

December 2016 Field day Soil nutrient management project

Backtrack Dairies



The season so far



Thanks To

- DairyNZ
- AGMARDT
- Ballance
- Healthy Soils
- Hills Laboratories
- Hydroservices
- Kiwi Fertilisers
- Paddock Vets
- Perry Laboratories
- Precision Tracking
- Individual farmers and rural business professionals



Waiora



Whakapono

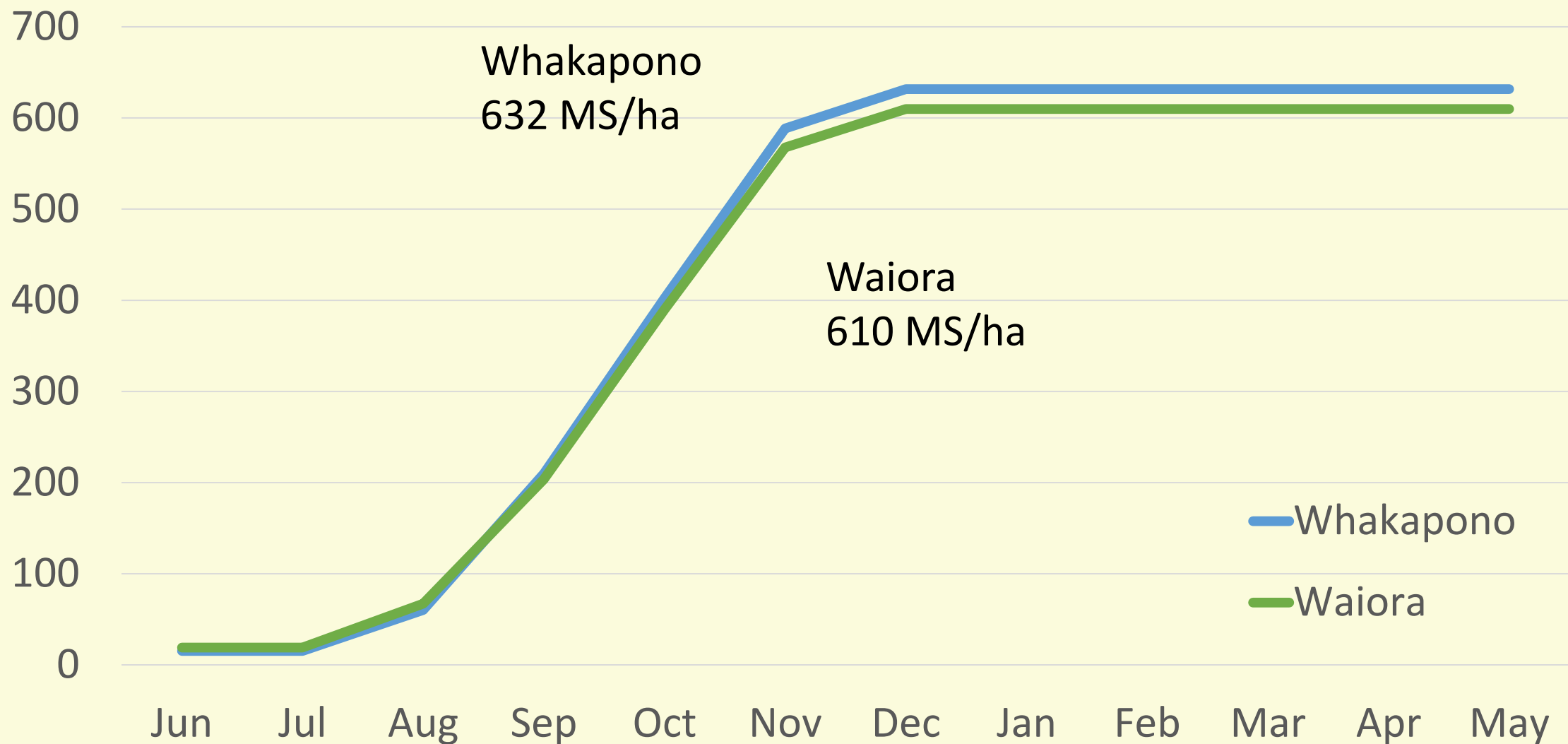
Backtrack Dairies

	Whakapono	Waiora
Effective Area	155	210
Stocking Rate	3.1	3.0
Peak Cows	483	639
Treatment	Kinsey-Albrecht	Conventional
Total MS/Ha	632	610
Total MS/Cow	216	215
Total Pasture Grown	5.6	5.9
Total Supplements Fed	185	198
Total Supplements Made TDM	41	97
Total N Applied	63	100
N Leaching (15/16 Season)	35	40

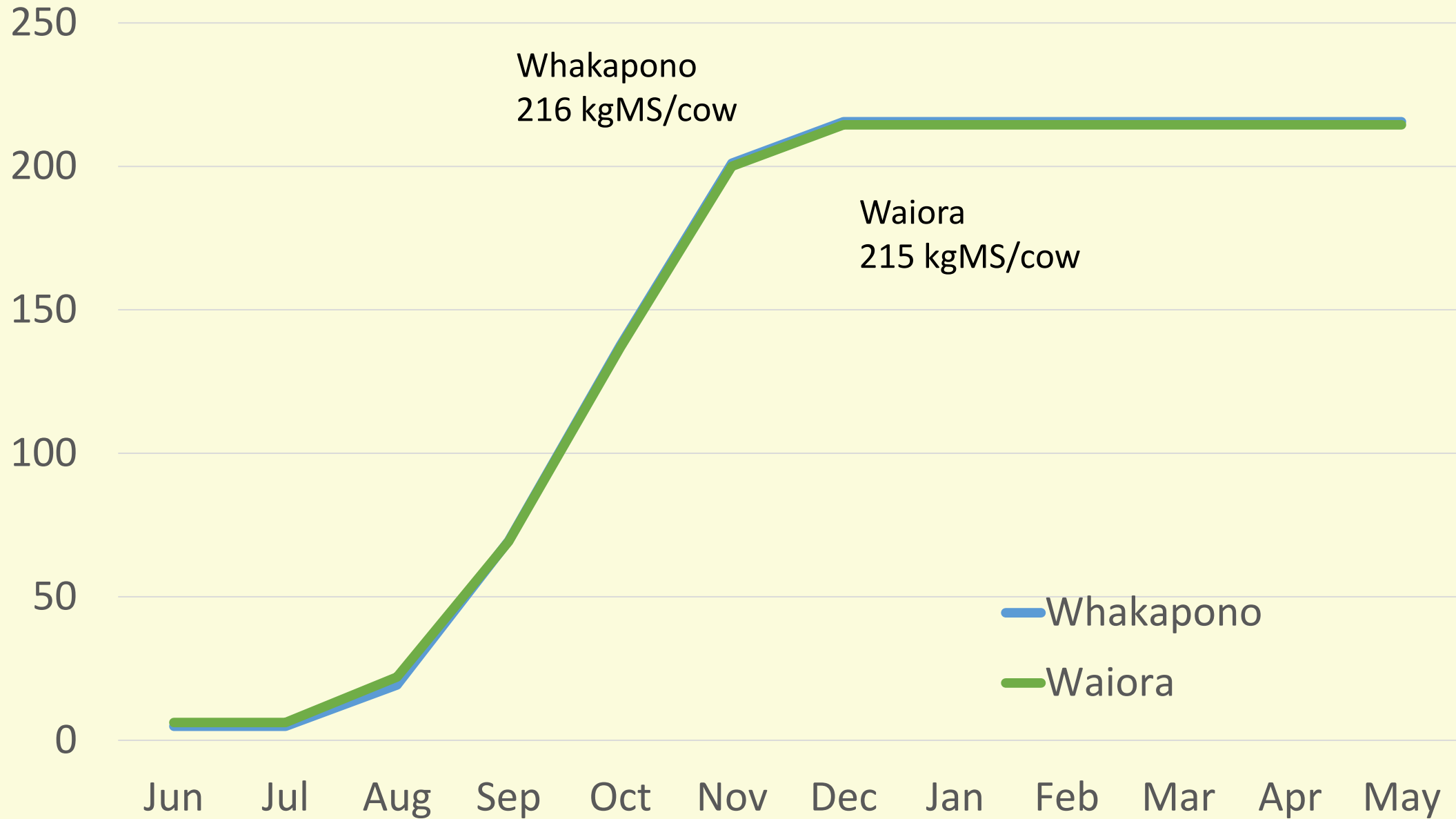
Latest Weekly Summary of Performance

	Whakapono	Waiora
Peak Cows	483	639
Stocking Rate (cows/ha)	3.1	3.0
Milk Solids/Cow/Day	2.06	2.07
Milk Solids/ha/day	6.19	6.02
Pasture Cover	2506	2784
Pasture Intake (kgDM/cow)	19	19
Supplements Offered (kgDM/cow)	1.0	1.0
Total Intake (KgDM/cow)	20	20
Irrigation Applied (mm)	5	6
Rainfall	15	15
Nitrogen Applied to date (kgN/ha)	63	100
Deaths %	0.8	2.7
Culls %	3.3	2.0

Milk Solids/Ha



Milk Solids/Cow



Soil Tests - Hills

	Whakapono	Waiora
pH	6.3	6.2
Olsen P	14	16
Sulphur	19	11
Potassium	6	8
Calcium	9	10
Magnesium	29	17
Sodium	3	4

Soil Tests – Kinsey Albrecht

	Whakapono	Waiora
Total Exchange Capacity	11.4	10.7
pH	6.1	6.2
Base Saturation Calcium %	64	71
Base Saturation Magnesium %	14	8
Base Saturation Potassium %	2	4
Base Saturation Sodium %	1	1

