, a TN soil test, a farm map in MyBallance, and a recent Overseer nutrient budget.

The average TN measured by soil testing indicates the likelihood of pasture growth increasing in response to an application of N fertiliser and can be assessed during the regular soil testing program (soil testing for TN only needs to done every four- five years). The TN test along with feed demand and average pasture growth rates is used to determine the required rate of N fertiliser needed to grow more grass to fill an anticipated feed deficit.

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MPP can be used to develop a differential N fertiliser strategy for the farm:

- On farms where TN testing shows high variability between blocks, MPP will show where and when to apply the N fertiliser, and how much to apply.
- On farms where initial testing shows no or low variability in soil TN levels, MPP can be used to develop a differential N fertiliser strategy for the farm showing when to apply the N fertiliser, and at what rate.

MPP will create an annual plan that is specifically optimised to each different property.

Key points

- To run MPP you need:
  - A MyBallance account
  - A soil TN assessment
  - An Overseer nutrient budget
  - A farm map in My Ballance
- The average Total N determined by soil tests indicates the likelihood of a yield response to N fertiliser
- MPP can be used to develop optimal N fertiliser strategies for different areas of the farm

MPP in action

The following example shows how MPP could be applied in a pastoral setting, delivering production and economic benefits to the farmer.

Soil testing of a 100ha dairy farm reveals the following:

- 50 ha has TN of 0.7% (high N area)
- 50 ha has TN of 0.3% (low N area)

A difference of this magnitude is considered significant enough to warrant the use of MPP for differential application of N fertiliser application.

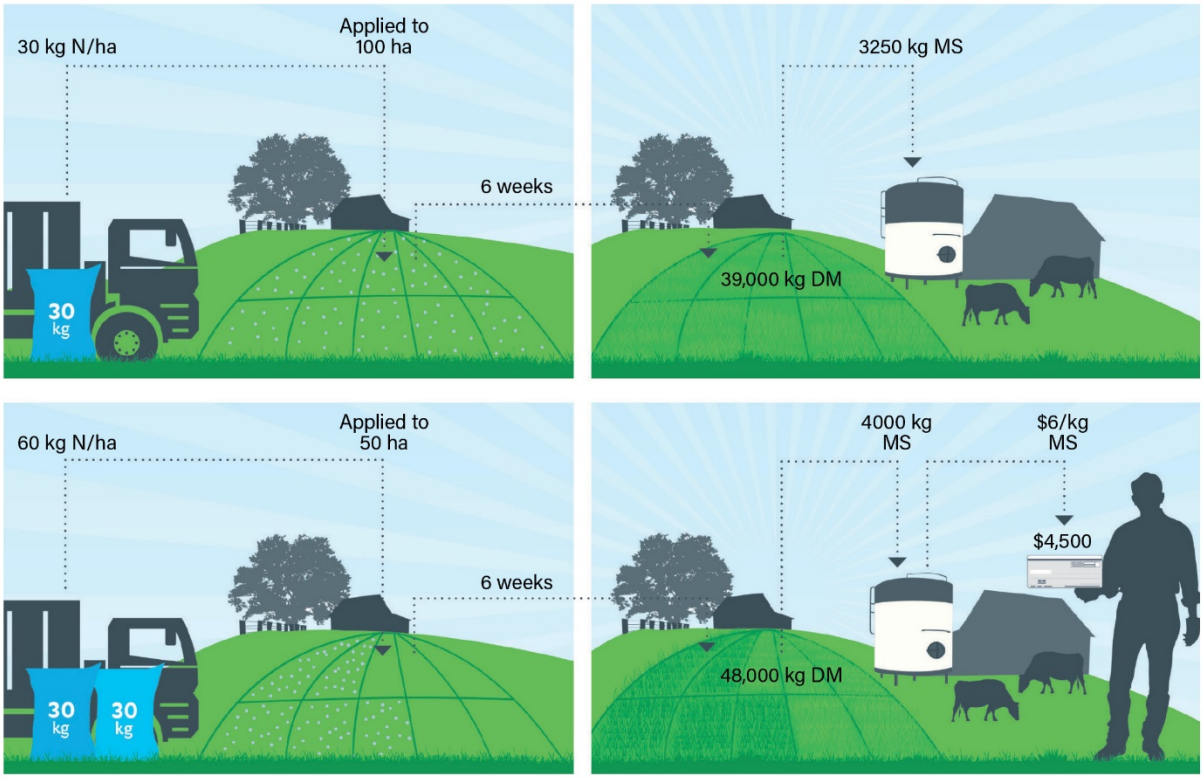
According to MPP, fertiliser N will result in the following production responses:

