Owl Farm

Providing knowledge

St Peter's School/Lincoln University
Demonstration Dairy Farm

St Peter's · Cambridge
New Zealand

Lincoln University
Te Whare Wānaka o Aoraki
AOTEAROA · NEW ZEALAND
New Zealand's specialist land-based university

Farm Focus Day

Wednesday, 13 September 2017

PROVIDING KNOWLEDGE – Wins and Lessons

Owl Farm Season Update: Can we achieve 6kgMS/ha/day all grass this spring?

Financial Review: Do the dollars make sense?

How has our Constructed Wetland Performed for us?

Planting Plantain for Future Performance!

Optional Workshop: Pasture Condition Scoring workshop after lunch.

OPUS LIC PGG Wrightson Seeds DairyNZ Ballance agri-nutrients NEW ZEALAND FARM SOURCE

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HEALTH AND SAFETY

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

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 YOUR 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

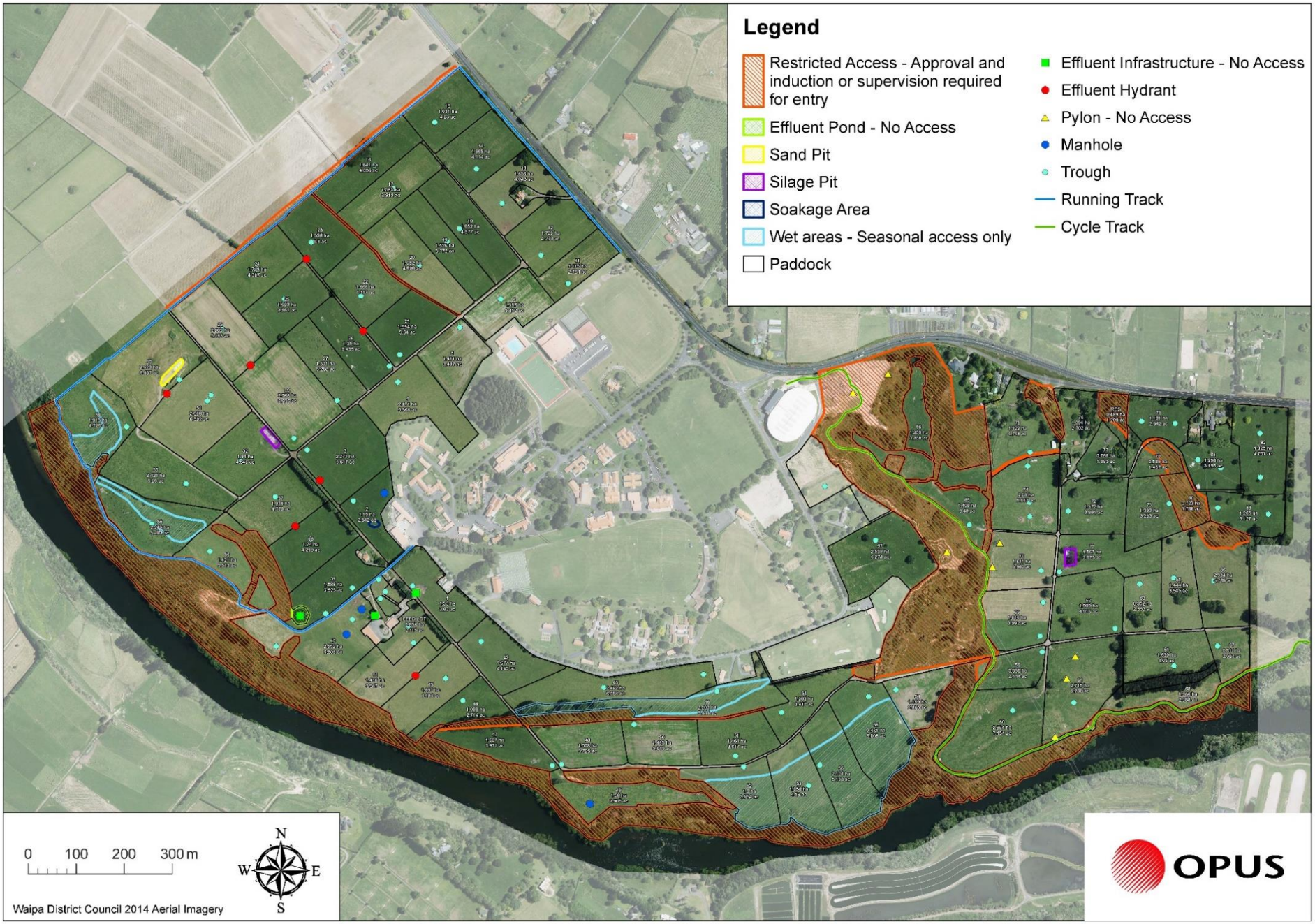
Farm Staff

- Louise Cook – Demonstration Manager 027 808 5777
- Tom Buckley – Farm Manager 021 058 4916
- Theresa Riley – Demonstration Co-ordinator 021 142 8154

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 Access - Approval and induction or supervision required for entry
Effluent Pond - No Access
Sand Pit
Silage Pit
Soakage Area
Wet areas - Seasonal access only
Paddock
Effluent Infrastructure - No Access
Effluent Hydrant
Pylon - No Access
Manhole
Trough
Running Track
Cycle Track
0 100 200 300 m
N
W
E
S
Waipa District Council 2014 Aerial Imagery
OPUS

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OWL FARM - ST PETER'S SCHOOL / LINCOLN UNIVERSITY DAIRY FARM STRATEGY

1. Vision

a. Dairy Farm

- To apply proven research, utilising good on farm practice and scientific monitoring for the farm to become 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.
- Optimise profit through identifying the appropriate dairy production system for Owl Farm.
- Achieving a farm 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)

Establish credibility by addressing current issues and performance, whilst setting up the farm for future development. During this stage, the farm will operate 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.

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Demonstration Dairy Farm

CONTENTS

OWL FARM SNAPSHOT

	Year	2015-2016	2016-2017	2017-18 forecast
Physical Info	Total Farm Area	177	172	171
	Effective Area	151	146	148
	Effective area Leased	23	18	18
	Leased Run off	3	7	5
	Cows Wintered	470	453	441
	Peak Cows (1Dec)	445	423	420
	Peak Stocking Rate Cows/ha	2.95	2.90	2.84
Production	Total kgMS	176,197	178,294	171,135
	MS/cow	396	421	407
	MS/ha	1,167	1,221	1,156
	MS/ha from homegrown feed	949	1,011	1,072
Feed and Inputs	Feed Grown TDM/ha	13.9	14.2	14.7
	Feed Harvested TDM/Ha (actual kgs)	11.9	12.5	13.1
	Feed harvested TDM/ha (@11.0MJME/kgDM)	12.4	12.8	14.4
	Supplements Imported TDM/Ha	4.2	3.1	2.0
	Nitrogen Applied/effective ha	149kg	163kg	150kg
Financials	FWE/kgMS	$4.97	$4.07	$4.06
	OPEX/kgMS (incl deprn &feed inventory adj)	$4.91	$4.75	$4.37
	EFS/ha actual payout ($3.90/$6.15/$6.50)	-$144	$2,742	$3,423
	EFS/ha @ $5.80 farmgate milk price	$2,101	$2,287	$2,632
	Opening Debt/kgMS held	$20.00	$23.02	$21.23
Statistics	Cowshed	36 Rot	36 Rot	36 Rot
	Feed infrastructure	NIL	NIL	NIL
	Herd Figures	BW 162/189 PW	BW 107/128 PW	BW 112/135 PW
	Industry BW/PW	BW 110/122 PW	BW 64/73 PW	BW 64/73 PW
	Effluent Storage	Clay lined pond	Clay lined pond	New lined pond
	% farm effluent applied to	44Ha 29%	51Ha 35 %	51Ha 34%
	Soils are a mix of Clays and Sands, on largely flat terraced contour			
	Operational regrassing via crop and regrassing ~ 10-15% per year			
	3 permanent staff members are employed - with no relief staff required to cover time off or calf rearing duties.			

SEASON TO DATE

	Year to date 08/09/17	2015-2016	2016-2017	2017-2018	Notes
Stock	Milking Platform	160	146	148	1
	Cows on farm	460	430	421	2
	Peak cows	445	423	420	
	Cows calved	421	404	408	
	Cows in vat	403	385	386	3
	Stocking rate on farm	2.88	2.95	2.84	
Production	Total kgMS	34,475	35,098	36,311	4
	MS/cow/day	2.00	1.95	2.08	5
	MS/ha/day	5.10	5.30	5.50	
	MS/cow	77	83	86	
	MS/ha	215	240	245	
Feed and Inputs	Pasture cover 1 June	2142	2951	2256	6
	Feed Grown TDM/ha	2.4	1.8	3.3	7
	Pasture eaten TDM/Ha	2.2	2.4	2.6	8
	Supplements fed/ha	1.7	1.2	1.2	
	Imported Supplements Fed TDM/ha	1.7	0.8	1.1	9
	Homegrown supplements fed	0.0	0.4	0.1	
	Silage on hand T DM	0	0	40	10
	Supplements fed/ha since PSC	1.3	0.9	0.6	11
	Nitrogen Applied/effective ha	44kg	57kg	42kg	12

Owl Farm Numbers – Seasonal Update

"Wet, wet, wet"

Lower stocking rate without maize in the system

1. Two extra hectares in lease land are being milked off this year.
2. Less cows were wintered, despite the slightly larger platform due to the decision last year not to replace the Maize silage. This was based around the poor utilisation of Maize silage being fed in the paddock. Fewer cows is a decision to support a weak autumn feed budget with limited resources to fill deficits.

Animal Health challenges have been comparable to last year

3. Lameness incidence is the same as last year to date – though the cases are less severe. A decision to feed PKE on cowshed concrete areas rather than damaging the paddock has caused some problems.

   Mastitis case numbers are the same as last year despite a robust dry-cow and teat seal policy last year. The prolonged wet weather over the winter compared with last year has contributed. Most cows have cleared after one treatment however.

   Milk Fever incidences have been low, with approximately 15 cows treated this season. Cows had Mag Chloride via the dosatron, Mag Oxide in PKE troughs and Mag Sulphate sprayed onto pasture up until mid-August. When PKE stopped, Mag Oxide was dusted to all mobs.

Strong early season production

4. Calving rate is slower than last year with fewer cows on farm. However, cows have been producing significantly higher than last season.
5. Cows have been producing well above expected levels this spring – with per cow production in excess of 2kg/cow since late July. During this time, milkers have had an increasing diet of grass all season, with PKE reducing in volume through July and finished by 20th of August. Recent prolonged rainy weather has seen re-introduction to stabilize production as cows continued to drop on the grass-only diet. This is a considerably different feeding regime to last year and only viable because of the pasture cover available.

Unexpected growth in the early season

6. In May, an August feed deficit was forecast in the feed budget due to low cover and growth in May. Consequently the Pasture Cover at 1 June was only 2,256kgDM/ha, below the 2,500kgDM/ha target. Additional silage bales and hay were purchased to fill the deficit due to lower cover. This feed was fed out in June and the high quality pasture silage on hand (40T) was retained to feed to the milkers in August.
7. Cover lifted in June as normal growth rates resumed. Growth rates in July were also above expectations and cover continued to climb. PKE volumes fed were lower than expected in July and August. August growth rates were very unseasonal and well above expectations meaning the farm was able to go all grass mid-August – a month earlier than expected and there is still 40 of silage on hand in the stack. To date the farm has grown 1.5TDM/ha more than last year.
8. Pasture eaten to date is very similar between years, as last season the very high early pasture cover was eaten, along with early season growth.
9. Despite the extra growth and because of the different 1 June pasture covers, the supplements consumed YTD is higher this year than last. Particularly the imported supplements as the purchased bales were fed in June while cover was still low and growth rates were normal.
10. However, this year we have 40T of silage in the stack to help support summer and autumn production.
11. With cover correcting itself by the start of calving, the supplements fed since then reflects the much better growth rates on the farm this year.

Nitrogen year to date

12. Due to the wet weather in April/May, the autumn application of Nitrogen as Phased N, was only applied in May and completed in June. This delayed our first round of N this spring, so the first round of Nitrogen as Sustain Ammo 30N at 80kg/ha was only started in early July. Application rates are targeting 25kgN/application this year, with one heavier dressing before summer.

ADDITIONAL SILAGE PURCHASED

What would have happened if the decision had been to not purchase the bales due to the forecast feed deficit?