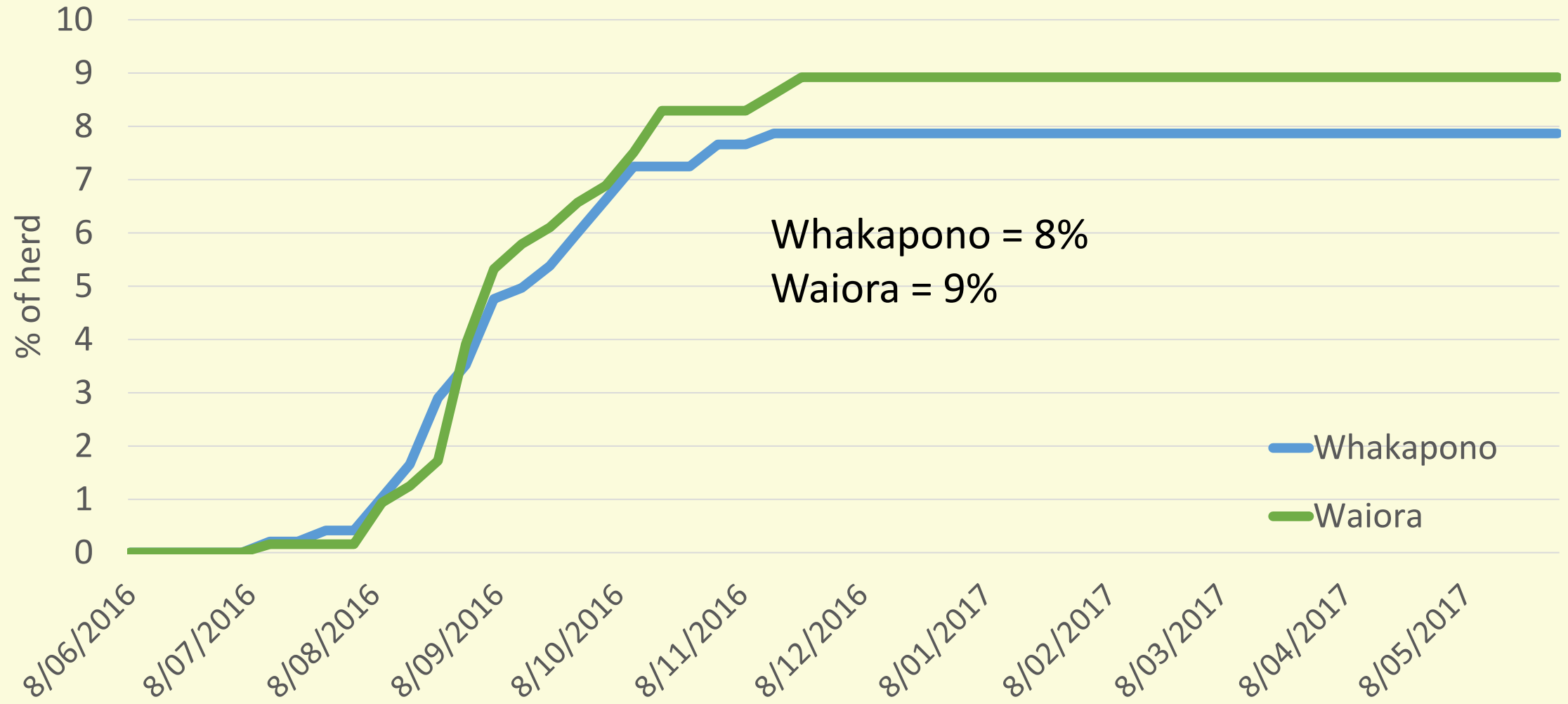
Animal Health – Down Cows at Calving

	Whakapono	Waiora
% of Cows at Calving time	4%	7%
% of Cows Pre Calving	1%	1%
% of Cows Post Calving	3%	5%
% of Cows for Season so far	1%	1%

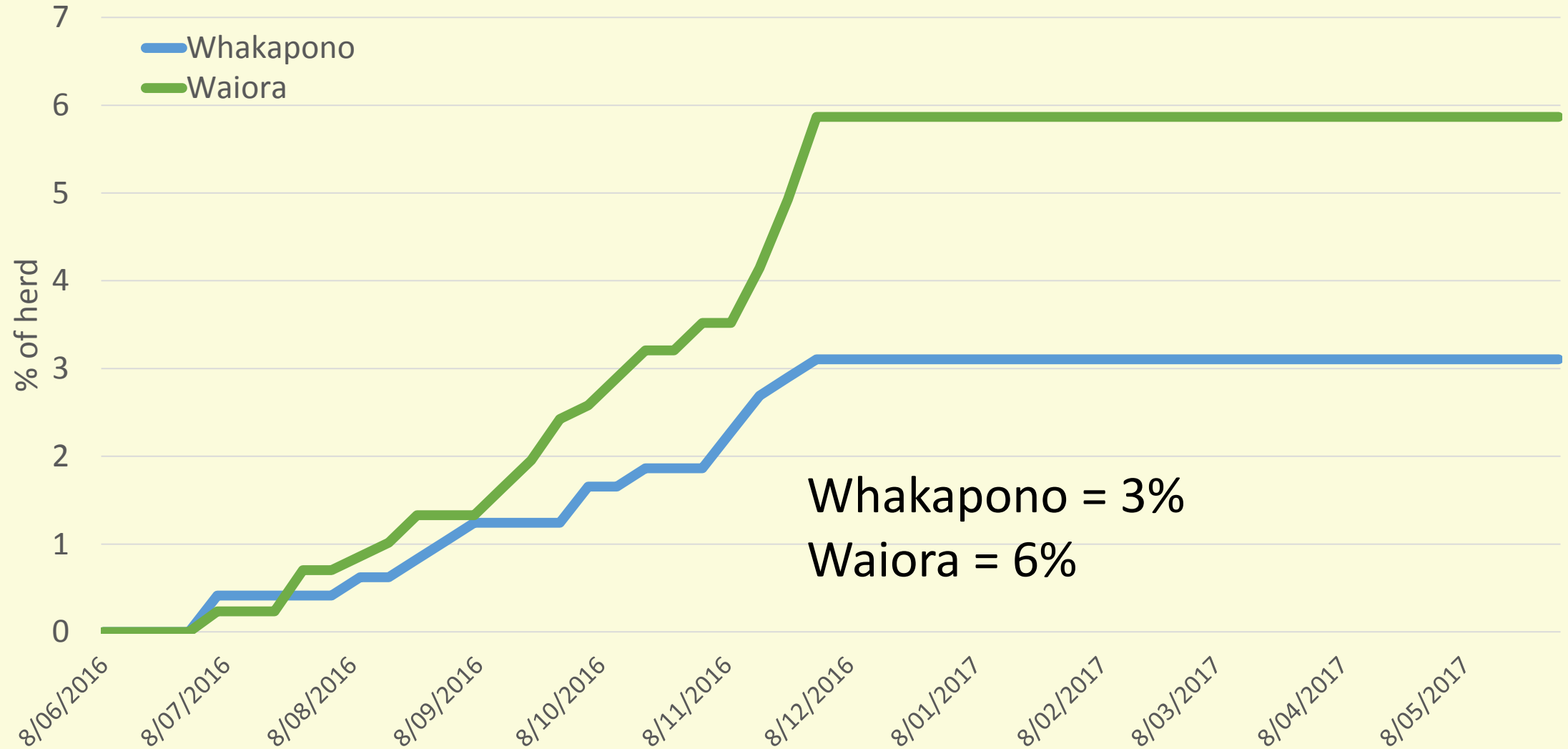
Reproductive Performance to end of November

	Whakapono	Waiora
Submission Rate (23 Days)	91%	87%
Non-cyclers	9%	12%
Metri-cured	6%	6%
PG Shot 1	8%	11.5%
PG Shot 2	3%	3.5%

Animal Health - Mastitis



Animal Health – Lamé cows



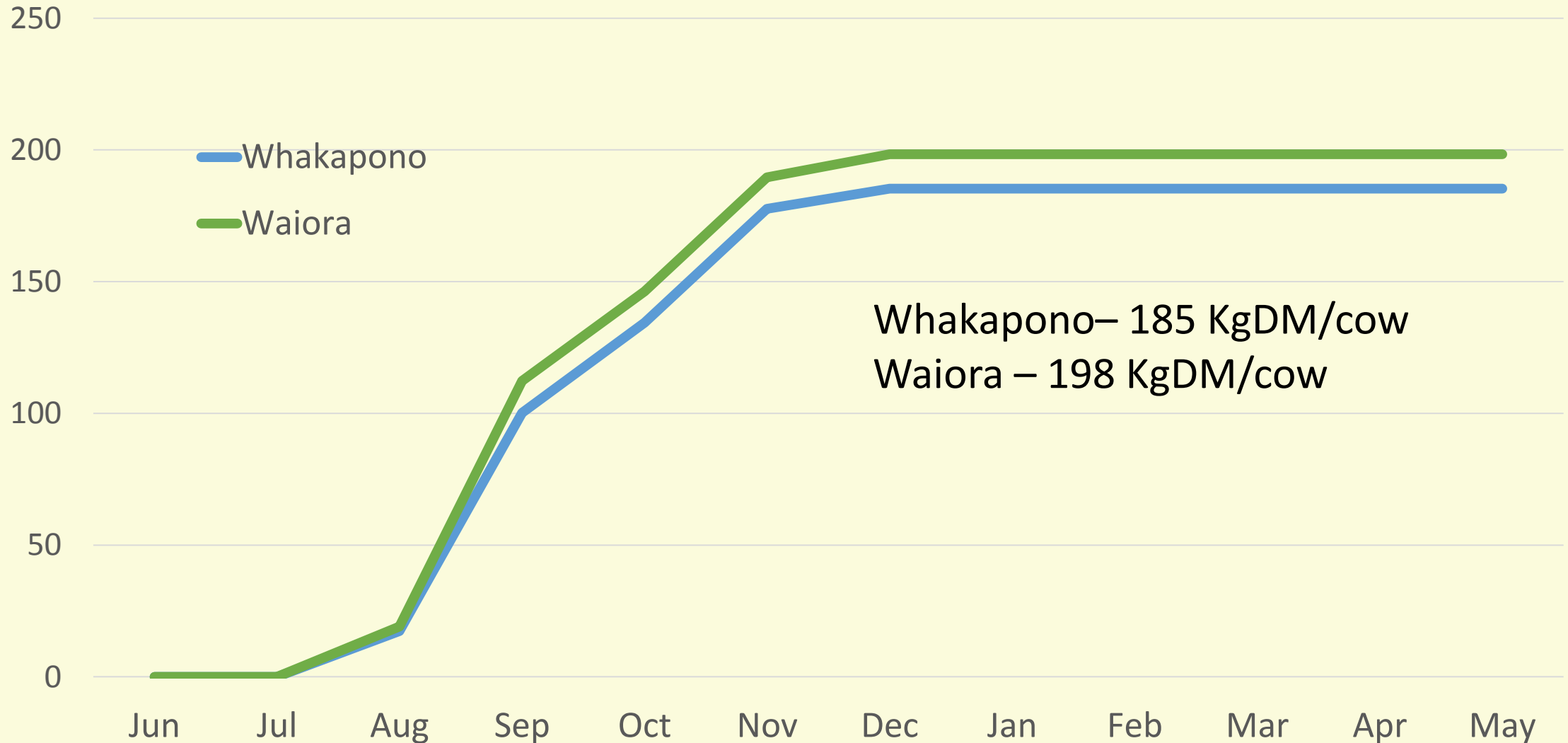
Trace Elements Results

	Waiora	Whakapono	Reference Range
Copper (umol/L)	12.62	12.5	(8-25)
Selenium (nmol/L)	773	555	(600+)
B12 (pmol/l)	293	351	(300+)
Iodine (ug/l)	34	36	(45-60)
Zinc (umol/L)	13.88	13.33	(12-18.5)