- 10 kg DM/kg N applied, in the high N area
- 16 kg DM/kg N applied, in the low N area

Without MPP, the farmer would typically apply 30 kg N/ha uniformly over the farm. This could be expected to produce a 13:1 response, resulting in a total of 39,000 kg DM.

With MPP, the farmer would apply 60 kg N/ha to the low N area, and none to the high N area. This would produce a 16:1 response, resulting in a total of 48,000 kg DM.

If the extra 9000 kg DM grown is converted to production at 12 kg DM/kg MS, the result is an additional 750 kg MS. At a pay-out of $6/kg MS, this is an economic gain of $4,500 for the farmer.



CAN YOU HANDLE THE HEAT?

Lactating cows prefer temperatures below about 20-21°C. To cope with warm weather, they use a variety of strategies to maintain normal body temperature, including using shade, drinking more water and spending more time around water, especially if there is no shade, increased sweating and breathing rate, and reduced feed intake. When this is insufficient to keep their body temperature below 39.3°C, they exhibit symptoms of clinical heat stress, such as panting and drooling and their welfare, health, and production can be severely affected.
Cows with high production, Friesian genetics or dark coats are more susceptible – lower producing cows and jerseys may be comfortable until about 25°C. High air temperature, humidity, solar radiation, and low air movement contribute to increased risk.
A distinct decline in milk yield means that the cows have not been able to stay cool and may not be observed until 2 days after the hot weather. Night-time cooling can help reduce the negative effects of heat load on production but it does not reduce the welfare impact on the cows during the day.

During the summer months in the Waikato, there are 6-8 hours a day that are hot enough to impact milk production and another 4-5 hours a day which are too warm for cow comfort. The estimated impact on milk production is 6kgMS per cow over summer, or $12,000 for a 300-cow herd at $6.80/kgMS.

When thinking about how to reduce the impact of heat, we can think in three categories:

1. Reduce the heat from the sun, i.e. shade and also cooling reflective surfaces such as yards and cow shed roofs.
2. Reduce the internal heat load – that's a whole lot of smaller things, like making sure they have plenty of water, allowing plenty of space on the yard, shifting 'hot' feed to cooler hours of the day, and limiting walking during the heat.
3. Finally, remove the heat. Options here are sprinklers, misters and fans, that pull the heat off the cow through evaporation.

Ideally, our farms would be set up so that cows could access shade and water whenever they want it. But that is easier said than done. Over the next ten years, we will be expected to have comprehensive mitigation plans and probably a lot more shade available. But, as a starting point for the next 1-2 years, we will be expected to know how many hours our cows might be too hot and make the most of the resources and management options already available to us.

STRATEGIES AT OWL FARM

1. Check and manage water flow and quality

Lactating cows can drink more than 100 litres/cow/day and will drink between two to six times per day. Most cows drink soon after milking, which is why we often see troughs running low or dry straight after milking. If cows cannot drink when they want to, their daily water intake will be reduced, even if they could have drunk it all later. Water intake is directly related to milk production, partly because water intake regulates feed intake. Ensure flow rates to troughs are fast enough that the trough never runs dry. Work on 14 litres/hour per cow the trough needs to serve. Herds larger than 400 cows need two troughs in the paddock, but any herd will benefit from extra troughs.