The following three scenarios are considered:

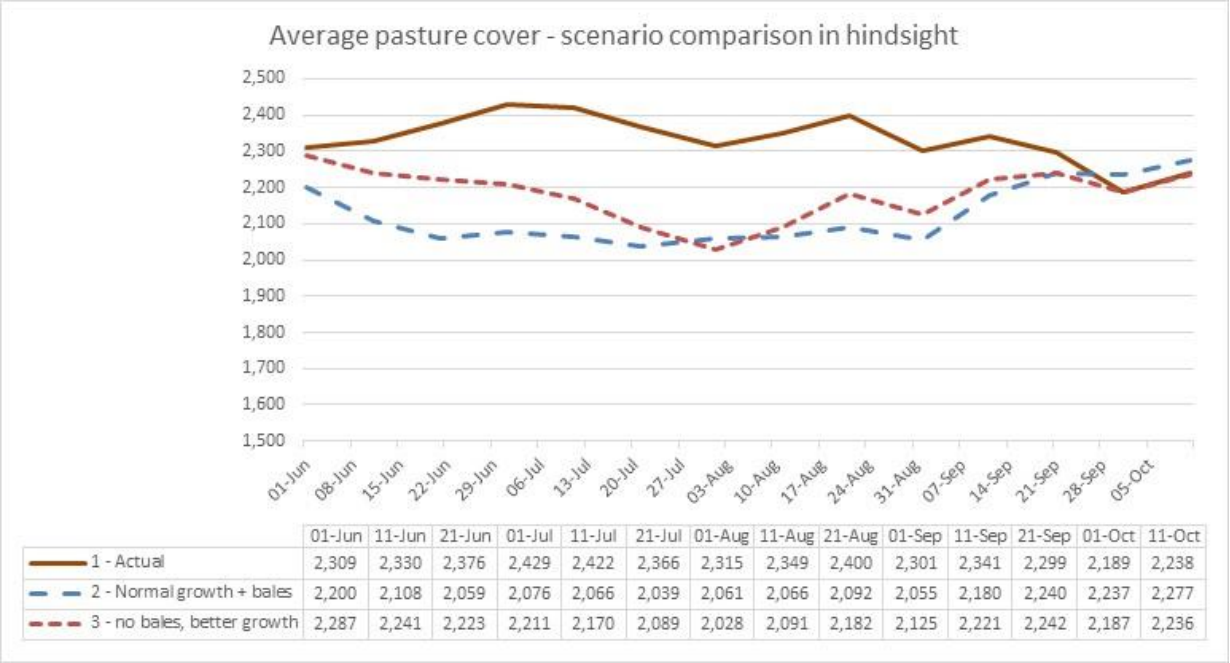
1. Actual – Bales were purchased and growth was well above expectations
2. Bales were purchased and fed out but only the normal growth rates occurred
3. Bales weren't purchased and growth was well above expectations (actual growth we have seen)

Scenario 1 – we have lifted our season production target by about 5,000kgMS.

Scenario 2 the normal growth scenario, lines up with the budgeted pasture growth as shown in our "budgeted" pasture cover on page 26. In actual fact this is what we thought would happen. This results in 5,000kgMS less across the season (or our base budget)with no silage on hand after spring, 26T more of our Annual allocation of PKE fed out in spring and 52 tonne less silage produced meaning Summer and Autumn production is heavily constrained. A net profit position $30,000 worse off than we are forecasting now.

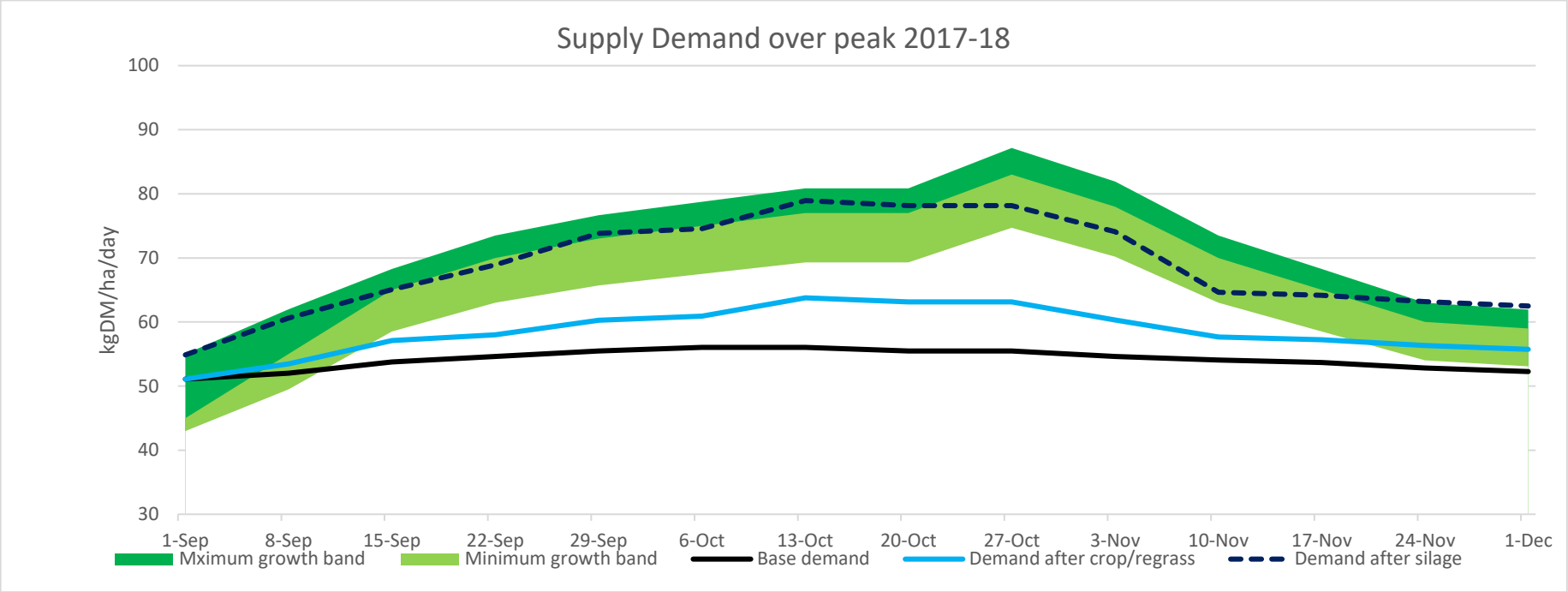
Scenario 3 no bales purchased but good growth occurs. This results in 2,600kgMS less produced across the season as 22T less silage is produced which constrains the Summer and Autumn production. A net profit position the same as where we are now.

The graph below highlights the pasture covers we could have expected. Would we have seen the very strong growth rates that were observed, if cover had got as low as expected? Or would we have expected growth rates closer to normal, which is what most farmers in the region with lower covers seemed to see?



	01-Jun	11-Jun	21-Jun	01-Jul	11-Jul	21-Jul	01-Aug	11-Aug	21-Aug	01-Sep	11-Sep	21-Sep	01-Oct	11-Oct
1 - Actual	2,309	2,330	2,376	2,429	2,422	2,366	2,315	2,349	2,400	2,301	2,341	2,299	2,189	2,238
2 - Normal growth + bales	2,200	2,108	2,059	2,076	2,066	2,039	2,061	2,066	2,092	2,055	2,180	2,240	2,237	2,277
3 - no bales, better growth	2,287	2,241	2,223	2,211	2,170	2,089	2,028	2,091	2,182	2,125	2,221	2,242	2,187	2,236

	Actual growth and bales	Normal Growth + bales	No Bales act growth
Less milk		-4900	-2560
Extra PKE fed in Spring TDM		26	
Pit silage on hand in September TDM	40	0	40
Reduced silage harvested TDM		52	22
Change in Revenue	$0	-$33,075	-$17,280
PKE purchased	$0	$4,962	$0
Bales not bought	$0	$0	-$13,000
Reduced silage harvest costs	$0	-$7,830	-$4,500
Total cost change	$0	-$2,868	-$17,500
Profit compared to actual	$0	-$30,207	$220



Date	01-Sep	08-Sep	15-Sep	22-Sep	29-Sep	06-Oct	13-Oct	20-Oct	27-Oct	03-Nov	10-Nov	17-Nov	24-Nov	01-Dec	08-Dec
Ha of farm	148	148	148	148	148	148	148	148	148	148	148	148	148	148	148
Ha new grass		4	9	9	9	9	9	9	9	5					
Ha into crop					3	3	9	9	9	9	9	9	9	9	9
Ha into silage	10	17	17	22	25	25	25	25	25	25	15	15	15	15	
Ha to graze	138	127	122	117	111	111	105	105	105	109	124	124	124	124	139
Target rotation length	24	22	21	20	19	19	19	19	19	20	23	23	23	23	25
Ha grazed/day	5.7	5.8	5.8	5.9	5.9	5.9	5.5	5.5	5.5	5.5	5.4	5.4	5.4	5.4	5.5
Target pre-graze	2,867	2,884	2,916	2,928	2,953	2,967	3,050	3,035	3,035	3,032	3,037	3,026	3,003	2,987	2,921
Target APC - grazing window	2,208	2,217	2,233	2,239	2,251	2,258	2,300	2,292	2,292	2,291	2,293	2,288	2,276	2,269	2,235

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total
Milksolids KG	-	6,807	21,184	24,806	25,322	22,589	20,598	17,378	12,675	12,133	9,250	2,087	174,829
Total Milk Receipts	35,599	26,737	91,821	145,076	162,141	111,987	100,225	87,830	117,634	86,383	87,300	75,158	1,127,891
Dividends Received	-	-	-	37,200	-	-	-	-	-	-	37,200	-	74,400
Cattle Sales	-	8,223	11,922	48	492	1,781	3,458	-	11,091	18,459	9,588	4,809	69,870
Total Income	35,599	34,961	103,743	182,324	162,633	113,767	103,683	87,830	128,724	104,842	134,088	79,967	1,272,161
Total Labour Costs	8,179	12,550	16,555	11,492	18,187	11,826	12,356	12,287	11,492	12,422	11,492	19,548	158,386
Animal Health	4,513	4,315	4,533	2,706	333	775	1,595	386	6,048	928	7,754	5,664	39,550
Breeding Expenses (incl Herd Testing)	**735**	**340**	**135**	**9,209**	**9,165**	**9,913**	**1,099**	**1,869**	**1,344**	**135**	**796**	**131**	**34,871**
Total Cow Costs	5,249	4,654	4,668	11,915	9,497	10,688	2,695	2,255	7,392	1,063	8,551	5,795	74,421
Net made purchased cropped	**7,839**	**14,265**	**9,229**	**8,562**	**21,843**	**3,888**	**2,045**	**12,349**	**8,344**	**18,225**	**8,247**	**16,244**	**131,079**
Fertiliser & Nitrogen	**-**	**10,828**	**12,033**	**10,758**	**8,368**	**-**	**13,819**	**-**	**5,061**	**266**	**22,866**	**-**	**84,000**
Re-grassing	-	-	71	-	-	-	-	-	-	5,923	9,528	1,740	17,262
Total Feed/Fert costs	7,839	25,094	21,334	19,320	30,211	3,888	15,864	12,349	13,406	24,414	40,641	17,983	232,341
Replacement Heifers & Calves	3,734	3,856	4,790	3,734	3,856	3,927	5,883	8,783	7,243	4,017	3,392	11,986	65,200
Shed Expenses	3,333	2,361	244	266	749	349	1,243	1,223	400	-	1,834	-	12,000
Electricity	178	836	1,145	1,224	1,254	1,213	1,176	1,175	1,001	589	894	315	11,000
Freight	-	1,168	1,430	2,487	976	396	1,100	-	446	104	894	-	9,000
R&M Total	**2,778**	**8,440**	**1,259**	**1,008**	**5,190**	**1,494**	**707**	**217**	**3,233**	**2,633**	**4,423**	**378**	**31,760**
Vehicle and fuel	**5,045**	**3,081**	**6,367**	**6,836**	**1,532**	**1,985**	**2,067**	**758**	**360**	**2,030**	**2,516**	**1,277**	**33,853**
Weed & Pest Control	-	-	-	-	-	-	5,000	-	-	-	-	-	5,000
Total General costs	11,334	15,885	10,444	11,820	9,701	5,436	11,293	3,373	5,440	5,356	10,560	1,970	102,613
Total Administration	3,485	7,259	3,199	16,810	6,910	4,200	4,210	5,184	3,446	4,041	2,940	2,569	64,252
CASH Farm Working Expenses	39,819	69,298	60,990	75,091	78,363	39,965	52,300	44,230	48,419	51,313	77,575	59,851	697,214
FWE/kgMS	-	10.18	2.88	3.03	3.09	1.77	2.54	2.55	3.82	4.23	8.39	28.68	3.99
Surplus before Finance charges	(4,220)	(34,338)	42,752	107,233	84,270	73,803	51,383	43,599	80,306	53,529	56,513	20,116	574,947
Lease Land on Milking Platform	2,827	2,827	2,827	2,827	2,827	2,827	2,827	2,827	2,827	2,827	2,827	2,827	33,924
Interest - Farm Loan	14,106	14,106	14,106	14,106	14,890	14,890	14,751	14,613	15,236	15,090	14,944	14,799	175,638
Total Depreciation	4,415	4,415	4,415	4,415	4,415	4,415	4,415	4,415	4,415	4,415	4,415	4,415	52,979
Total Financial Charges	21,348	21,348	21,348	21,348	22,132	22,132	21,993	21,855	22,478	22,332	22,186	22,040	262,541
Tota OPEX	44,234	73,713	65,405	79,506	82,778	44,380	56,715	48,645	52,833	55,728	81,990	64,266	750,193
Breakeven													-
Surplus After Finance charges	(25,568)	(55,686)	21,404	85,885	62,139	51,671	29,390	21,745	57,828	31,197	34,327	(1,925)	312,407
Tax	20,380				29,158				29,158				78,695
Cash surplus	(45,947)	(55,686)	21,404	85,885	32,981	51,671	29,390	21,745	28,670	31,197	34,327	(1,925)	233,711
Overdraft													
Opening Overdraft Balance	0	(45,947)	(101,633)	(80,229)	5,656	38,637	90,307	84,697	71,442	65,112	61,309	60,636	
ClosingOverdraft Balance	(45,947)	(101,633)	(80,229)	5,656	38,637	90,307	84,697	71,442	65,112	61,309	60,636	23,711	23,711
Principal @ $6.75							35,000	35,000	35,000	35,000	35,000	35,000	210,000
Principal @ $6.25							25,000	25,000	25,000	25,000	25,000	25,000	150,000
Debt/kgMS	21.52	21.52	21.52	21.52	21.52	21.52	21.32	21.12	20.92	20.72	20.52	20.31	

FINANCIAL UPDATE

The final costs for the 2016-2017 Season are shown here in the excerpt from Dairybase. As discussed at the last Focus Day, the inclusion of an allowance for the Maize silage eaten during the year is included as a feed inventory adjustment. Some late costs coming in saw the total Operating Expenditure for the farm finish at $4.75/kgMS.