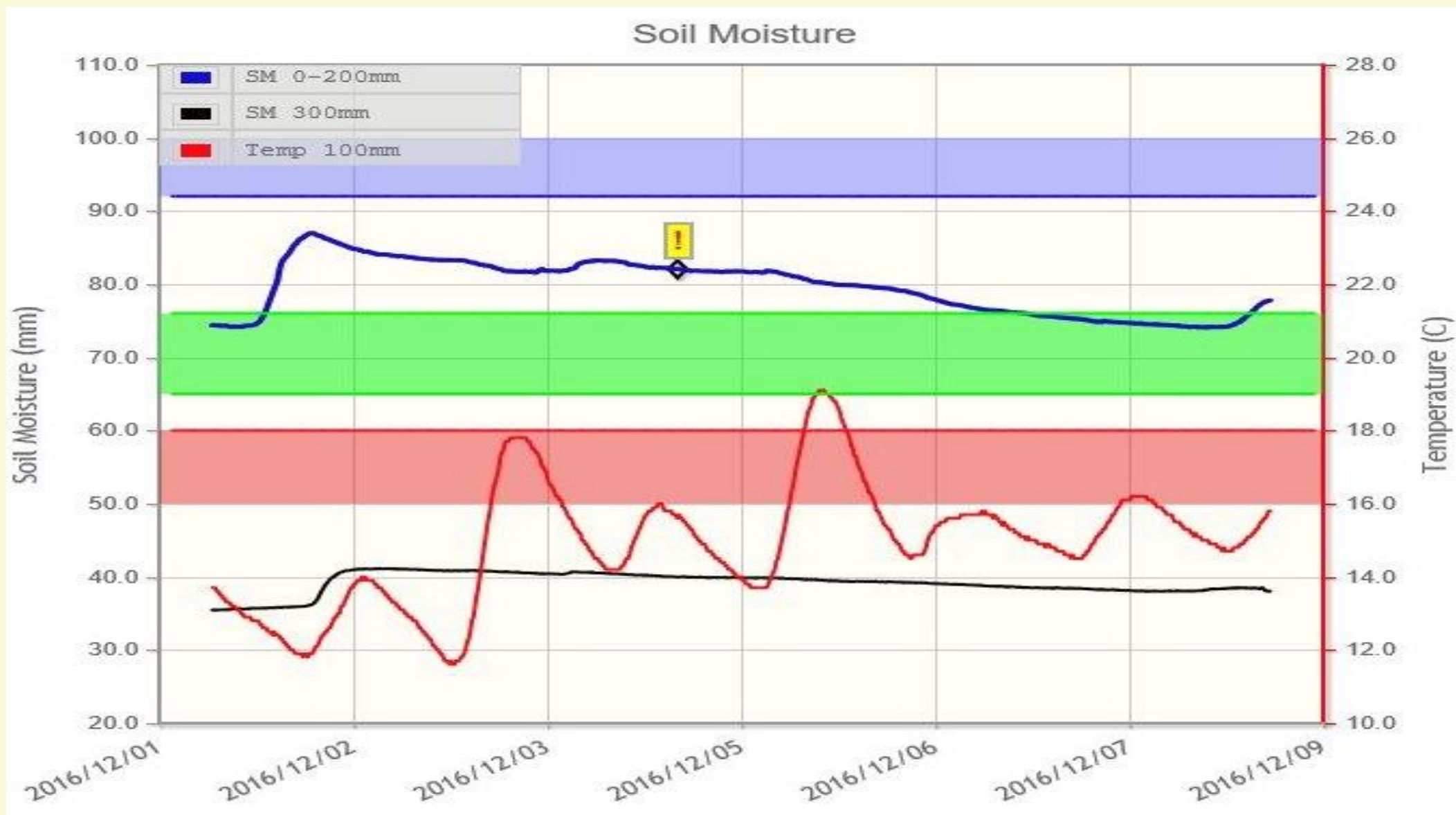
Fertiliser Applied

Waiora	N	P	K	S	Mg	Ca	Whakapono	N	P	K	S	Mg	Ca
July	0	0	0	0	0	0	July	0	0	0	0	0	0
August	12	0	0	5	0	0	August	6	1	0	6	0	0
September	16	0	0	5	0	0	September	18	15	24	47	44	227
October	24	0	0	2	0	0	October	3	2	5	5	7	32
November	25	36	25	30	0	17	November	19	2	16	15	0	1
December	23	0	25	0	0	0	December	17	2	12	12	0	2
January	0	0	0	0	0	0	January	0	0	0	0	0	0
February	0	0	0	0	0	0	February	0	0	0	0	0	0
March	0	0	0	0	0	0	March	0	0	0	0	0	0
April	0	0	0	0	0	0	April	0	0	0	0	0	0
May	0	0	0	0	0	0	May	0	0	0	0	0	0