Tom's tactics:

Check water use overnight via Halo to respond to higher than expected volumes which would initiate a water leak check.
Check water toughs in paddock every time you are in there.
Turn off water lines when cows are not grazing a block to increase flow to other areas
Monitor the impact of Mg, Zn etc. on palatability and add flavourings if needed

2. Put in extra troughs in the races

- Rule of thumb: if troughs cause cow flow issues, in the paddock or in the race, too many cows are thirsty, and more troughs are required
- Install troughs where cows are already spaced out, rather than where they already congregate.

Tom's tactics:

Last season 2 more troughs were provided on the races - 1 new 1100L trough, and a change in fence line to access to another. There are now 3 troughs on the main trunk line, these are all 100-400m from the shed.

FIGURE 1: TROUGH 1 - COWS MOVE FREELY OUT OF THE PADDOCK KNOWING THAT THERE'S A DRINK AVAILABLE ON THE WAY TO THE SHED. GOOD HYDRATION STOP BEFORE THE AFTERNOON MILKING.

FIGURE 2: TROUGH 1 - COWS GRAB A COOL DRINK AFTER MILKING ON THE WAY TO THE PADDOCK REDUCING THE PRESSURE ON THE PADDOCK TROUGHS

FIGURE 3: TROUGH 2 - REALIGNED THE FENCE TO PROVIDE ACCESS TO THIS TROUGH FOR COWS AS THEY GO TO AND FROM CROP PADDOCKS

FIGURE 4: TROUGH 3 - COWS STOP FOR A DRINK IN THE SHADE AFTER A CLIMB UP THE HILL

3. Use sprinklers on the yard

Cows cannot sweat much so they have limited capacity for evaporative cooling off their skin. Spraying them with water works like artificial sweat – the water droplets absorb heat from the cow's skin then either evaporate or run off, taking the heat with them. To be efficient, the droplets need to be big enough to wet the cow to her skin. Fans or wind can be used to shift the humid air away on humid days when evaporation is slower. Higher flow rates may also be used provided the water drips off the sides of the cow rather than running onto the udder.

In New Zealand studies, cooling with sprinklers for 10-90 min before afternoon milking reduced respiration rate by 60% and reduced body temperature for at least 4 h after milking. Because sprinklers are so effective at cooling cows don't wet them for long periods when Temperature Humidity Index (THI) is lower than 69 which is typically about 24°C. Cows that were in sprinklers for 90 min had higher body temperature when THI was lower than 69, suggesting that cows were getting hypothermia (Kendall et al. 2007).

Tom's tactics:
Set up includes one sprinkler on the roof and one at the back of the yard. Measured flow rates this year which were 45L/min on each sprinkler @ $1.49/m3 water. Triggers for using it are usually temperatures around 25°C or lower if it's humid or the cows have had limited access to shade during the day.
When cows are on OAD they can be brought into the yard for a cool down before moving to another paddock for their night feed. Sprinklers sometimes get used in the mornings when night time temperatures don't fall below a comfortable 18°C.
It's a loud pump to run so although it cools the shed down it can reduce milker comfort and it costs approx. 13c/min in water to run.
Use data for decision making. We collect temperature and humidity data from the farm and use the DairyNZ website to calculate THI. Monitor breathing rate (normal 24-40 breaths per minute) to check cows response to the environment.

FIGURE 5: SPRINKLER AT BACK OF YARD

4. Alter milking times

Changing milking times can achieve multiple outcomes depending on your system. Reducing the number of milking's in the hot afternoon can reduce heat generating exercise for the cows and heat generated in the yard (if not using effective cooling systems). Milker comfort can be increased by milking before lunch or later in the evening.

Tom's tactics:
Last season we used 3 n 2 milking interval after mating finished. Milking times were 5am then 6pm then 11am the next day. This worked well with crop allocation and removed the afternoon milking time during the heat of the summer.

5. Planning for shade when allocating feed

Access to shade for 90 min before afternoon milking in New Zealand reduced respiration rate by 30% and lowered body temperature by 0.3°C compared to cows without shade (Kendall et al. 2007). The body temperature remained lower for 2 to 4 h after milking.