DairyBase
Platform for growth

Profitability KPI's

Owl Farm (Farm ID: 375316)
Dairy Season ended: 2017

Printed: 20 July 2017

Number in Benchmark Group: 1 (DairyNZ Estimate)
Benchmark Group Selected by: Profitability analysis
Region : Waikato
Farm business type : 1- Owner operator
Benchmark Group Ranked by:

FARM PHYSICAL KPI's	2016-17		2015-16		2014-15	
	Farm	Benchmark	Farm	Benchmark	Farm	Benchmark
Cows/ha	2.9	2.8	3.0	3.0		3.1
Kg Milksolids/ha	1,221	1,020	1,137	1,152		1,213
Kg Milksolids/cow	421	358	379	389		397
Cows/FTE	141	146	160	148		141
Kg MS/FTE	59,431	52,250	60,758	57,798		55,850

PROFITABILITY Dairy	2016-17		2015-16		2014-15	
	Farm	Benchmark	Farm	Benchmark	Farm	Benchmark
Gross Farm Revenue/ha	7,795	6,592	4,958	5,193		7,774
Operating Expenses/ha	5,801	4,512	5,576	5,140		5,982
Operating Profit (EFS)/ha	1,994	2,080	-618	52		1,792
Gross Farm Revenue/kg MS	6.38	6.47	4.36	4.51		6.41
Operating Expenses/kg MS	4.75	4.43	4.91	4.46		4.93
Operating Profit (EFS)/kg MS	1.63	2.04	-0.54	0.05		1.48
FWE/kg MS	4.07	3.63	4.97	3.76		4.24
Operating Profit Margin %	25.6%	31.6%	-12.5%	1.0%		23.0%

Moving forward this year the total OPEX is forecast at $4.29/kgMS. Principally a reduction in costs associated with growing and purchasing feed.

The Profit off the farm last season with a $6.15 payout, and the forecast profit of the farm in the coming season at the opening payout of $6.50/kgMS and updated forecast of $6.75/kgMS have seen the farm have the ability as mentioned to address our total term debt.

The cashflow on the adjacent page shows our Overdraft this season (the farm had a cash surplus at 1 June 2016 so started with a zero balance).

There is a provision for the estimated final tax payments from last season as well as estimated provisional payments for this season based on the forecast profit.

The cash in bank figure by December will exceed $100,000 so we have approached Westpac with a plan to begin making principal payments in December 2017. We are taking a conservative position and paying approximately 80% of the expected profit, if payout is at $6.25/kgMS – a total of approximately $150,000 in six equal payments. At this point we still have cash in the bank, and have paid for our Operational Capital requirements this year including primary cooling.

We will however be drawing down against our term loan to construct a new effluent pond at some point this season. Excluding the draw downs, this pays down our Term debt to approximately $20.30/kgMS.

NOTES

Owl Farm

HOME GROWN FEED SUMMARY

This year we are changing the cropping plan on the farm to utilise a smaller area in Summer crop via Turnips rather than Chicory.

Chicory has been a valuable tool while we had a very large amount of regrassing to get done, and the improvement in pastures we are now seeing is a direct result of using this programmed approach to regrassing with Chicory as a break crop.

Now that the bulk of the regrassing is done, we want to reduce closer to 10% of the far/year cycling through a cropping program, and the earlier final grazing, and planting date of our permanent ryegrass following Turnips offers significant benefits in the feed budget in Autumn.

It reduces 14ha that needs to be out of rotation in Autumn, plus it allows us to separate the spray and out and sowing dates into permanent pastures following crop and other paddocks into annuals..

This year the farm has 17.4ha in Winter Star II Annual Ryegrass from PGG Wrightson Seeds, which was due to go into Chicory. Now there will be 7.7ha sown directly into new pasture this spring after the annual ryegrass has been sprayed out. To aid the success of spring regrassing these paddocks are being done earlier than the turnip paddocks, and will be sown and are effluent block paddocks, which allows some ability to provide summer moisture to avoid moisture stress. These paddocks are being sown in Base AR37 – tetraploid ryegrass, with white clover and Tonic Plantain.

The remaining 9.7ha will be planted at two different dates with an early sown Barkant Turnip, (October 10th), later sown Barkant Turnip (October 25th) and longer establishing Cleancrop Rape® (October 25th) for different maturation dates over the 6 week summer dry spell.

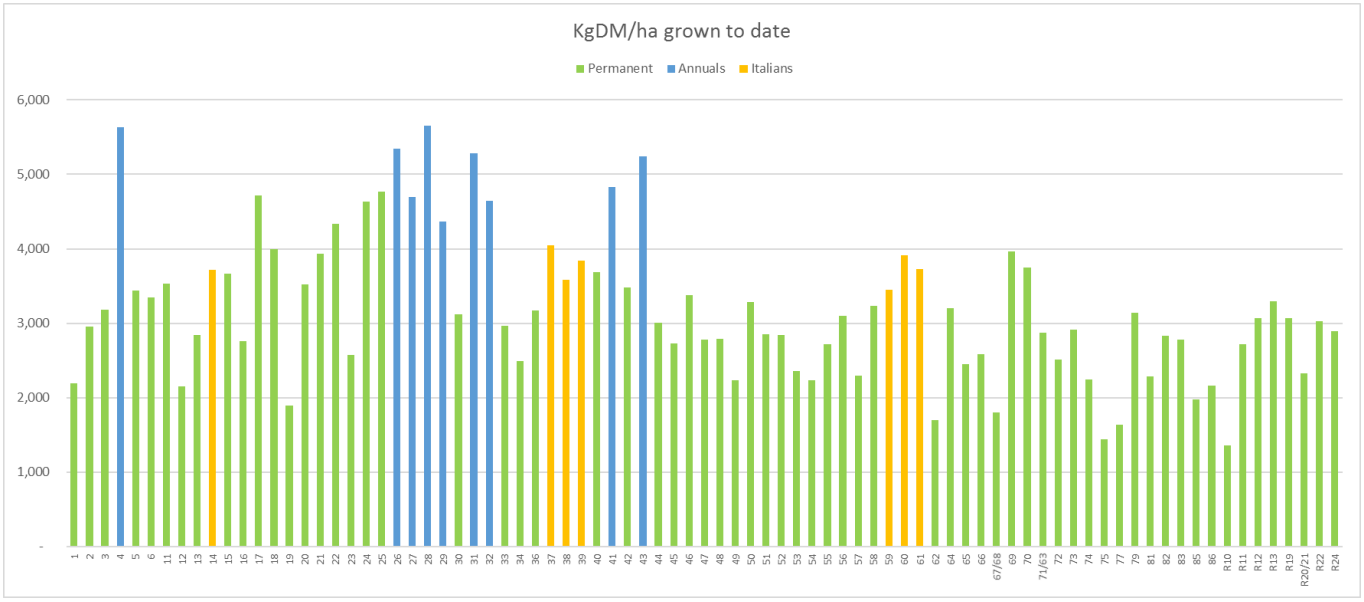
In addition to pasture involved in this year's cropping regime, there will be approximately 7ha of pasture planted in Annuals for the following season's turnip crop.

There is also 12ha of paddocks due for some form of patching or over-sowing this Spring due to small patches of damage that have occurred.

3ha of this is weak pasture that will be undersown with Lush Italian Ryegrass and become next year's turnip crop. The balance is being patched or undersown with Excess AR37 and Tonic Plantain.

We plan this spring to broadcast Plantain seed with our spring fert onto one block of the farm to see what sort of establishment occurs. One block of the farm is due for two Phosphate fertiliser applications, so half of each of these paddocks will be broadcast with Plantain this Spring, and the other half of the paddocks broadcast in the Autumn to see what effect time of year has on establishment.

To date the range of pasture grown by paddock is quite varied with Annuals having grown 5.1TDM/ha, Italians 3.7TDM/ha and Permanent pasture paddocks 2.9TDM/ha



NOTES

PRIMARY COOLING

With the new dairy company regulations coming at the end of the season a decision has been made regarding primary cooling for the farm.

Currently the farm water supply that runs through the primary cooler is at approximately 17-19deg C. In summer months that will increase to closer to 23 deg C.

This means our milk is coming out of the primary cooler at the moment at 18deg C at the start of milking and 21deg C at the end of milking.

Because of this, any primary cooling upgrade will have a large amount of actual cooling to do and is likely to have a large energy requirement to achieve this.

Understanding this helped us look at both the capital installation cost but also the annual running cost of the system in electricity terms to carry out the job.

All Systems examined

A range of systems have been considered that look at both water and ice-bank cooling along with several that use glycol cooling methods.

The ice-bank systems are more expensive to install than water, and not particularly cheap at completing the primary cooling however they do achieve greater cooling than water systems, which reduces the running costs of the existing direct expansion vat chilling system the farm has.

Without a transformer upgrade, a traditional glycol system couldn't be installed, however one variable rate glycol system will also replace the current vat chilling system. It reduces energy demand considerably on the farm, using approximately $4,000 less power in a year than the water-cooled system.

The summary of all systems is included below showing costs of hot water heating after the varying amounts of heat recovery off each system is considered.

	System name		**Supplier 1**	**Supplier 2**	**Supplier 3**	**Supplier 4**	**Varichill**
	Type	**Current**	**Water cooling**	**Ice bank**	**Ice bank**	**Ice bank**	**Glycol**
Jobs carried out	Primary cooling	Yes	Yes	Yes	Yes	Yes	Yes
	Vat chilling	No	No	No	Yes	No	Yes
Cost to complete job	Heating hot water	$4,301	$2,572	$2,061	$2,036	$1,648	$1,208
	Cooling	$0	$2,255	$3,164	$2,982	$2,813	$2,923
	Vat chilling costs	$3,521	$3,150	$3,516	$2,100	$3,150	$0
	Total running cost	$7,822	$7,977	$8,741	$7,118	$7,611	$4,131
	Variance to current	$0	-$155	-$919	$703	$210	$3,691
	Installed cost	$0	$31,691	$47,011	$44,849	$39,750	$57,500

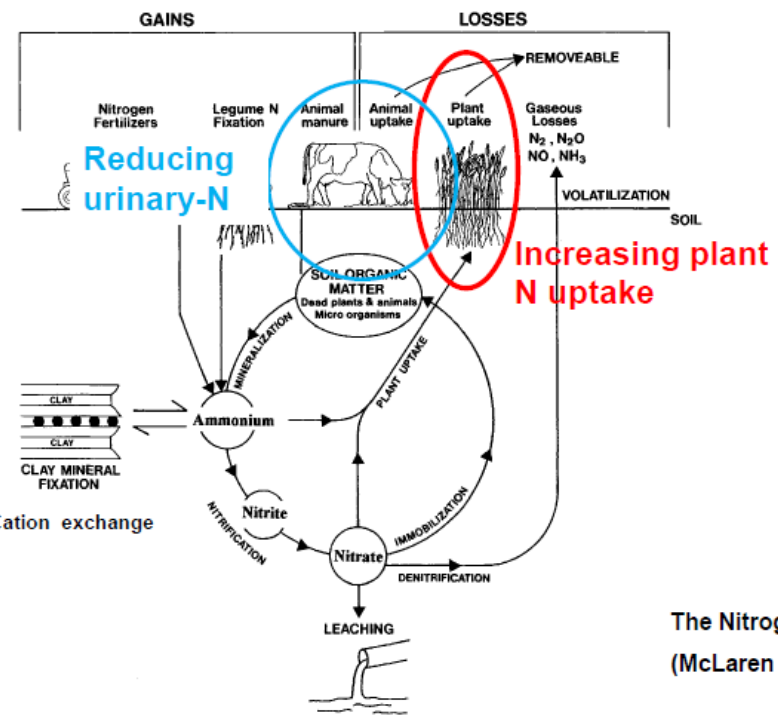
The Varichill system offers the best operating cost margin per year, which quickly exceeds the increased capital cost. It uses energy more efficiently to complete the cooling and given the large amount of temperature change that needs to occur the benefit of efficiency multiples quite quickly.

It is also cheaper to move to a new location and to repair. The changes in refrigerant legislation from the Paris accord mean that if new refrigerant gas had to be put into the systems, the water-cooled system would require $9,000 of gas where the Varichill will cost about $950.

It uses a number of very clever engineering techniques to maximize efficiency, which is what drives the major difference in electricity prices. It also replaces the existing Vat chiller with a far more efficient method of maintaining vat temperature.