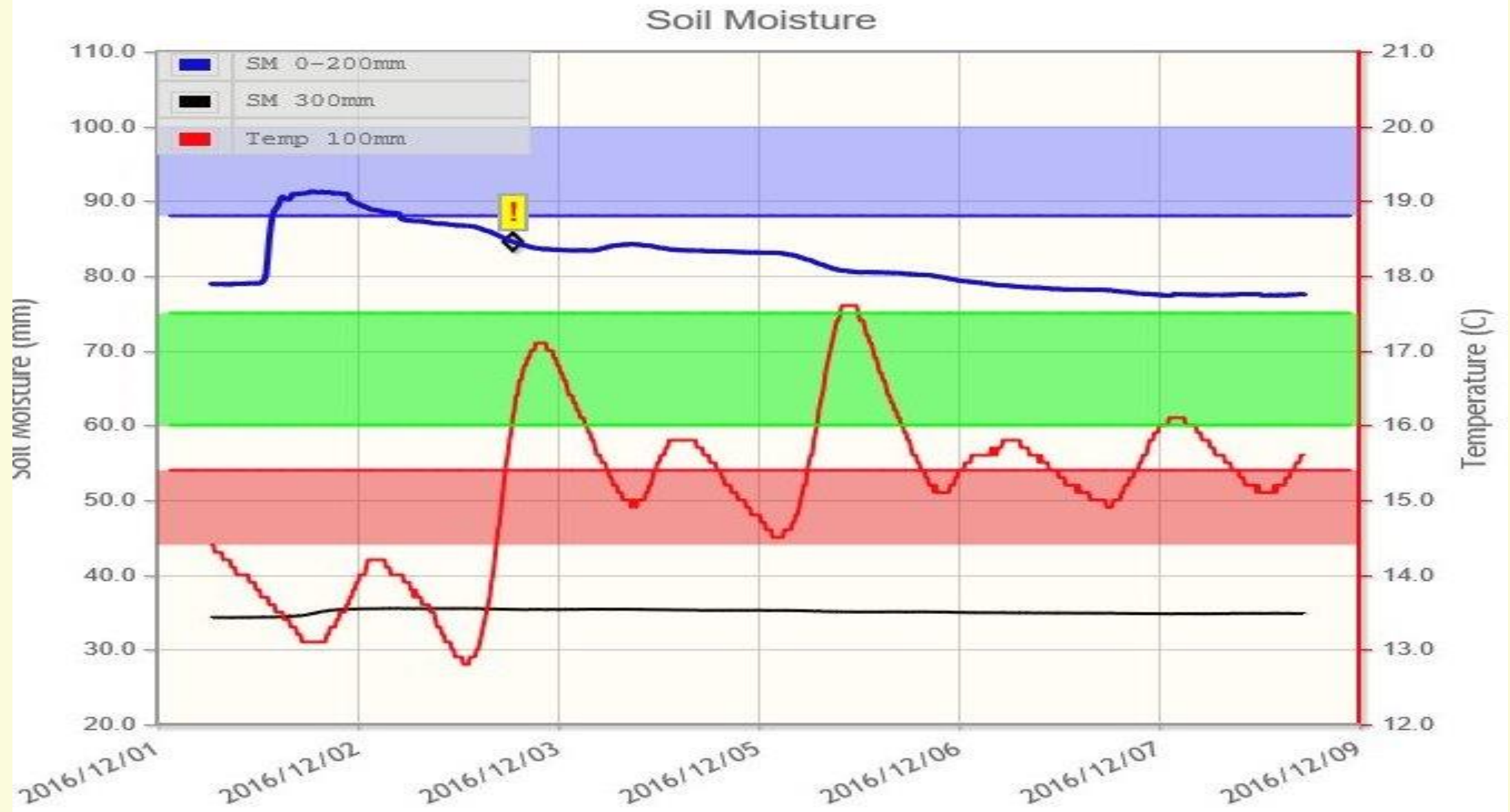
Supplements Fed to Date



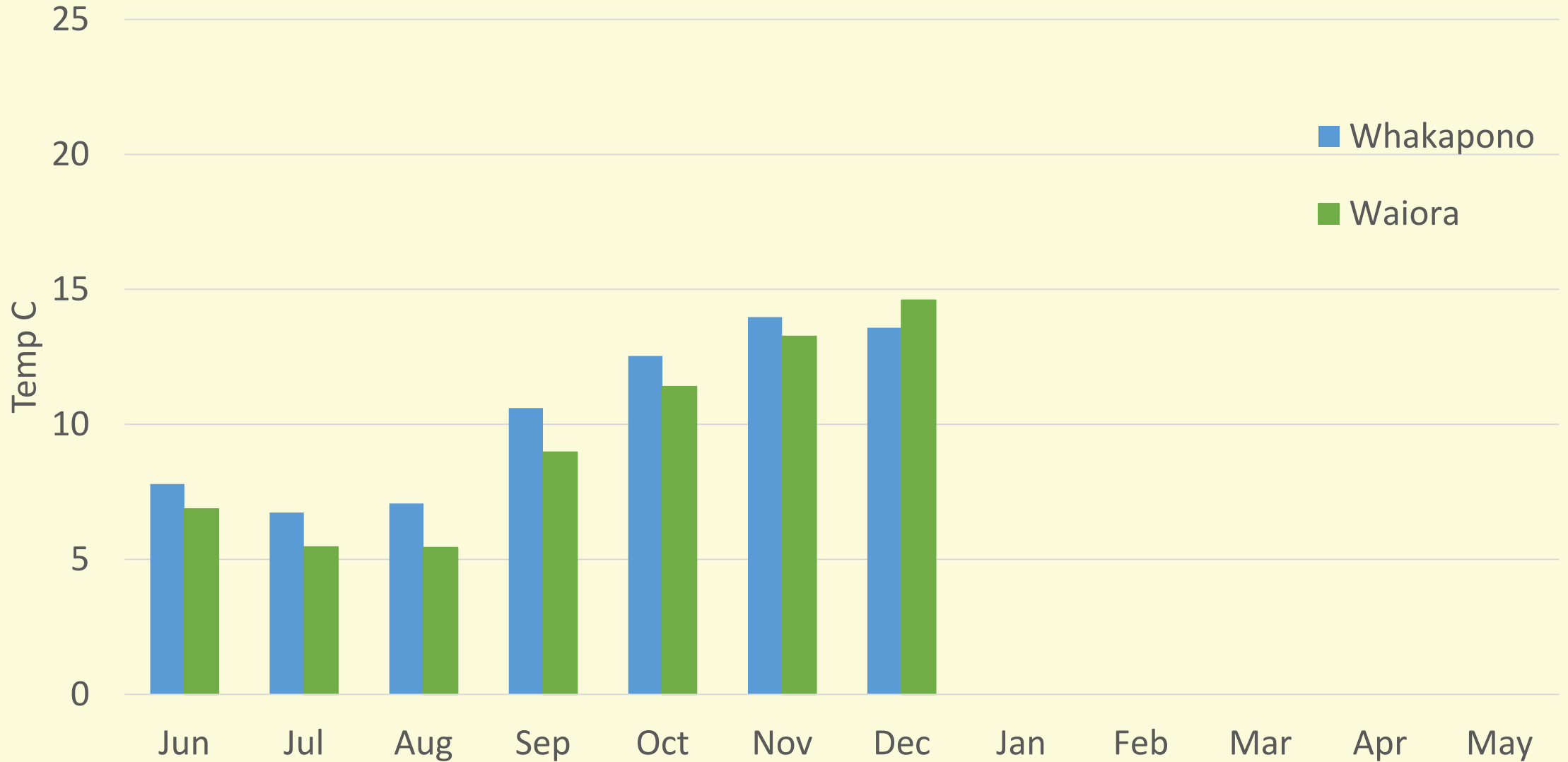
Pasture Growing Conditions – Whakapono



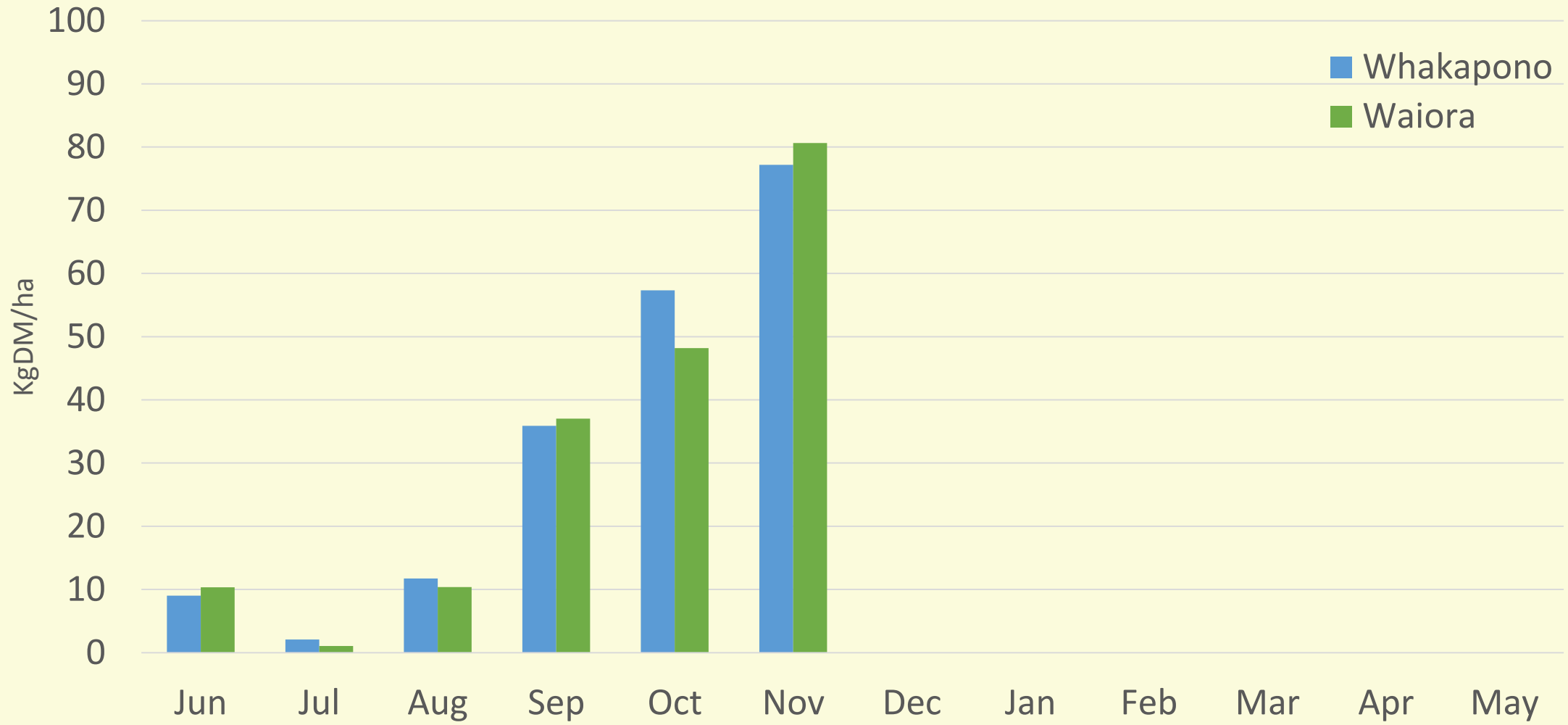
Pasture Growing Conditions - Waiora



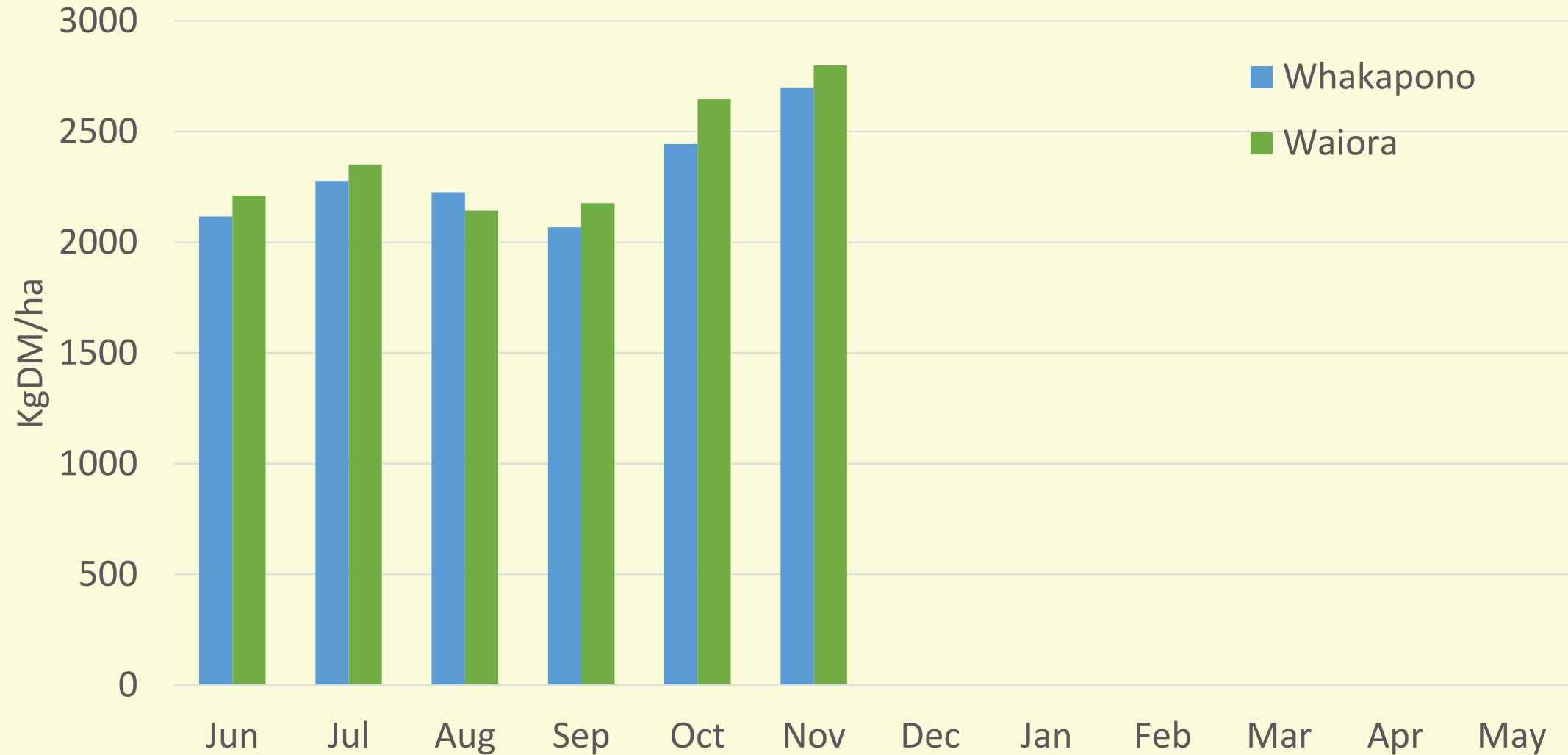
Soil Temperature at 9am - Month



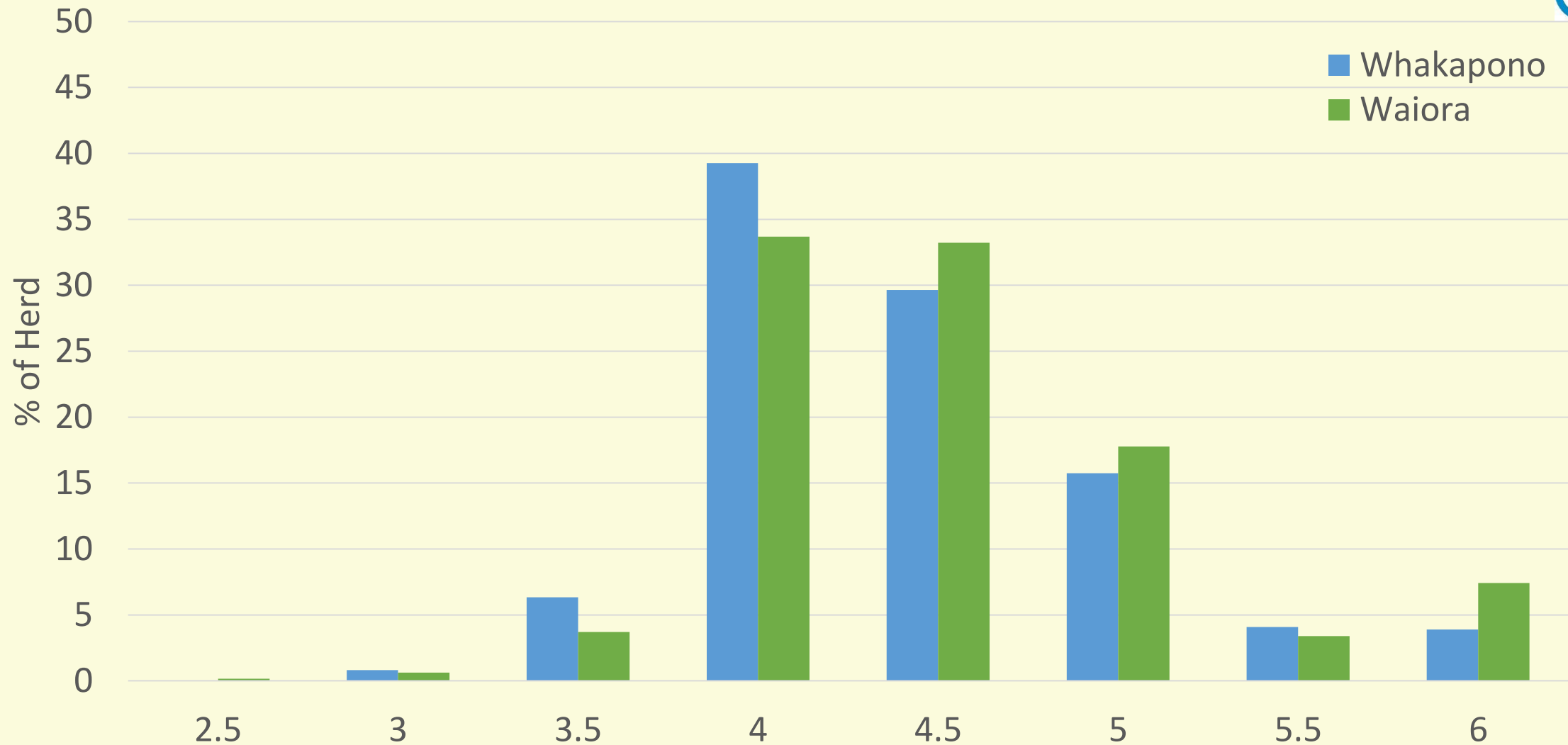
Average Growth Rate (KgDM/ha/day) - Month



Average Pasture Cover (KgDM/ha)- Month



Cow Condition Spread in December



Latest Weekly Summary of Performance

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Deaths %	0.8	2.7
Culls %	3.3	2.0

The New Zealand Institute for Plant & Food Research Limited

Plant & Food
RESEARCH
RANGAHAU AHUMĀRA KAI



Soil Nutrient Management in Dairy Farming Systems

Prepared by:

Abie Horrocks and Richard Gillespie

Healthy soil

continued capacity to sustain biological productivity
and ecosystem function within land-use boundaries

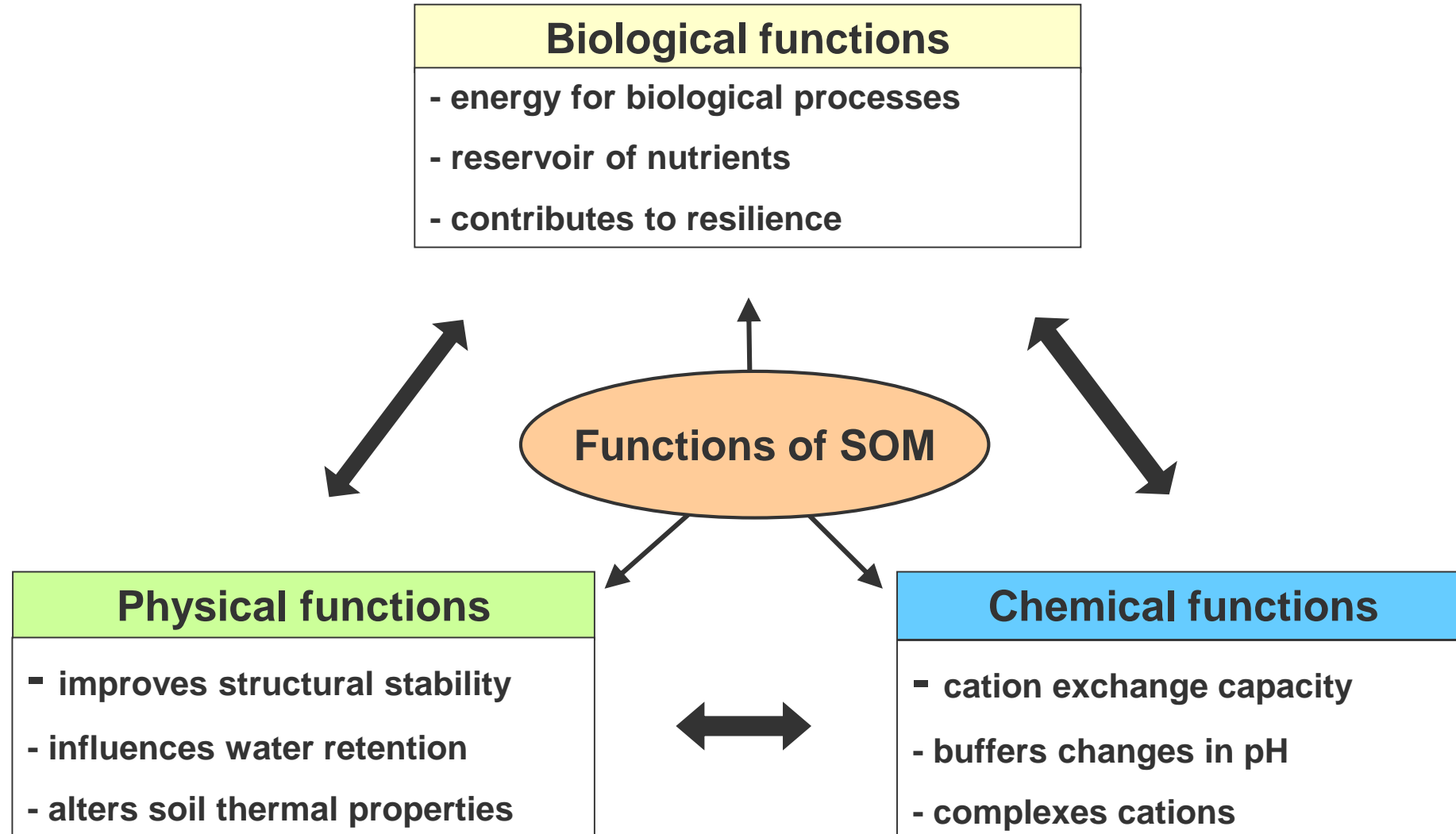
Soil resilience

capability of a soil to return to its original state (recover)
after being stressed or disturbed

Why is soil organic matter important?

Contributes to a range of important soil properties

Functions of organic matter in soil



Soil organic matter

- Organic matter contributes positively to many soil properties.
- Changes in soil organic carbon and associated physical properties can be slow.
- Biological and chemical properties may be more responsive to changes in management but differences need to be tracked over time (due to inherent variability).
- Management can alter the amount and distribution of different types of organic matter.

Methods



- Three focus paddocks identified from each farm.
- Focus paddocks were chosen with as similar a cropping history as was possible.

Recent crop history

New paddock ID	System	Pairing	2008-09	2009-10	2010-11
North 3	Conventional	A	Triticale (cut and carry)	Peas (seed)	Feed wheat
South 12	Biological	A	Pasture (short term?)	Milling wheat	Feed wheat
North 15	Conventional	B	<i>information not available</i>	<i>information not available</i>	Ryecorn (winter grazed)
South 19	Biological	B	Pasture/chicory mix	Chicory	Ryecorn (winter grazed)
North 22 south end	Conventional	C	<i>information not available</i>	Milling wheat	Clover
South 26	Biological	C	Pasture?	Clover	Wheat

- Different nutrient management systems had already been implemented at time of 'baseline' sampling (August 2013).