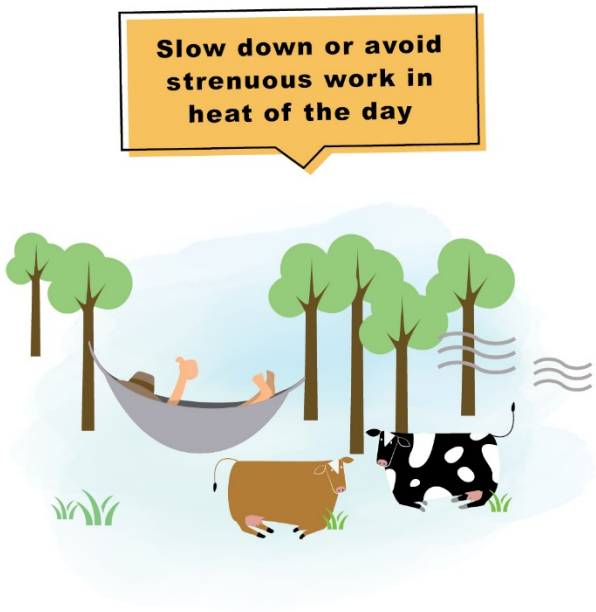
Pasture grazing cattle will spend 1-3 h per day in shade depending on weather conditions and amount of shade available per cow. Cows use shade to reduce the heat they're absorbing from the environment. Shade trees reduce solar radiation by >50% and the ambient temperature can be up to 10°C cooler under trees in summer. In NZ studies, cows start using shade from 20-25°C, and cows with access to shade had lower body temperatures, lower breathing rates and higher milk production.
Contrary to opinion, providing shade does not result in animals spending less time grazing. Cows provided with shade actually spend the same or more time grazing per day than those without shade and can have increased dry matter intake. Providing shade for as many animals as possible will help prevent large groups gathering under too few trees, which leads to high nutrient loading, soil compaction and pasture loss. If there is less than 4-5 m^2 of shade per cow, there will be competition for the space and some cows will miss out – for a 300 cow herd, that would be about 7 mature oaks or 60 mature poplars, or a 36m x 36m shade structure.

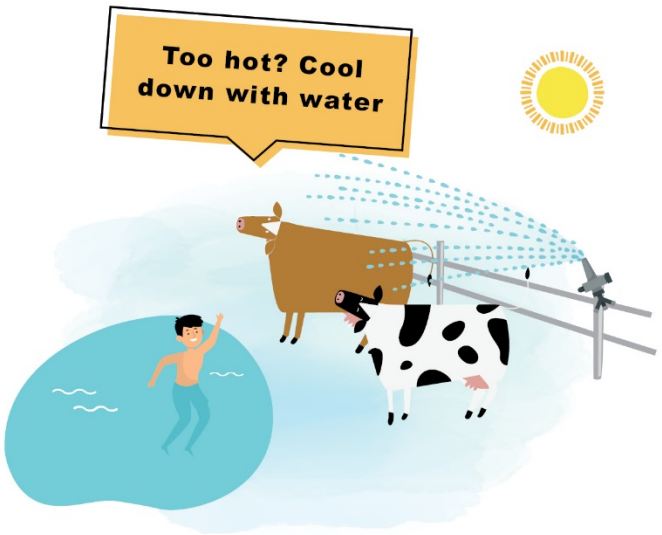
In New Zealand, where solar radiation levels are high, shade is likely a more important resource to cows than water cooling. However, cooling with water is efficient if cows are showing signs of being too hot (eg, panting, drooling), on warm days, and in particular after a long walk to milking. Compared to shade alone, cooling with water spray reduces body temperature, respiration rate, and air temperature more efficiently. So bringing the herd in for cooling is a good option when there isn't enough shade available.