NOTES

Identify the 'intervention points' to reduce nitrate leaching losses



The Nitrogen Cycle

(McLaren & Cameron, 1996)

N excretion and milksolids production from diverse and ryegrass-white clover pastures

	Ryegrass	Diverse
CP(%) diet	26.3	23.7
N intake (g N/d)	609	550
Milksolids (kg/d)	1.5	1.5
Milk N excretion (g N/d)	101	112
Urine N concentration (g N/L)	5.8	3.4
Urine N excretion (g N/d)	426	353

Totty et al. (2013) J Dairy Sci

New Zealand's specialist land-based university

NOTES

N excretion and milksolids production from diverse and ryegrass-white clover pastures

	Ryegrass	Diverse
CP(%) diet	18.6	18.2
N intake (g N/d)	551	497
Milksolids (kg/d)	2.1	2.0
Urine N concentration (g N/L)	6.1	4.9
No. urinations (no./cow/d)	12.6	14.0
Urination volume (L/urination)	2.0	2.2

http://www.rotorualakes.co.nz/vdb/document/1150

Edwards et al. (2015) NZ Soc. An. Prod

New Zealand's specialist land-based university

Table 1. Mean milk yield and composition for dairy cows grazing perennial ryegrass-white clover pasture, plantain or 50-50 pasture-plantain[4].

	Standard Pasture	Pure Plantain	50% Pasture Plantain
Milk			
Milksolids (kg/cow/day)	1.50	1.67	1.60
Milk protein (%)	4.28	4.34	4.29
Milk fat (%)	6.16	5.80	5.52
Lactose (%)	4.95	5.05	5.07
Milk urea (mmol/L)	11.2	9.9	10.9
Urine			
N concentration (g N/L)	5.4	2.4	3.6
Faeces			
%DM	10.9	15.7	12.6
N (%)	3.4	3.5	3.3

Daily milksolids production per cow was 0.17 kg MS greater for cows grazing plantain than cows grazing pasture, with cows grazing 50-50 pasture-plantain intermediate. A striking result was that the urine-N concentration was 56% lower for plantain and 33% lower for 50-50 pasture-plantain than pasture.

https://www.dairynz.co.nz/media/5534118/technical-series-december-2016.pdf

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PERFORMANCE OF OWL FARM'S CONSTRUCTED WETLAND

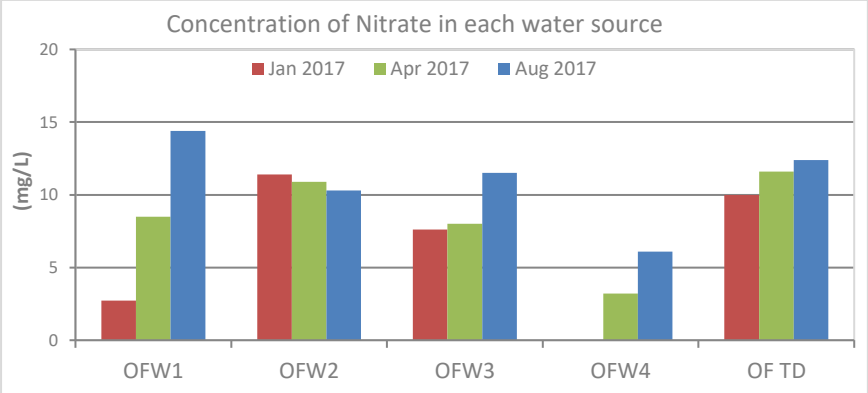
The Constructed wetland is being monitored for a number of nutrients along with looking at flow rate to understand how much water is going through, how fast, and how much the nutrient concentration is changing whilst the water transits the Wetland.

Owl Farm is taking regular sample data; NIWA is taking regular sample data and Ryan Wisnewski a Year 10 student at St Peter's School completed a science fair project focusing on the Wetland.

Some of the data reinforces what we already know – that as a general rule, nitrate concentrations in groundwater are higher in the high rainfall months.

OFW4 – was a well near the wetland exit that was dry in January, so no data was available to compare in the first round of sampling.

OFTD is a tile drain from the adjacent paddock that empties out just alongside and into the wetland.



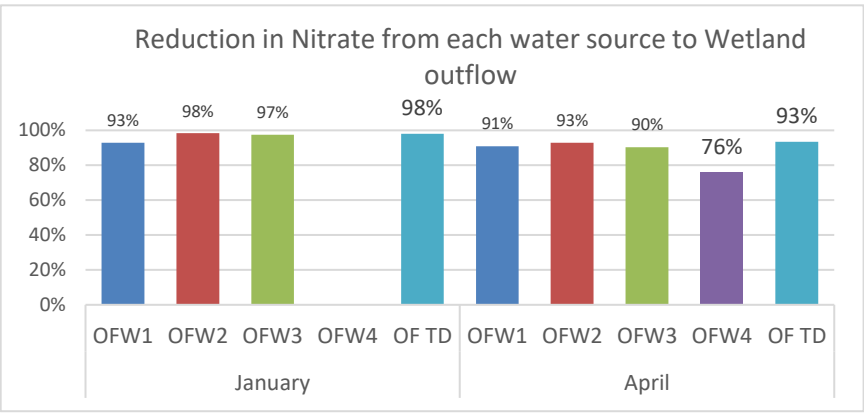
The short summary of the data collected so far, is that the Wetland is removing large amounts of Nitrate from the Water as it passes from the ground water sources to the Wetland outflow.

Ground water samples from Wells in January and April showed reductions between in-flow ground water and outflow wetland water of between 93-98% in January and between 76-93% in April.

Additional samples taken by NIWA from water directly as it enters at the head of the wetland versus outflow show consistent reductions of 50% in fine weather.

Owl Farm's constructed Wetland is referred to as a "young wetland" and as such it may see even further improved performance.

Ryan Wisnewski's work looked at how long water is spending in the Wetland during rainfall events.



THE EFFECT OF MAJOR RAINFALL EVENTS ON THE NITRATE REDUCTION AND HYDRAULIC RESIDENCE TIME (HRT) OF THE OWL FARM WETLAND

By Ryan Wisnewski, Year 10.

Aim of Experiment

- To determine the impacts of different weather conditions in autumn on the wetland hydraulic residence time (HRT) and nitrate reduction
  - **No Rainfall (Event A/Control):** No rainfall is defined as a period of over 144 hours with <5mm of rainfall. This is to determine a HRT with little rainfall, to give a baseline from which to measure changes in HRT with different rainfall events.
  - **Moderate Rainfall Events (Event B):** A Moderate rainfall event occurs when there is between 20 -40 mm of rainfall in 96 hours, and <5mm of rainfall for 24 hours before and after.
  - **Major Rainfall Events (Event C):** Major Rainfall Events are when at least 50 mm of rainfall occurs in up to 96 hours. These rainfall events need to have a period with <5mm in 24 hours either side of the event.

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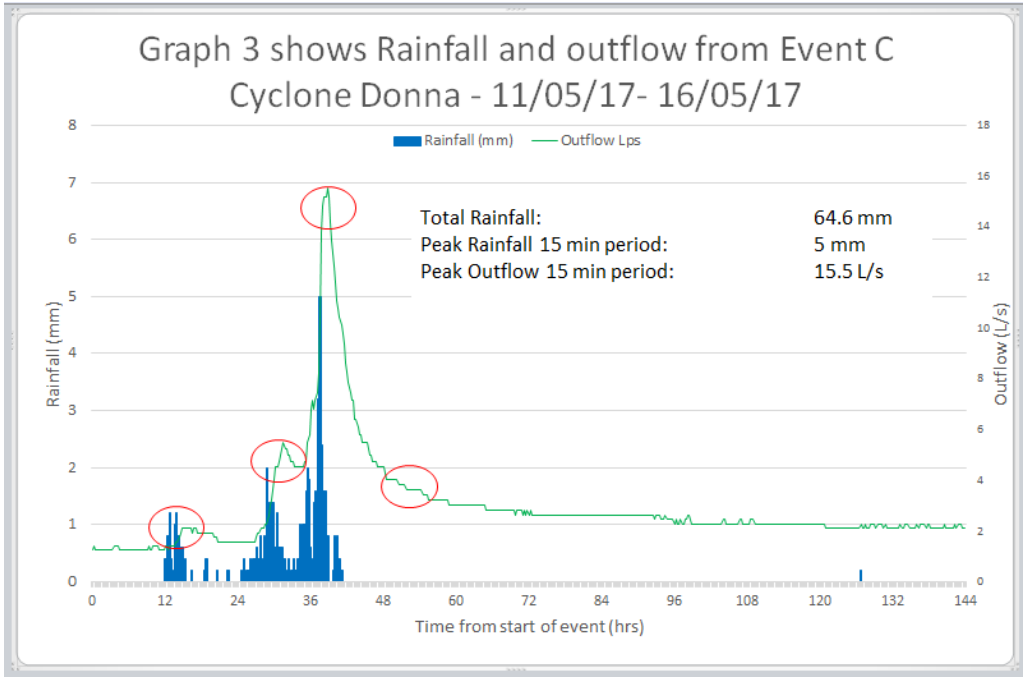
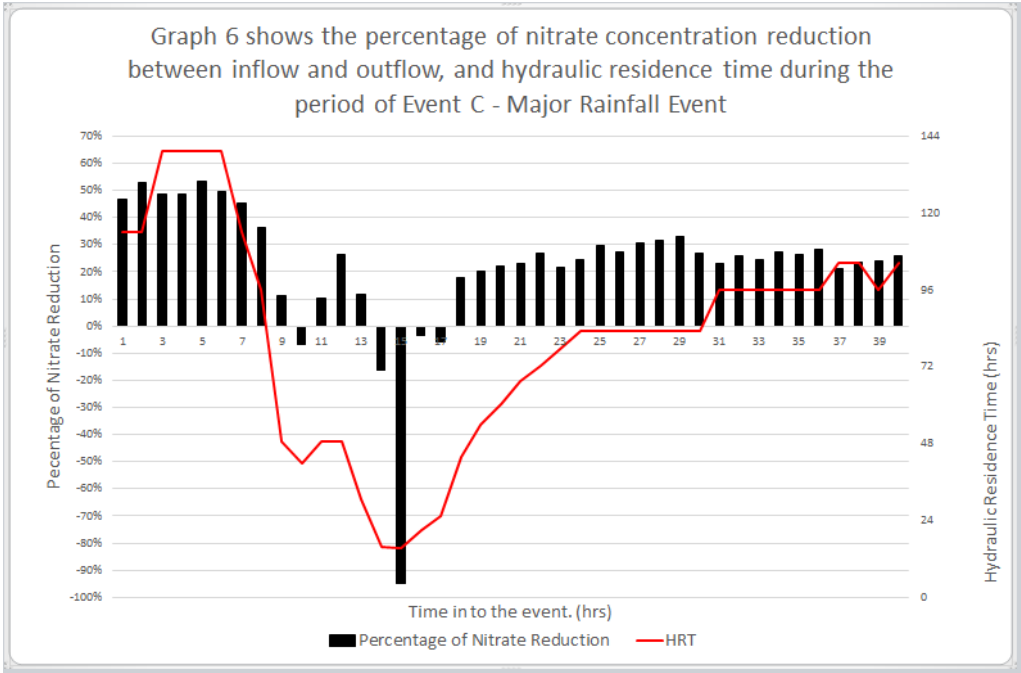




Key Findings

- The HRT was above the optimum 24 hours for over 99% of the time, far more than what I expected.
- The HRT may be even higher, because I calculated the flow rate using my bucket and stopwatch test to be lower than what the NIWA data for the same time period. This would increase the HRT, because the lower the flow rate, the higher the HRT
- Nitrate concentration is reduced by over 30% when the HRT is over 24 hrs.
- The level of nitrate reduction in the outflow remained fairly constant despite rainfall.
- Plants take up approximately 20% of the volume in the wetland, far less than what I expected.

I think the estimated catchment area for the Owl Farm wetland may be over estimated if the original design rule holds true (*A wetland should be 1% of the catchment area to have an HRT around 24 hours and 30% Nitrate Extraction*).

NOTES

OWL FARM FUTURE

There is no doubt that the world we farm in is changing. It is changing quickly and it is changing on multiple fronts and as farmers, we have just one choice – Evolve. The question is, how do you set about actively and deliberately changing what you do? Where do you start?

As we move forward – many farms in New Zealand will need to cross this bridge and it is important for farmers to know that it is a winding road with the odd dead end. However, if you can define what is important to you early on in the process, you will find a much straighter pathway to the destination.

The question of "what next" for the farm has been an involved and complex one to ponder. For the past 12 months, work has been ongoing that looked at what options lay before Owl Farm that might deliver on the strategic objectives in the future.

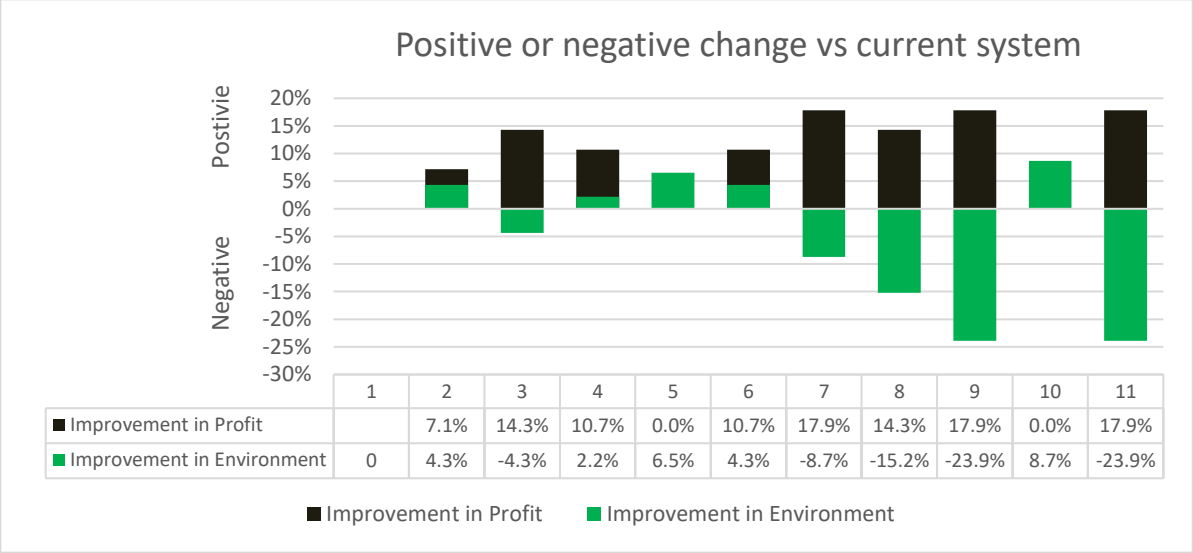
In March 2017, a summary of the farm systems considered was presented to farmers at the Owl Farm Focus Day and this represented a "shortlist" of 11 possible scenarios that provided a vast range of performance. These all looked at future change, away from the current spring calving farm system with no feed infrastructure and all cows wintered on.