		July 2013 results (Hill Labs Basic Soil + SO-S)						
		pH	Olsen P	S	K	Ca	Mg	Na
North 3	Conventional	6	15	8	5	8	14	3
North 15	Conventional	6.2	22	5	6	10	12	4
North 22	Conventional	6.1	17	8	5	9	13	4
		6.1	18.0	7.0	5.3	9.0	13.0	3.7
South 19	Biological	6.1	18	10	4	8	28	3
South 26	Biological	6.1	14	12	6	8	22	2
South 12	Biological	6.1	17	16	5	9	24	3
		6.1	16.3	12.7	5.0	8.3	24.7	2.7

Physical measurements:



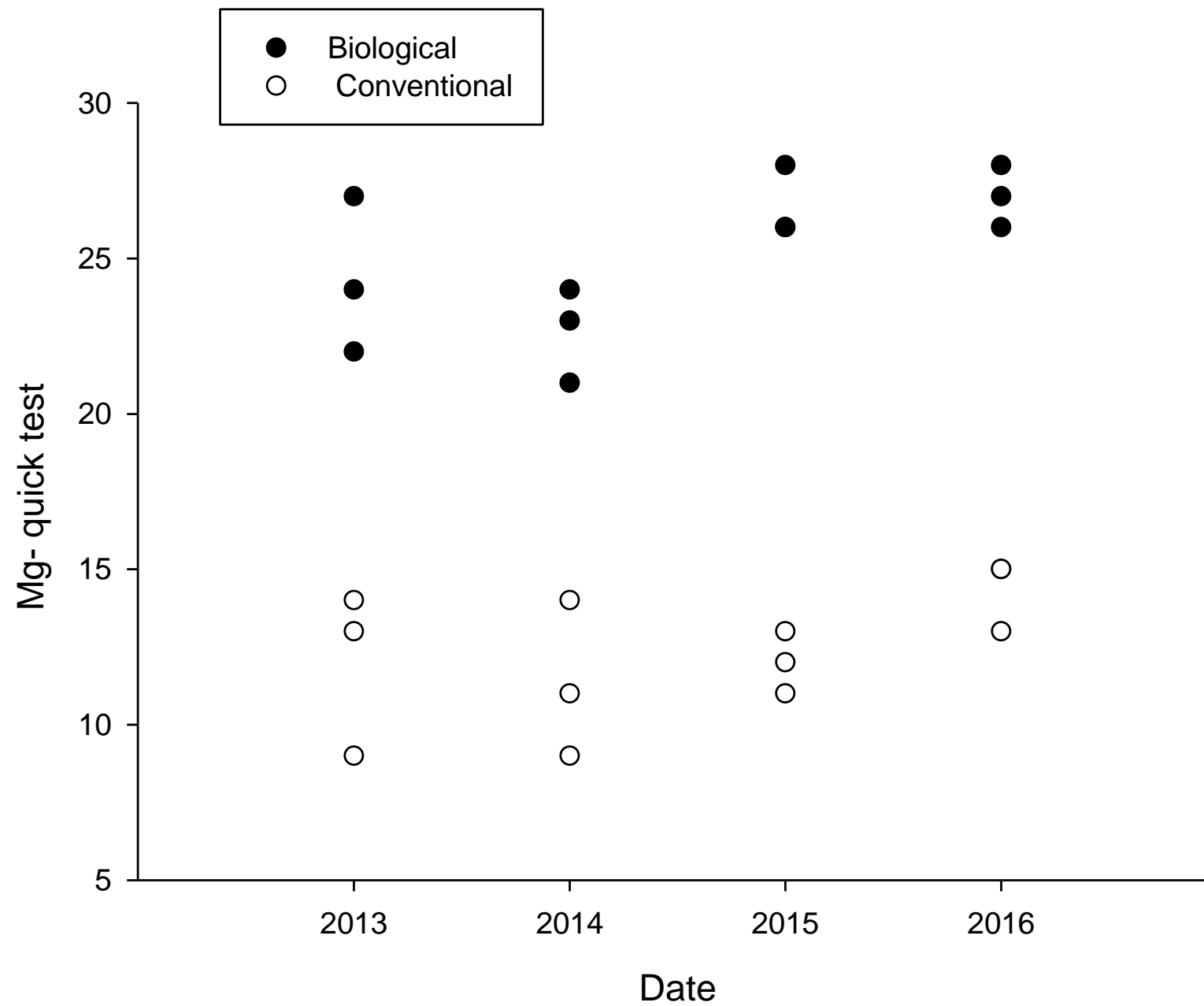
- Penetration resistance: 15 readings at 0-10 and 10-20cm depths. Measures soil density and represents compaction.
- Macroporosity and drained upper limit: 3 intact tension table cores to 7.5cm depth. Tension tables assess macroporosity as an indication of soils ability to drain efficiently. Drained upper limits give field capacity (to determine water storage capacity).
- Aggregate stability: 3 spade squares to 15cm for aggregate stability. Indicative of physical structure and stability of soil under physical forces such as cultivation, rainfall and stock treading (affected by organic matter in system).

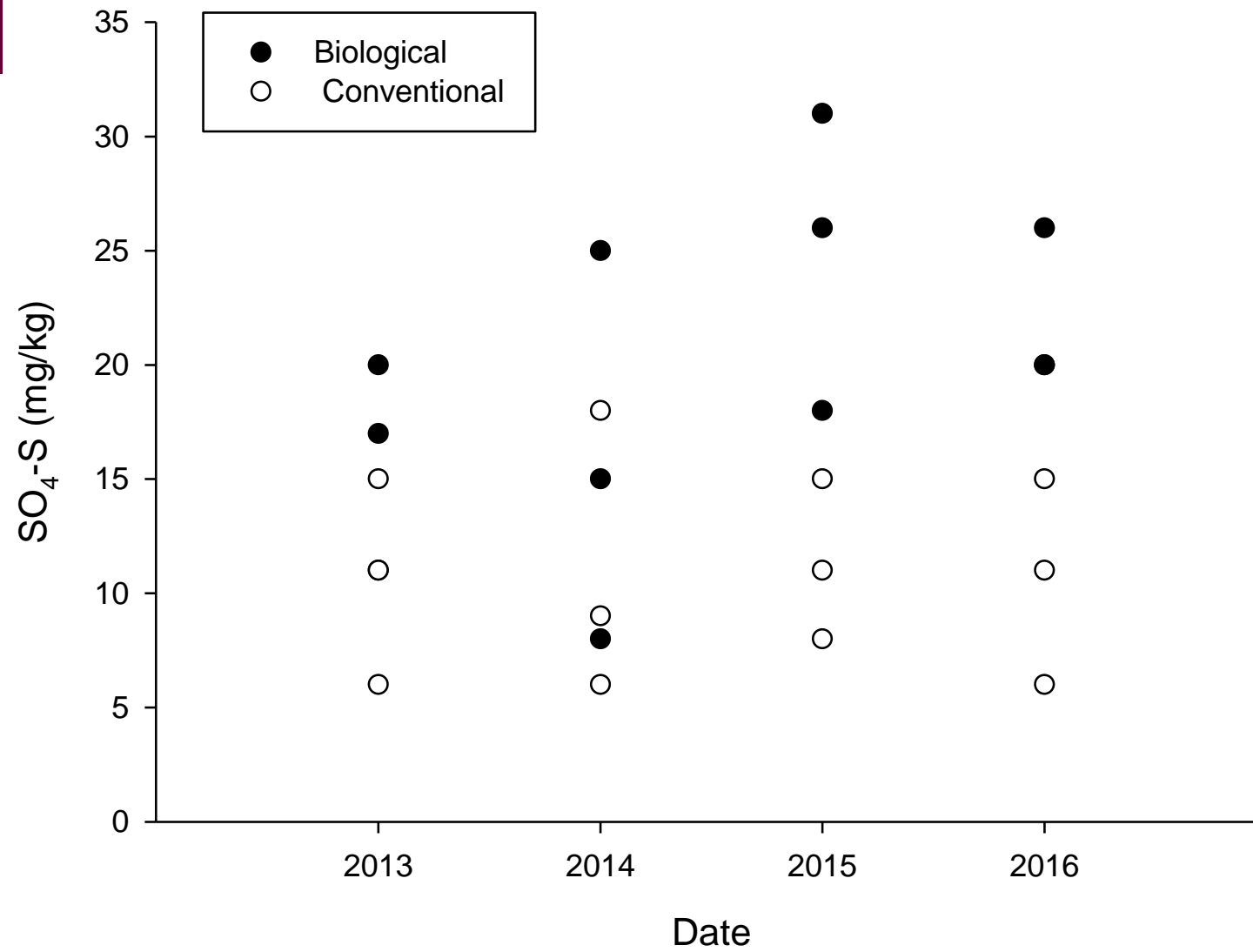
Chemical and biological measurements:



- Anaerobically mineralisable N: incubation process
- Total C and N. These N measurements will be indicative of available N under the two cropping systems.
- Hill Labs quick test (and $\text{SO}_4\text{-S}$, Olsen P and pH).
- Biological measurements: 3 'farmer spades' 18 x 36 x 25cm. Earthworms, clover root weevil, porina, grass grub. Effect of management on biological indicators may be direct or indirect.