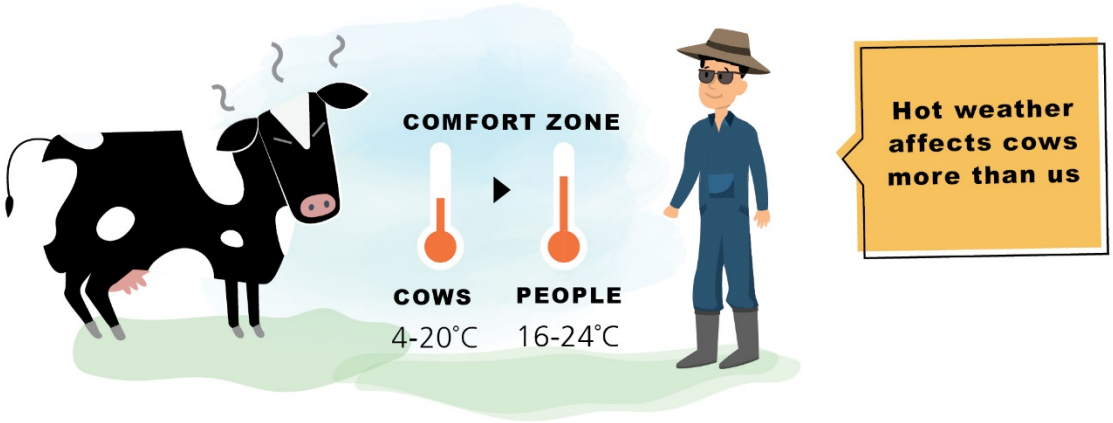
Tom's tactics:
Plan summer crops with trees for shade as cows will be on these during the day feeds. If a week of hot weather is predicted the grazing plan will be adjusted to reflect more shade access. In summer cows are only getting 50% of their diet in pasture so there is more flexibility when choosing paddocks to graze.
Early 2021 we are investing in an extensive planting plan which will also include shade and shelter outcomes.

HOW WILL YOU KEEP YOUR TEAM COOL THIS SUMMER?

Cool people and cool cows are more productive and less irritable.

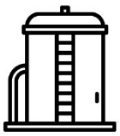






BRAIN

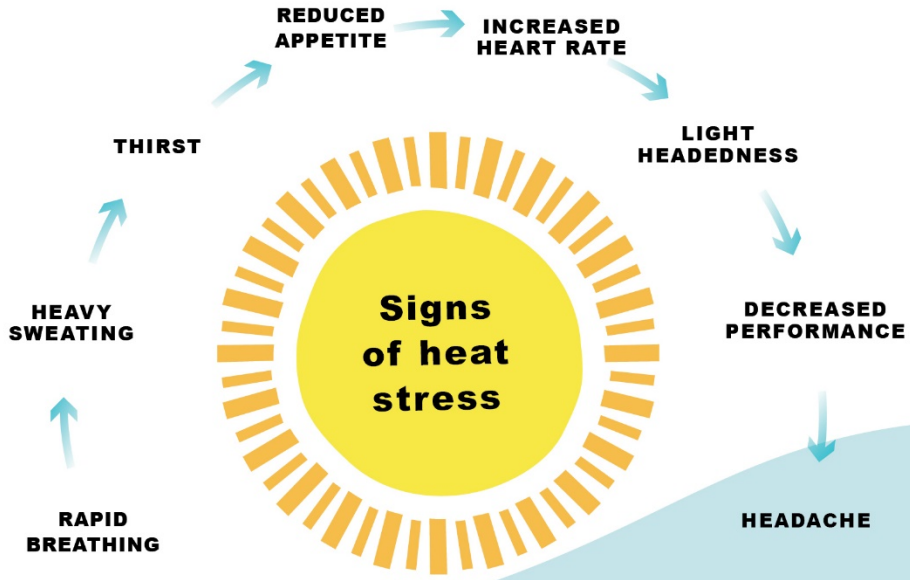
75% of brain tissue consists of water. Dehydration leads to mistakes and headaches.



MILK

per cow drops **10-15g MS** per **1°C** rise in max temperature.

COWS have **7 times** as much heat to get rid of but can sweat only **40%** more.



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Next Farm Focus Day

Wednesday 10 March, 2021

Weekly Farm Walk

Tuesdays, 10am

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