These included the following ideas and in some cases combinations of ideas:

- Wintering off 20% of cows
- In-shed feeding
- Feedpad
- Herd homes
- Winter milk
- Very low/no input and lower stocking rate
- Higher stocking rate

Out of this work, some clear data came to the fore about: variance in profit between each of the farm systems, the capital cost that it took to achieve this new system and about the environmental outputs that each system produced.

The following graph shows the summary improvement in Profit and Environmental outputs of the 11 systems considered.



	1	2	3	4	5	6	7	8	9	10	11
Improvement in Profit		7.1%	14.3%	10.7%	0.0%	10.7%	17.9%	14.3%	17.9%	0.0%	17.9%
Improvement in Environment	0	4.3%	-4.3%	2.2%	6.5%	4.3%	-8.7%	-15.2%	-23.9%	8.7%	-23.9%

It is fair to say that this is when the head scratching sets in. Some systems offer a large improvement in profit, but they make environmental performance a lot worse without further investment in options to reduce the environmental footprint. Other options offer environmental improvement but do not improve profit at all.

What came out of this process was a huge amount of discussion looking at the problem from all sorts of angles, and it became quite clear that to move forward we would need to look at where the farm is now and select a system that addressed the current weaknesses and built on the current strengths.

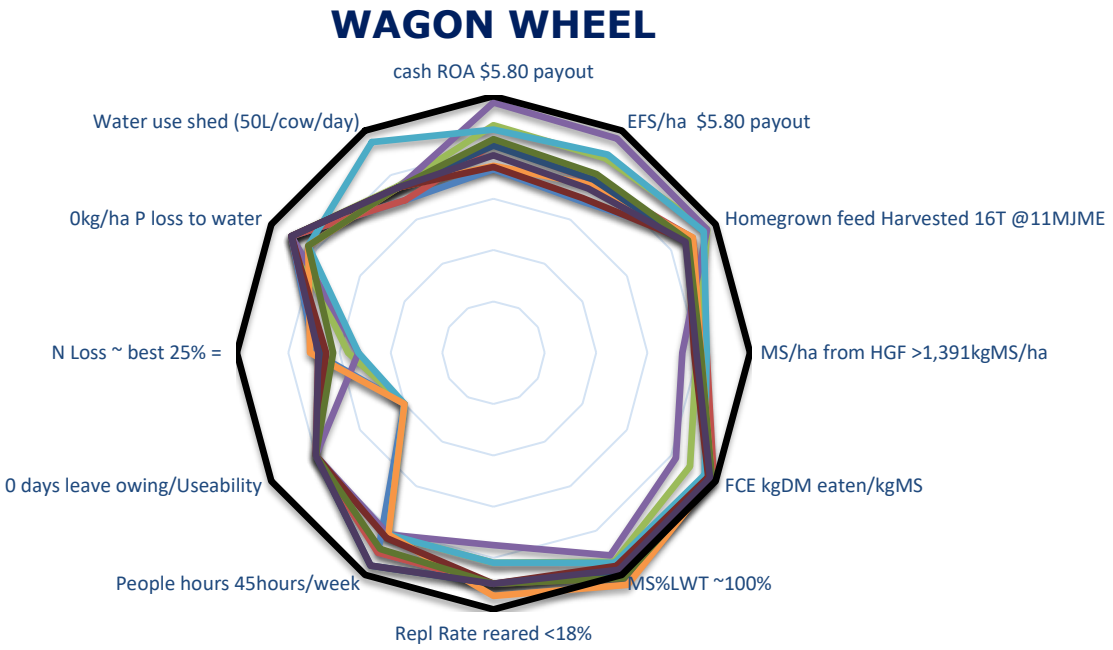
We set about developing a framework that evaluated the systems against all of our goals. With everything being equal, what would our high performing system produce in results in 5 years' time? At the outset, we were very strict that nothing in a new system would see us compromise health, safety or welfare of our animals.

NOTES

When we had finished, the targets we set looked at:

- Financial performance and a defined minimum EFS/Ha at a $5.80 payout, equivalent to what the top 20% of the region is achieving
- A target cash Return on Asset that would ensure any investment in infrastructure didn't lead to over-capitalisation.
- Physical farm performance measures that focused on increasing the amount of homegrown feed harvested and driving ever more towards more milk produced from homegrown feed.
- Livestock performance measures that look at high quality cows, efficiently producing our milk.
- A total replacement rate that would be need to be reared, as a sum of all reproductive and livestock wastage measures.
- The impact of the system on people, and the intention to offer a job with a good work-life balance and controlling the hours of work.
- The usability of the system and whether the key-people on farm are able to take their leave entitlements every year – no days outstanding at the year-end, or is the system too complicated to allow this to happen?
- And of course, environmental KPI's – moving the farm close to the best 25% in industry for Nitrogen loss to water. Targeting no loss of Phosphate to water and a focus on the amount of freshwater consumed/day in the process of milking and shed hygiene to reduce our consumption.

Comparing a system against all of these targets simultaneously is quite a difficult thing to do. It is a case of seeing which system was the most well rounded? As if each target were a spoke on the wagon wheel and the more round your wheel the more smoothly the ride will be. This led us to the following, looking at the systems performance on the "Wagon Wheel".



A number of systems could now be eliminated as we moved along this pathway due to such severe underperformance in certain areas that they just would not be feasible. Then we needed to answer some questions around compromise.

Would we sacrifice the highest performance in one area for an improvement in another area? What is it that Owl Farm will be famous for? There has been some more talking and thinking done and the most fruitful conversation of them all yielded the unwavering declaration that Owl Farm will be famous for: Demonstrating a sustainable Farm System. Using the original definition of sustainable: able to be maintained at a certain rate or level.

This means: our Financial performance, our Environmental performance, our Community and people performance and our Livestock performance needs to be good enough that we can continue to farm the way we are farming. We know we can't look at any one of these areas in isolation as they are all inter-dependent. Over-performance in one area will not make up for a failure of performance in another area so compromises must be made.

Poor livestock performance, will affect our community engagement and perception and undoubtedly also our profit. If we can't deliver on our Environmental objectives we won't be able to continue farming the way we are which will affect how others see us and possibly remove the ability to generate profit. If we can't find a viable financial model then we won't be able to afford to meet our environmental objectives and look after our stock.

NOTES

What would Owl Farm like to be Famous For?

Owl Farm
Providing knowledge

NOTES

OWL FARM WEEKLY MONITOR WALK

As we move forward into a new season with a much-diminished arsenal of supplements and a strong desire to increase our pasture harvested and pasture quality – the focus on pasture management is as important as it has ever been. This means that we need to ensure we validate our own maths by focussing on what our residuals are, as the cows very good at telling us whether we got the pre-grazing cover right.

We are starting a weekly monitor walk of the top block of the farm – approximately 80 ha that will be completed at 11am every Tuesday.

We hope that this regular platemetering will keep us fit and focussed, along with giving a second validation of pre-grazing and post grazing covers to ensure we maximise out pasture grown and eaten.

These walks are open to the farming community, so individuals, groups, visitors and students can share the experience with us and enjoy some robust discussion as we work to ensure we get the best estimate of what the cows are being fed.

The other outcome of these walks is hopefully a further opportunity to engage with other farmers for advice and support in both directions!

So feel free to drop by and bring your own platemeter, probe, or eye-ometer to the Demonstration office, leaving at 11am Tuesdays!

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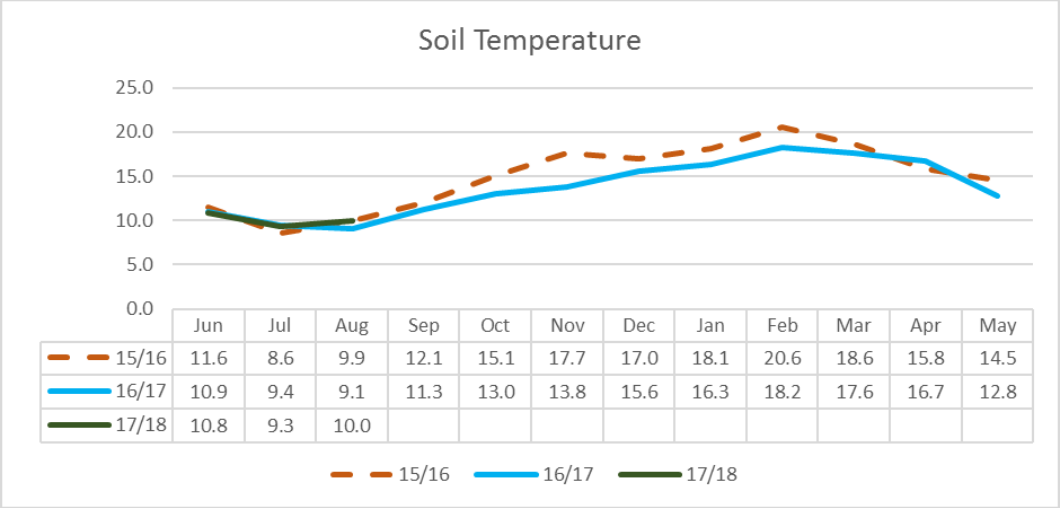
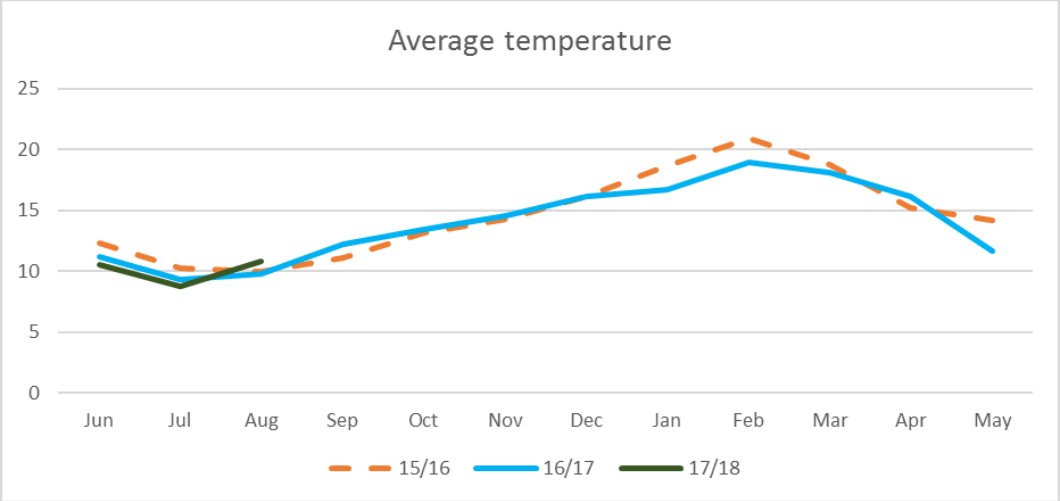
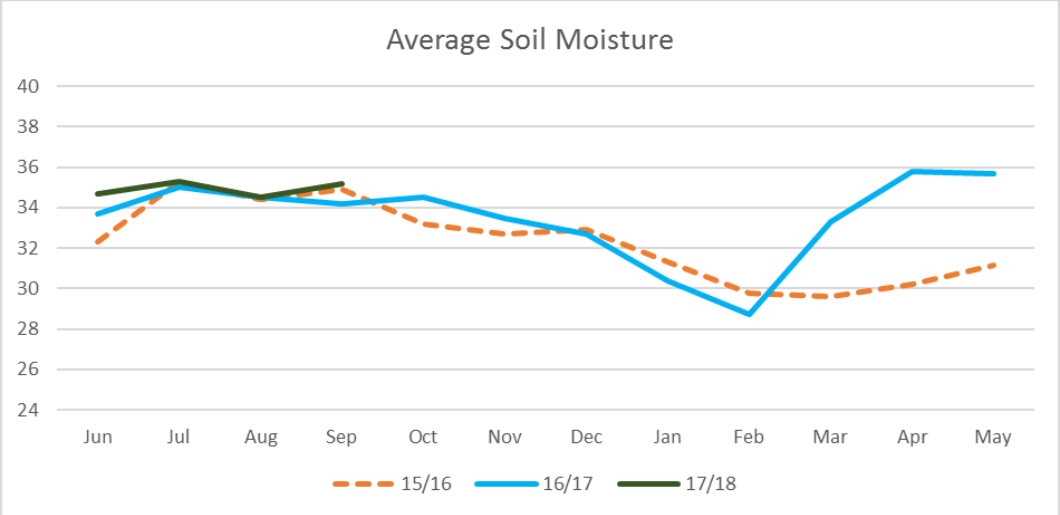
APPENDIX...