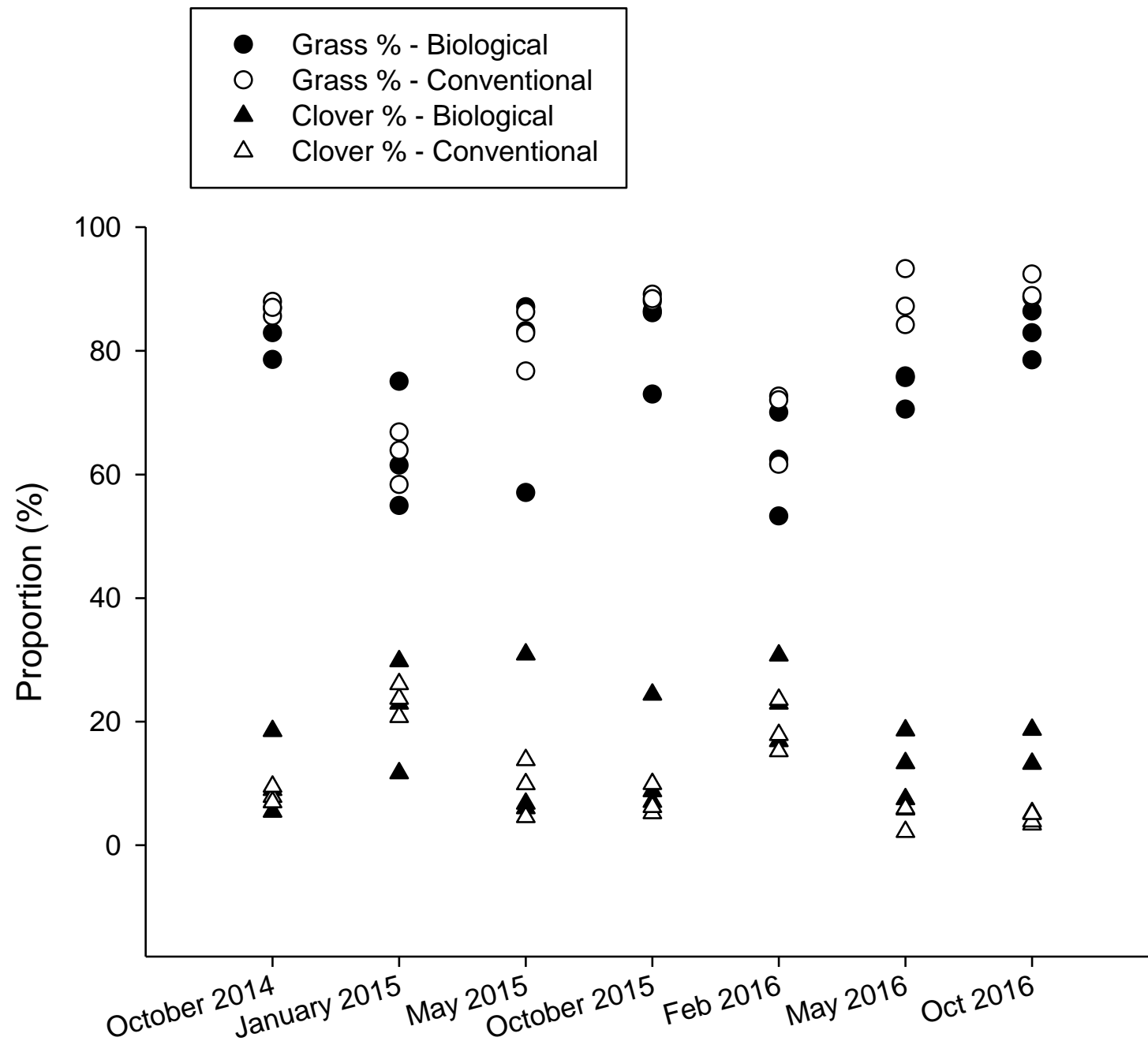
Results	Baseline		Year one		Year two		Year three	
	Conv.	Biol.	Conv.	Biol.	Conv	Biol.	Conv.	Biol.
AMN (ug/g)	82.7	79.2	65.7	66.1	71.7	81.4	99.8	102.5
Soil moisture (%w/w)	24.7	25.0	29.9	30.8	30.9	29.9	31.5	32.3
Organic C (%)	2.7	2.9	2.7	2.8	2.7	2.9	2.8	3.1
Total N (%)	0.26	0.26	0.26	0.26	0.26	0.28	0.27	0.28
Soil pH	6.0	6.1	6.1	6.0	6.2	6.1	6.1	6.0
Olsen P (mg/L)	16	17.3	12.3	14.3	13.7	12.7	14.3	13.7
CEC (me/100g)	14.7	15.0	14.0	14.0	14	14.7	14.7	15.0
SO₄-S (mg/kg)	10.7	16.0	11.0	16.0	11.3	25	10.7	22.0
K (MAF)	6.0	6.0	4.3	5.7	4.7	6.3	5.0	3.7
Ca (MAF)	8.7	8.7	8.3	7.3	9.7	8.3	9.7	8.7
Mg (MAF)	12.0	24.3	11.3	22.7	12	26.7	14.3	27.0
Na (MAF)	3	2.3	2.6	2.2	2.3	2.2	3.3	3.0





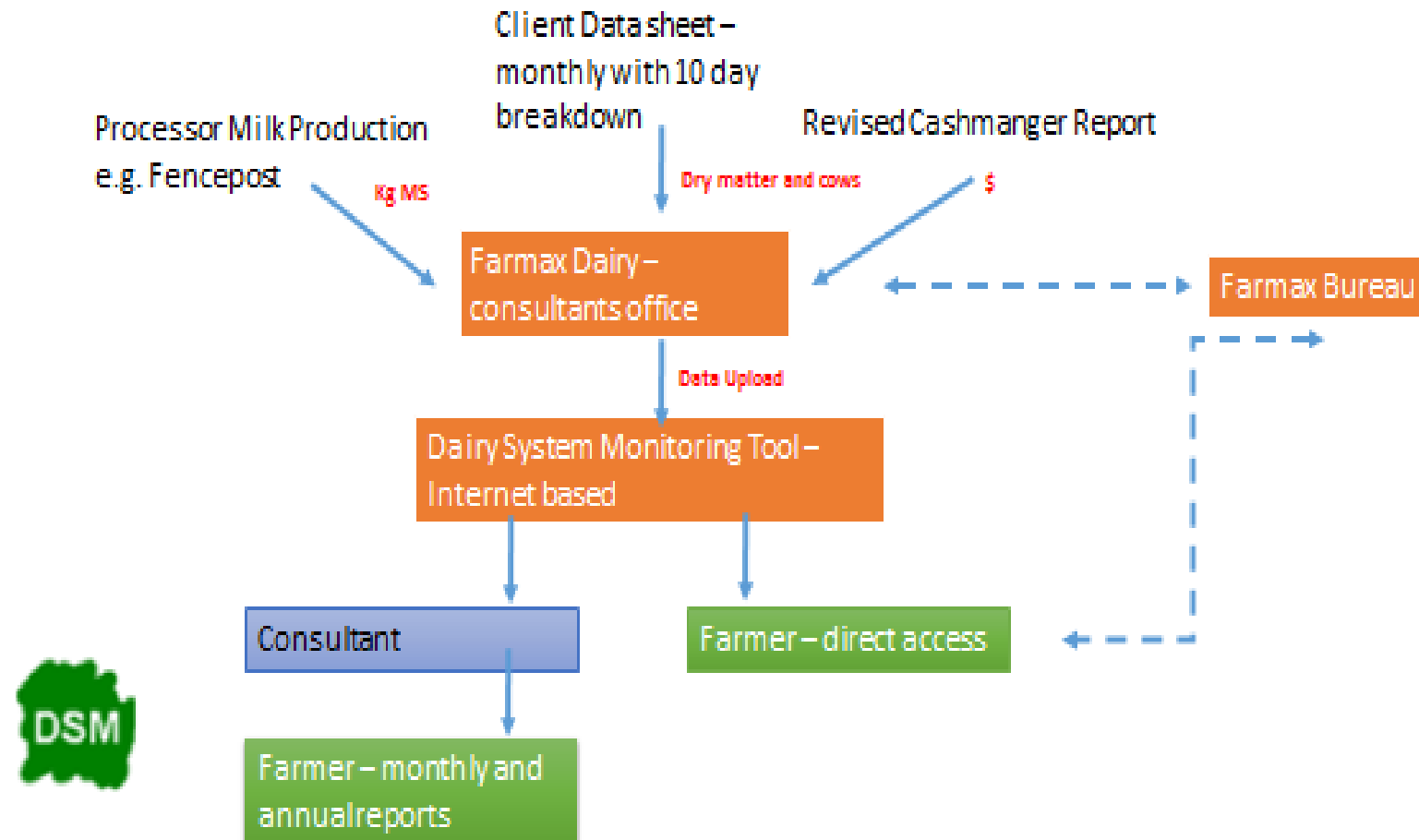
	Baseline		Year one		Year two		Year three	
	Conv.	Biol.	Conv.	Biol.	Conv.	Biol.	Conv.	Biol.
0-10 cm penetration resistance (MPa)	2.2	2.2	1.7	1.6	1.6	1.6	1.2	1.3
10-20 cm penetration resistance (MPa)	2.0	2.1	2.5	2.1	1.9	1.8	2.1	1.7
0-7.5 cm Drained Upper Limit moisture content (% v/v @ -10kPa)	40.5	40.8	44.3	43.9	43.9	43.5	42.7	42.2
0-7.5 cm Macro Porosity (% v/v @ -10kPa)	8.3	8.9	10.5	8.9	9.7	11	13.1	14.9
Aggregate stability (mm, MWD)	1.8	1.8	1.5	1.6	2.0	2.1	2.0	2.1
Aggregate stability (% >1 mm)	67	66	56	59	78.0	80.4	77.3	83.2

	Baseline		Year one		Year two		Year three	
	Conv.	Biol.	Conv.	Biol.	Conv.	Biol.	Conv.	Biol.
Earthworms per m²	452	562	1144	1822	977	1349	1037	1509
Grass grubs per m²	9	32	6	20	0	42	14	76
Clover root weevil adult per m²	208	236	2	0	0	0	0	0
Clover root weevil larvae per m²	-	-	276	227	155	205	333	340
Porina per m²	12	4	0	0	2	0	0	16