CLIMATE



	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
15/16	11.6	8.6	9.9	12.1	15.1	17.7	17.0	18.1	20.6	18.6	15.8	14.5
16/17	10.9	9.4	9.1	11.3	13.0	13.8	15.6	16.3	18.2	17.6	16.7	12.8
17/18	10.8	9.3	10.0									





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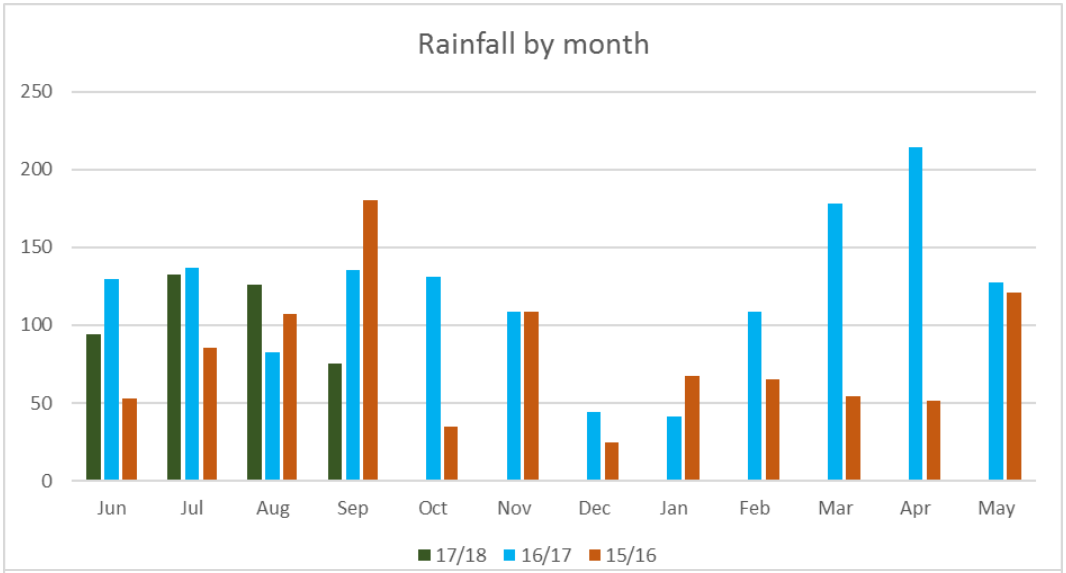
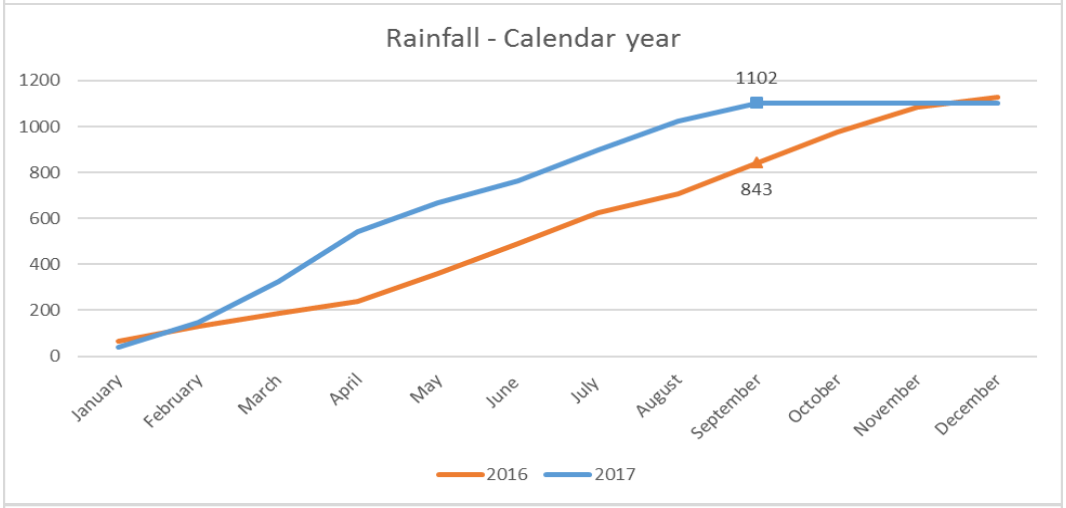
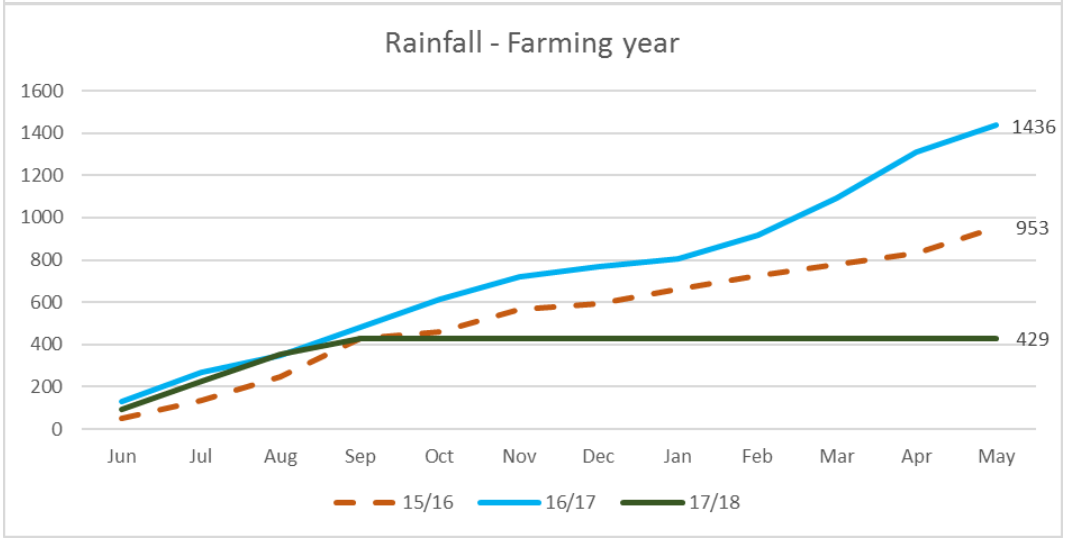
RAINFALL







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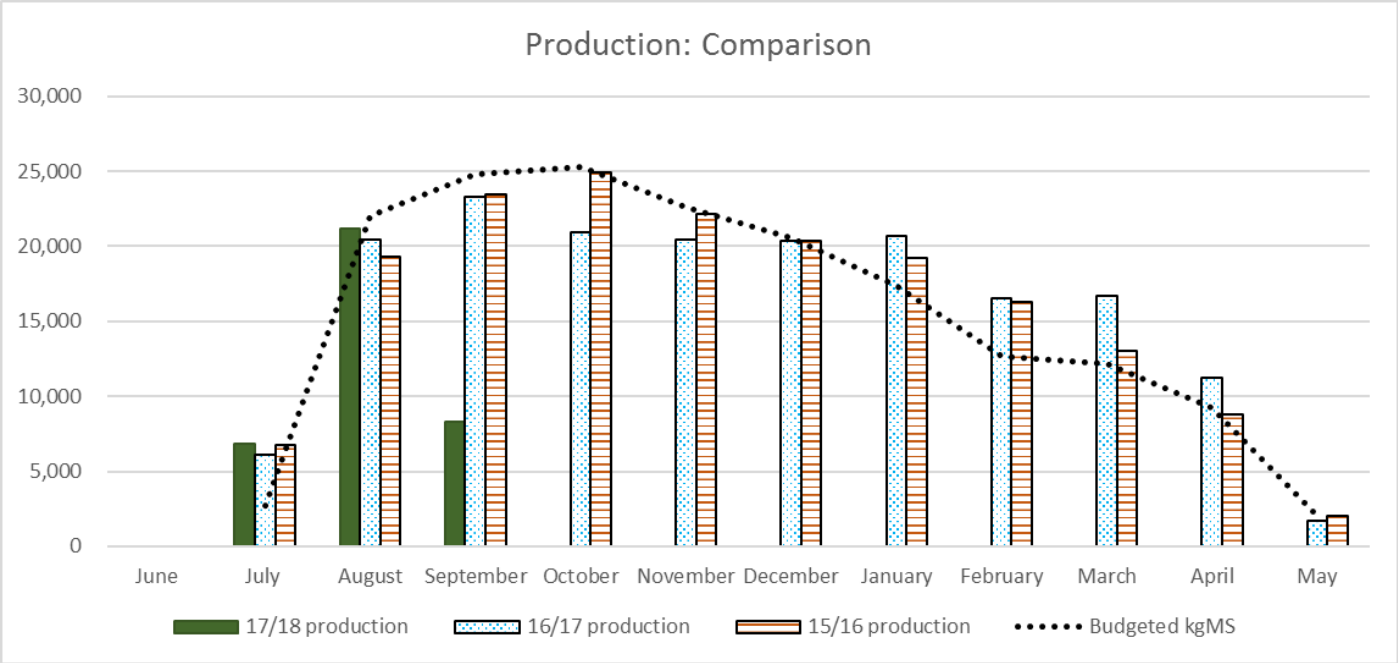
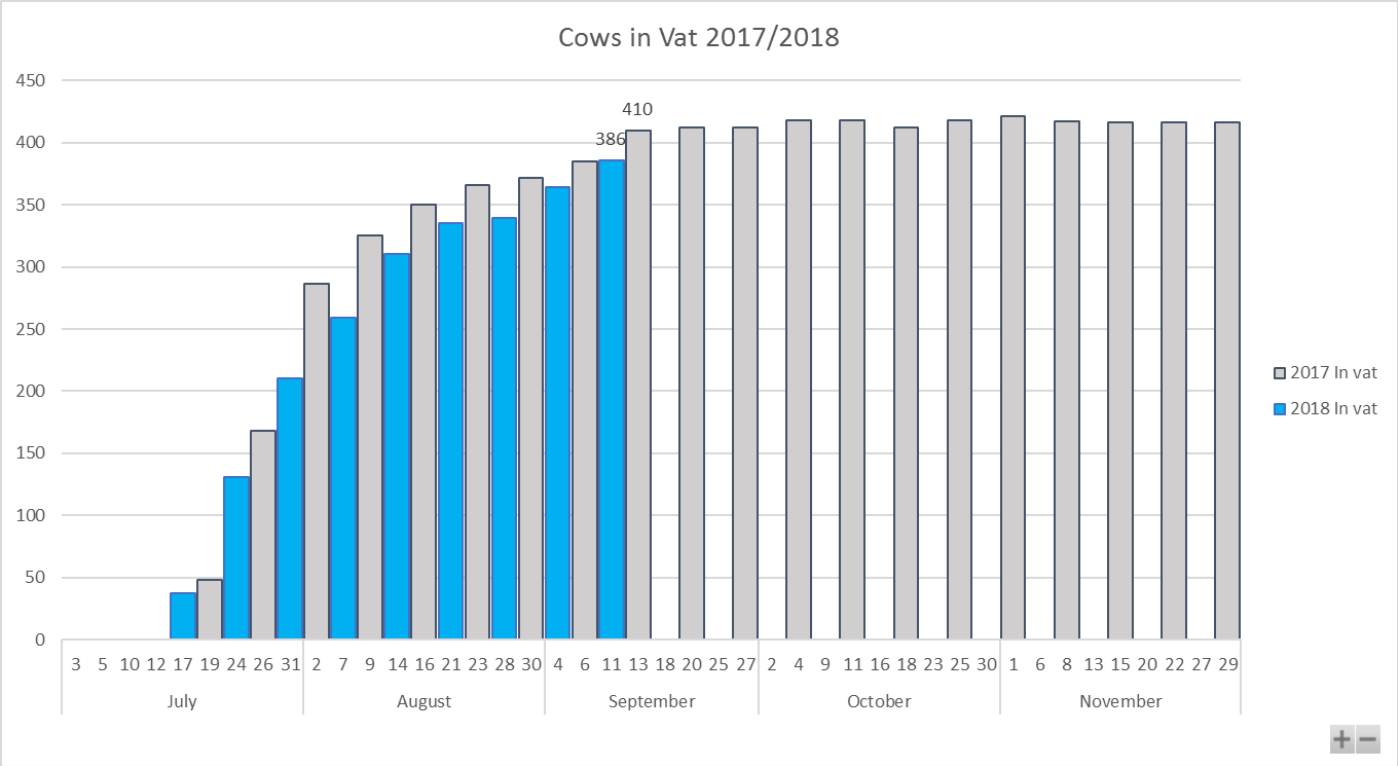
SUMMARY DATA - PRODUCTION





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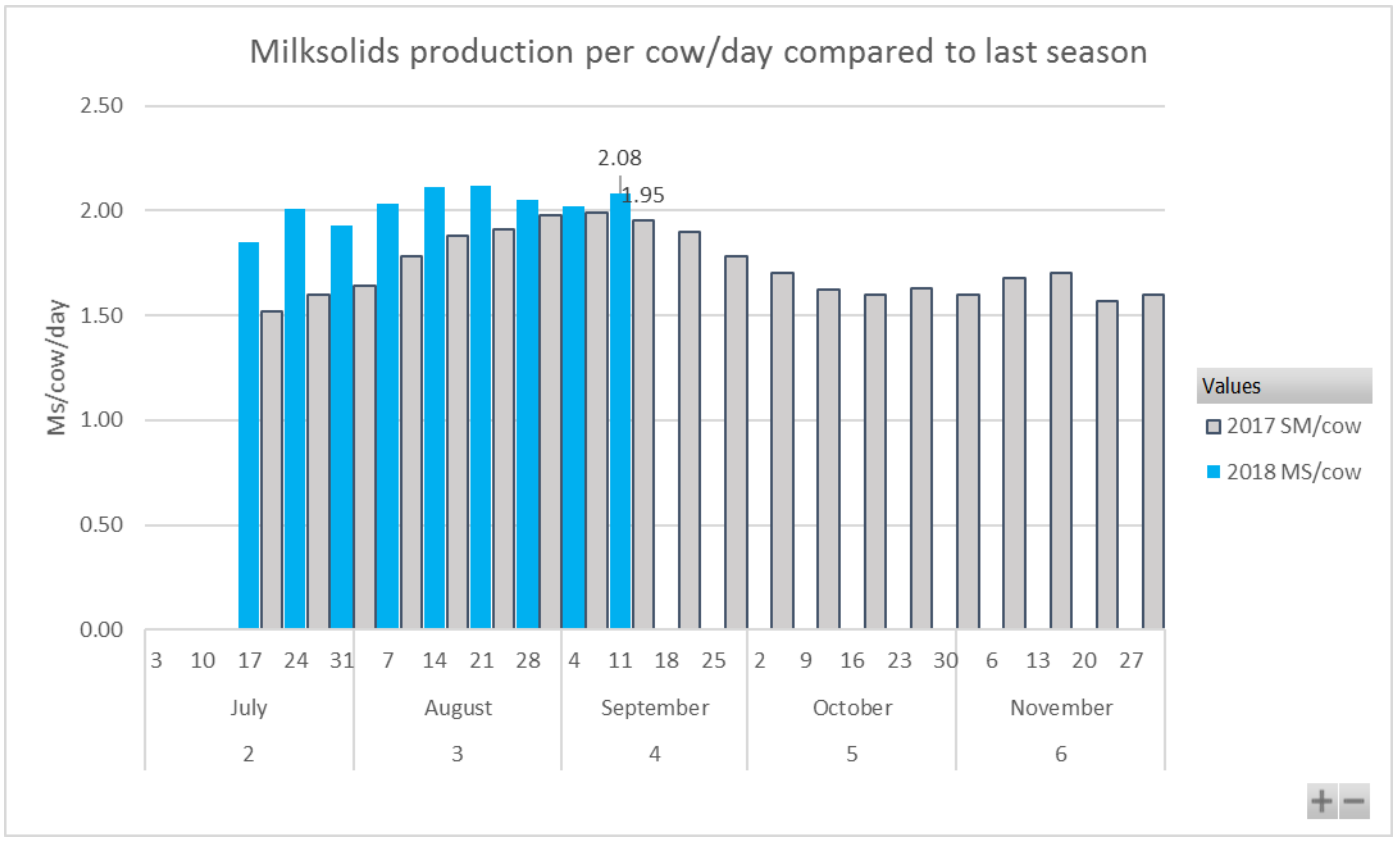
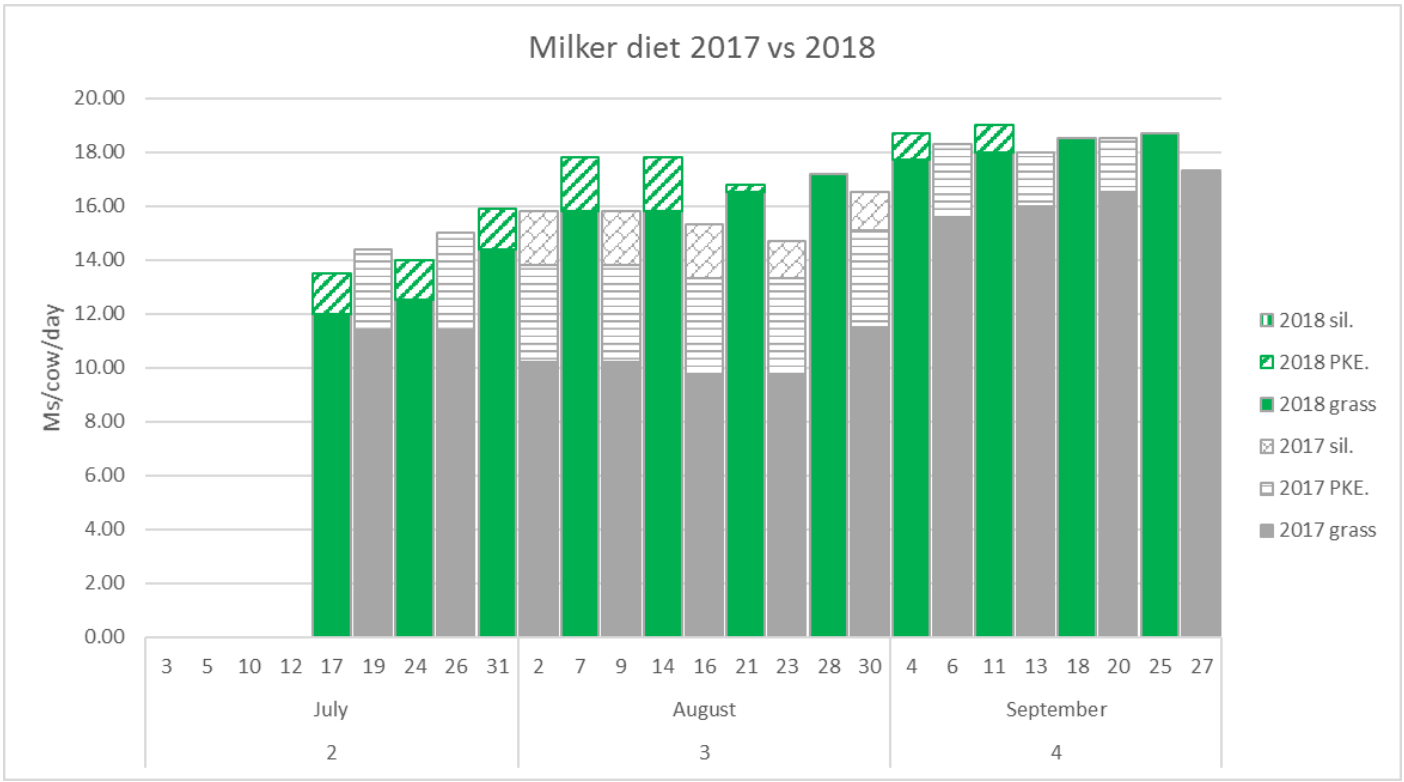
SUMMARY DATA – MILKER PERFORMANCE





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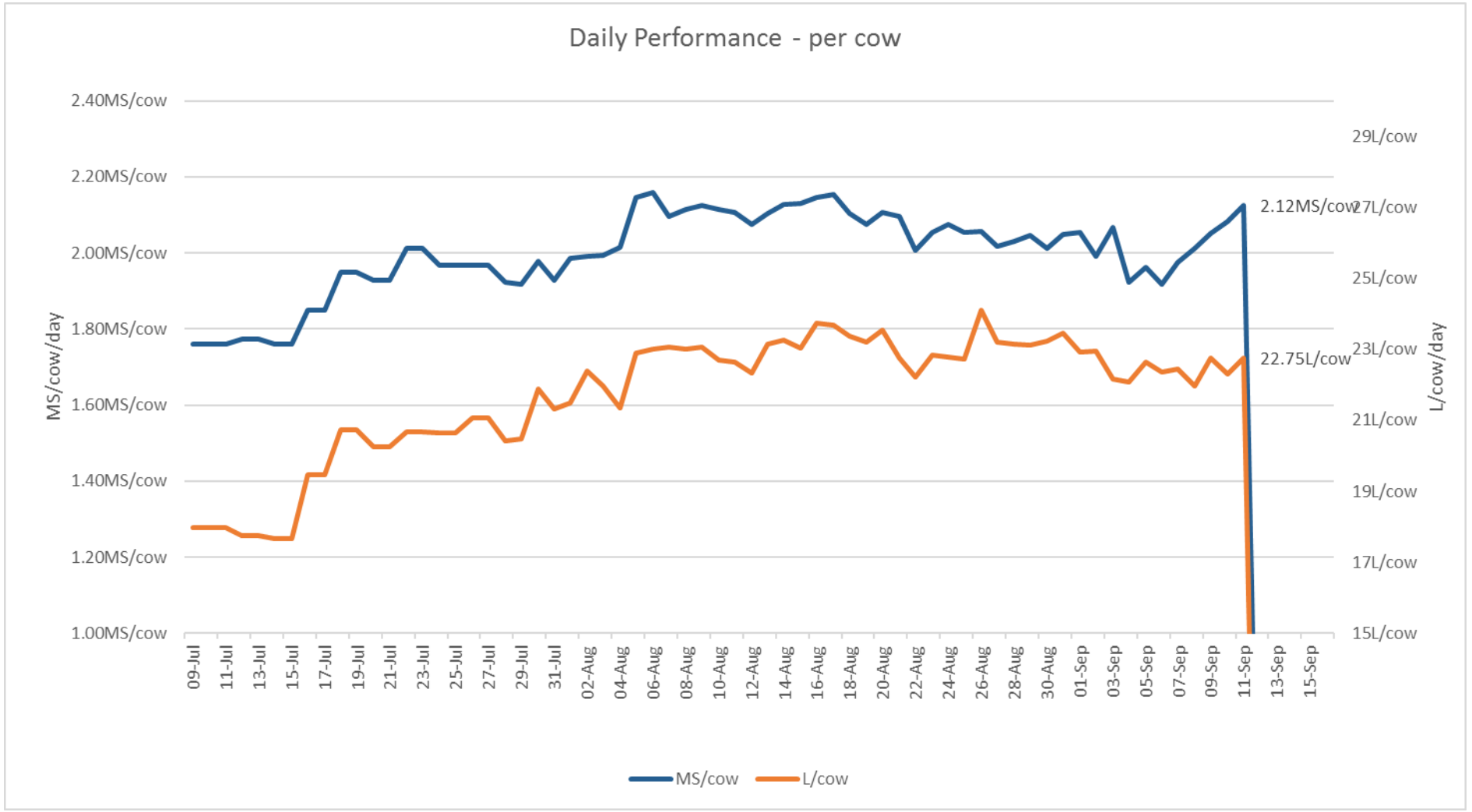
Daily Performance - per cow
2.40MS/cow
2.20MS/cow
2.00MS/cow
1.80MS/cow
1.60MS/cow
1.40MS/cow
1.20MS/cow
1.00MS/cow
MS/cow/day
29L/cow
27L/cow
25L/cow
23L/cow
21L/cow
19L/cow
17L/cow
15L/cow
L/cow/day
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22.75L/cow
09-Jul
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13-Jul
15-Jul
17-Jul
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27-Jul
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26-Aug
28-Aug
30-Aug
01-Sep
03-Sep
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09-Sep
11-Sep
13-Sep
15-Sep
MS/cow
L/cow

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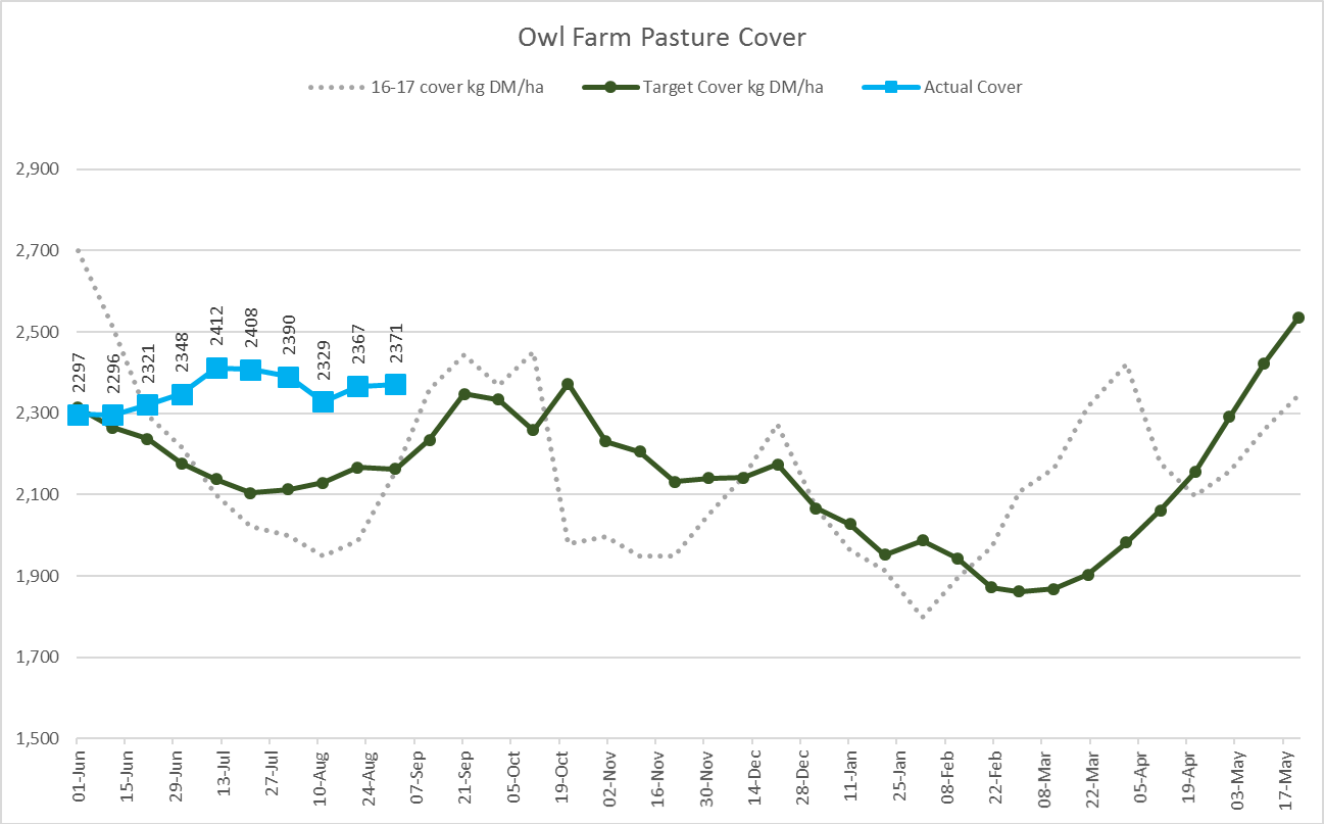
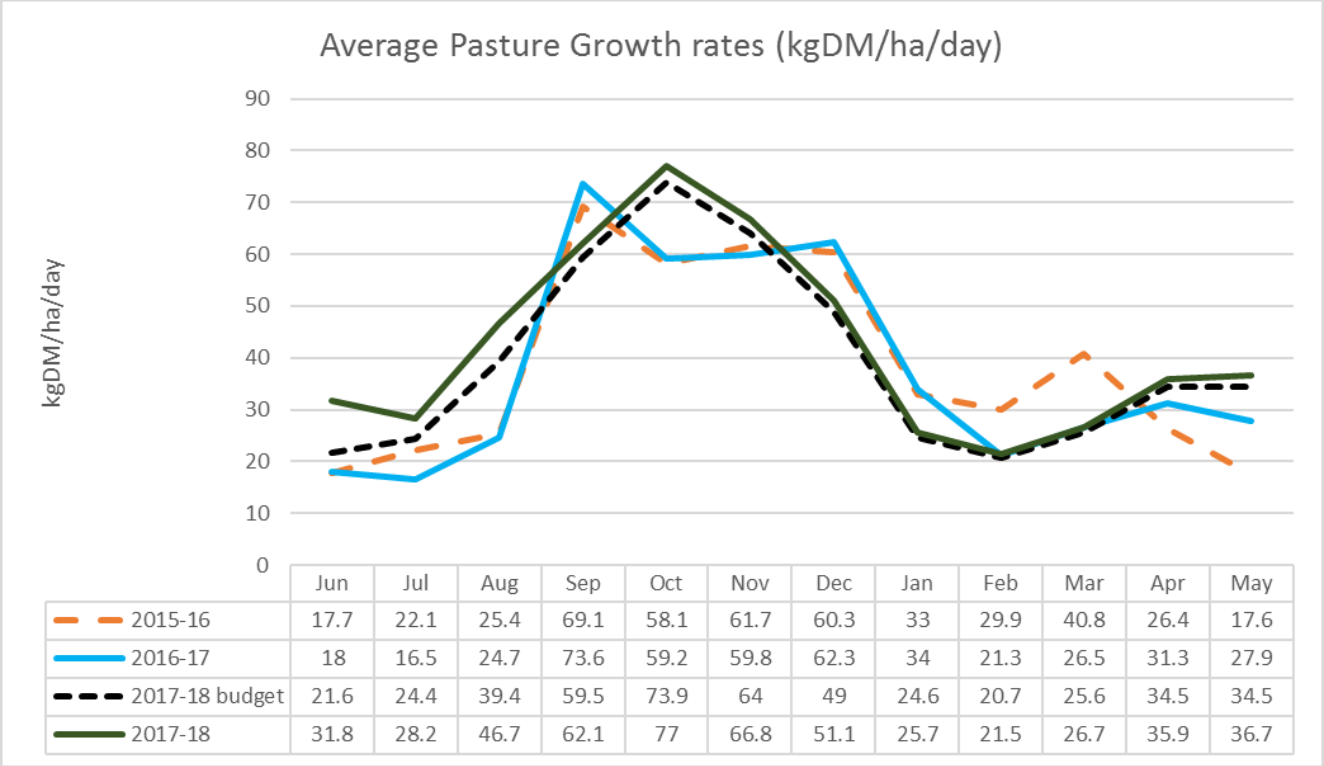
FEED INFORMATION



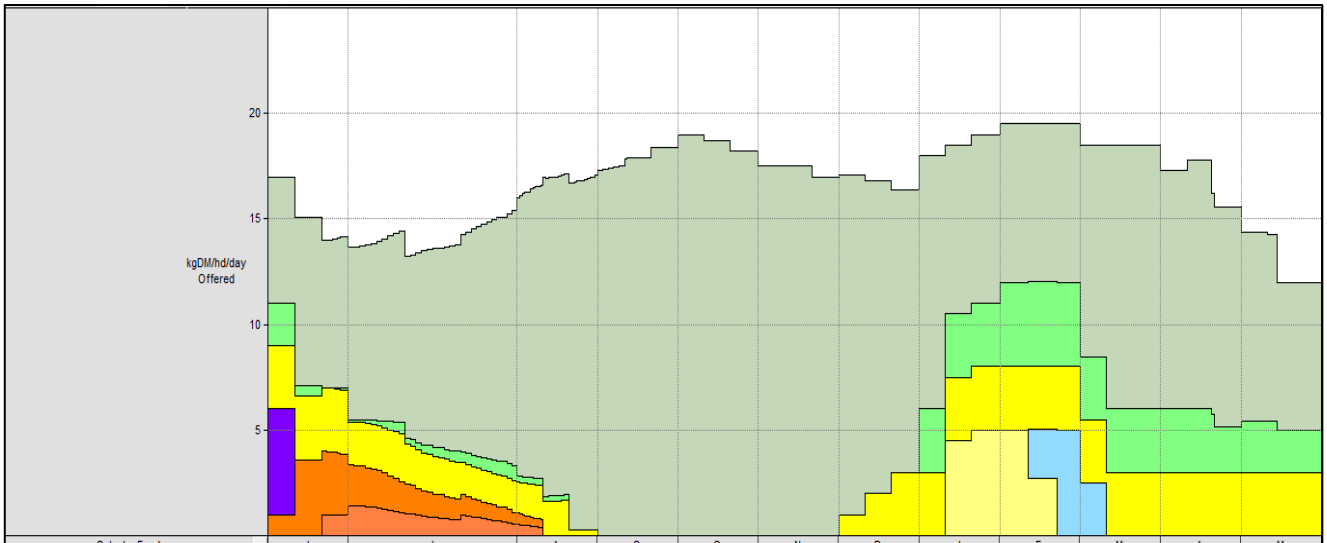


	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
2015-16	17.7	22.1	25.4	69.1	58.1	61.7	60.3	33	29.9	40.8	26.4	17.6
2016-17	18	16.5	24.7	73.6	59.2	59.8	62.3	34	21.3	26.5	31.3	27.9
2017-18 budget	21.6	24.4	39.4	59.5	73.9	64	49	24.6	20.7	25.6	34.5	34.5
2017-18	31.8	28.2	46.7	62.1	77	66.8	51.1	25.7	21.5	26.7	35.9	36.7

NOTES

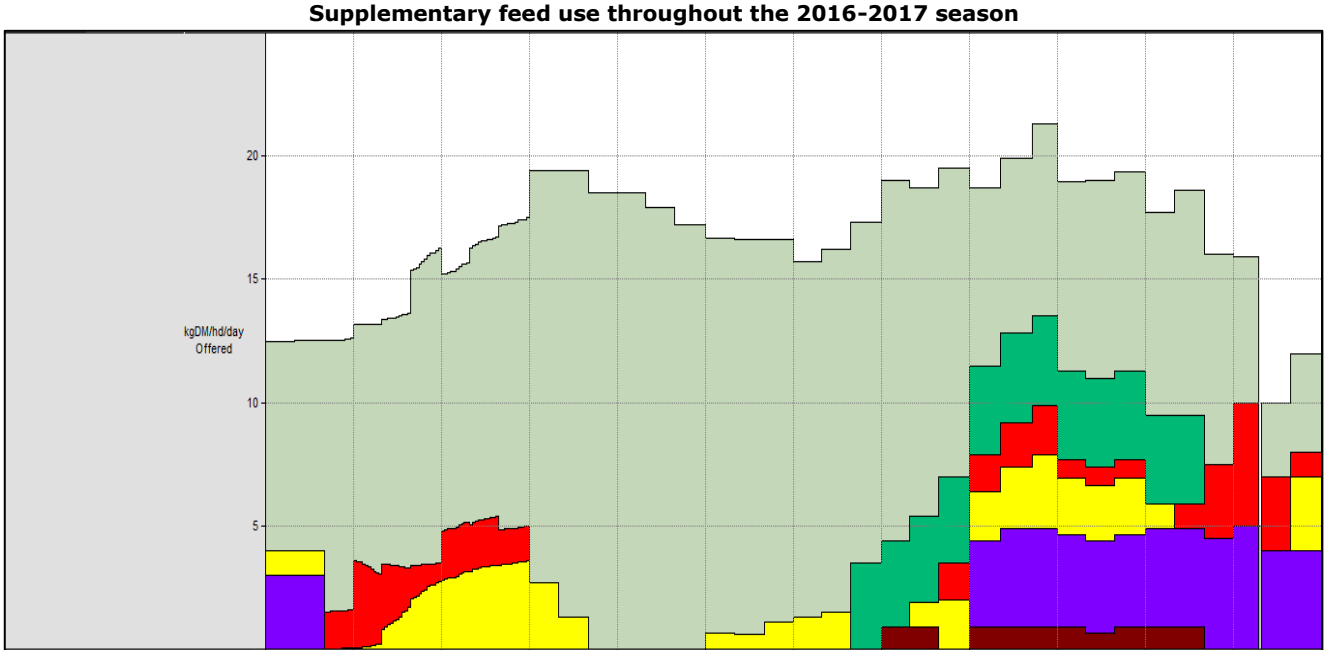
SEASONAL FEED BUDGET

Supplementary feed use to date and forecast throughout the 2017-2018 season



Select a Feed	J	J	J	J	A	S	O	N	D	J	F	M	A	M
Pasture	7.0	9.6	9.2	9.3	15.2	17.9	18.6	17.3	14.8	9.3	7.5	11.7	11.1	7.8
Pasture Silage	0.8	0.8	0.4	0.4	0.2					3.0	4.0	3.0	2.8	2.2
Palm Kernel	3.0	2.4	1.8	1.5	1.2				2.0	3.0	3.0	3.0	3.0	3.0
Bought maize silage	1.7													
Bought Baleage	2.5	1.2	1.2	1.2	0.1									
Bought Hay	0.3	0.9	0.9	1.2	0.1									
Forage Rape											2.2	0.8		
Bulb Turnip										3.2	2.8			

Supplementary feed use throughout the 2016-2017 season



Select a Feed	J	J	A	S	O	N	D	J	F	M	A	M
Pasture	9.3	10.6	11.3	17.8	17.9	15.8	14.3	13.5	7.4	7.9	8.6	4.9
Chicory							1.2	3.5	3.6	3.6	2.4	
Pasture Silage	0.5	2.0	1.8					0.5	1.7	0.7	1.3	2.1
Palm Kernel	0.7	1.0	3.3	1.3		0.8	0.9	1.0	2.5	2.3	0.3	0.8
Bought maize silage	2.0								3.8	3.7	4.2	3.2
Brought chicory								0.6	0.9	0.8	0.6	

NOTES

SUPPLY, DEMAND ALLOCATION

Pasture allocation

How to calculate pre-grazing cover

(Stocking rate x intake x rotation) + Optimum residual = Pre-grazing cover

(___ cows/ha x ___ kg DM/cow x ___days) + _____kg DM/ha = _____ kg DM/ha

e.g. (3.0 cows/ha x 17.5 kg DM/cow x 22 days) + 1500 kg DM/ha = 2650 kg DM/ha

PASTURE ALLOCATION:

HERD DEMAND *Is the pasture requirement for 12 or 24 hours?*

Required per cow x number of cows = demand e.g. 18 x 200 = 3600 kg DM

SUPPLY PER HECTARE

Pre-grazing yield – residual = supply *e.g. 2800 – 1500 = 1300 kg DM/ha*

AREA REQUIRED

Demand ÷ supply = area required *e.g. 3600 ÷ 1300 = 2.8 ha/day*

(Area x supply) ÷ number of cows = pasture available/cow

e.g. (2.8 x 1300) ÷ 200 = 18 kg DM

AREA ALLOCATION:

M² PER COW TO COWS PER HA *A stride is approx. 1 m.*

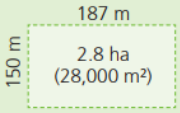
10,000 ÷ m²/cow = cows/ha *e.g. 10,000 ÷ 140 = 71 cows/ha (1ha = 10,000 m²)*

AREA REQUIRED BY HERD

Total cows ÷ cows/ha = area required *e.g. 200 ÷ 71 = 2.8 ha*

BREAK SIZE

Area (m²) ÷ paddock width = required length for break



e.g. (2.8 x 10,000 = 28,000 m²) 28,000 ÷ 150 m = 187 m

This optimises pasture utilisation and subsequent pasture growth and quality. For more information www.dairynz.co.nz/feed/pasture-management.

NOTES

Owl Farm

Providing knowledge

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Demonstration Dairy Farm

St Peter's · Cambridge
New Zealand

Lincoln University
Te Whare Wānaka o Aoraki
Aotearoa · New Zealand
New Zealand's specialist land-based university

Next Farm Focus Day

Wednesday, 22 November 2017

Weekly Monitor Walk

Tuesdays, 11am

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