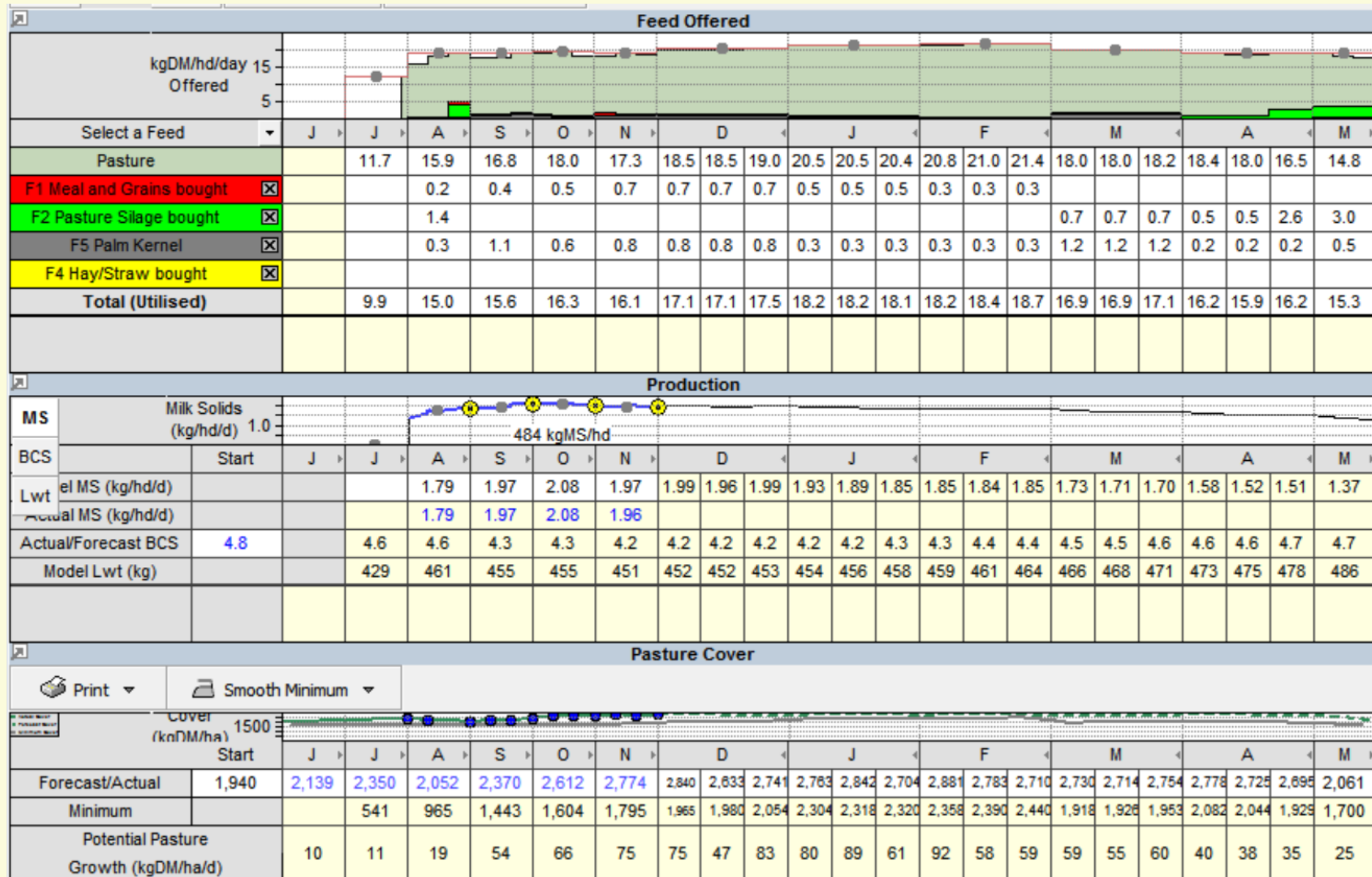


JEREMY SAVAGE MACFARLANE RURAL BUSINESS

How does it work?



Waiora – FarMax Dairy



Compare Physical Summary

Jun 15 - May 16

Category	Description	Whakapono Bio	waiora conv	Difference	Units
Farm	Effective Area	155	210	55	ha
	Stocking Rate	3.3	3.3	0.0	cows/ha
	Potential Pasture Growth	19.5	17.8	-1.7	t DM/ha
	Nitrogen Use	117	160	43	kg N/ha
	Feed Conversion Efficiency (eaten)	11.0	10.9	-0.1	kg DM eaten/kg MS
Herd	Cow Numbers (1st July)	533	735	202	cows
	Peak Cows Milked	506	690	184	cows
	Days in Milk	258	254	-3	days
	Avg. BCS at calving	5.0	4.9	-0.1	BCS
	Liveweight	1,520	1,483	-37	kg/ha
Production (to Factory)	Milk Solids total	251,061	336,570	85,509	kg
	Milk Solids per ha	1,620	1,603	-17	kg/ha
	Milk Solids per cow	496	488	-8	kg/cow
	Peak Milk Solids production	2.26	2.17	-0.09	kg/cow/day
	Milk Solids as % of live weight	106.5	108.1	1.5	%
Feeding	Pasture Eaten per cow *	4.1	4.0	-0.1	t DM/cow
	Supplements Eaten per cow *	0.5	0.5	0.0	t DM/cow
	Off-farm Grazing Eaten per cow *	0.8	0.7	0.0	t DM/cow
	Total Feed Eaten per cow *	5.5	5.3	-0.1	t DM/cow
Diagnostics	Pasture Eaten per ha	13.8	13.5	-0.3	t DM/ha
	Supplements Eaten per ha	1.8	1.7	0.0	t DM/ha
	Off-farm Grazing Eaten per ha	5.4	4.6	-0.8	t DM/ha
	Total Feed Eaten per ha	21.0	19.8	-1.1	t DM/ha
	Supplements and Grazing / Feed Eaten *	24.1	23.9	-0.2	%
	Bought Feed / Feed Eaten *	12.2	13.8	1.6	%

Compare Physical Summary

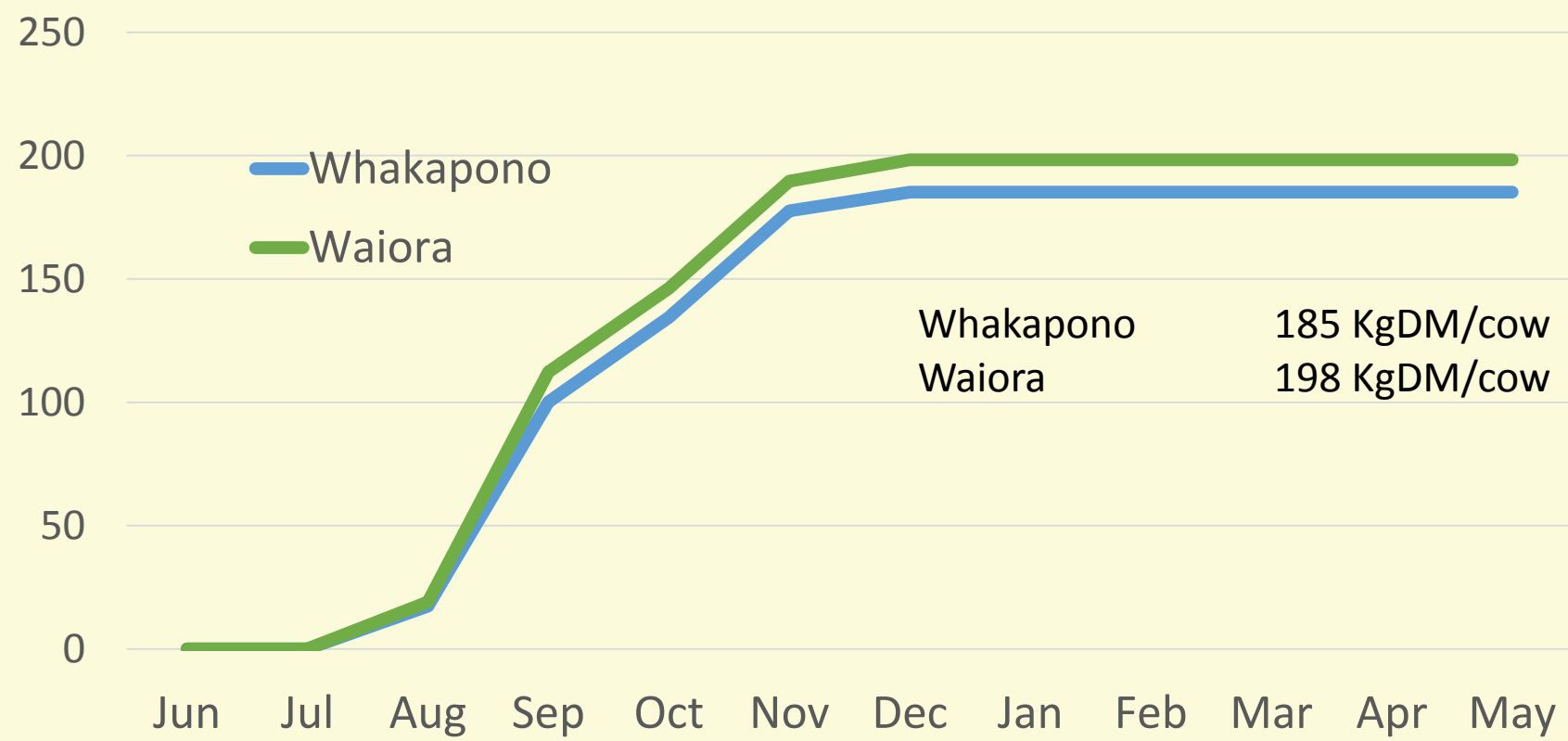
Jun 16 - May 17

Category	Description	waiora conv Monitoring	Whakapono Monitoring	Difference	Units
Farm	Effective Area	210	155	-55	ha
	Stocking Rate	3.0	3.1	0.1	cows/ha
	Potential Pasture Growth	17.3	16.7	-0.6	t DM/ha
	Nitrogen Use	157	71	-86	kg N/ha
	Feed Conversion Efficiency (eaten)	10.7	10.8	0.2	kg DM eaten/kg MS
Herd	Cow Numbers (1st July)	633	483	-150	cows
	Peak Cows Milked	633	483	-150	cows
	Days in Milk	269	269	0	days
	Avg. BCS at calving	4.3	5.1	0.8	BCS
	Liveweight	1,359	1,433	74	kg/ha
Production (to Factory)	Milk Solids total	305,595	237,513	-68,082	kg
	Milk Solids per ha	1,455	1,532	77	kg/ha
	Milk Solids per cow	483	492	9	kg/cow
	Peak Milk Solids production	2.11	2.11	0.00	kg/cow/day
	Milk Solids as % of live weight	107.0	106.9	-0.1	%
Feeding	Pasture Eaten per cow *	4.3	4.0	-0.2	t DM/cow
	Supplements Eaten per cow *	0.4	0.6	0.2	t DM/cow
	Off-farm Grazing Eaten per cow *	0.5	0.7	0.2	t DM/cow
	Total Feed Eaten per cow *	5.1	5.3	0.2	t DM/cow
Diagnostics	Pasture Eaten per ha	12.9	12.6	-0.3	t DM/ha
	Supplements Eaten per ha	1.4	2.0	0.6	t DM/ha
	Off-farm Grazing Eaten per ha	3.2	4.0	0.8	t DM/ha
	Total Feed Eaten per ha	17.5	18.6	1.1	t DM/ha
	Supplements and Grazing / Feed Eaten *	17.1	24.3	7.2	%
	Bought Feed / Feed Eaten *	8.5	13.8	5.3	%

Production (kgMS) Season to Date (Jun to Nov 2016)

Milk Solids Production	Per Cow STD	Per Hectare STD
Wairoa (Conv)	226	549
Whakapono (KA)	219	589

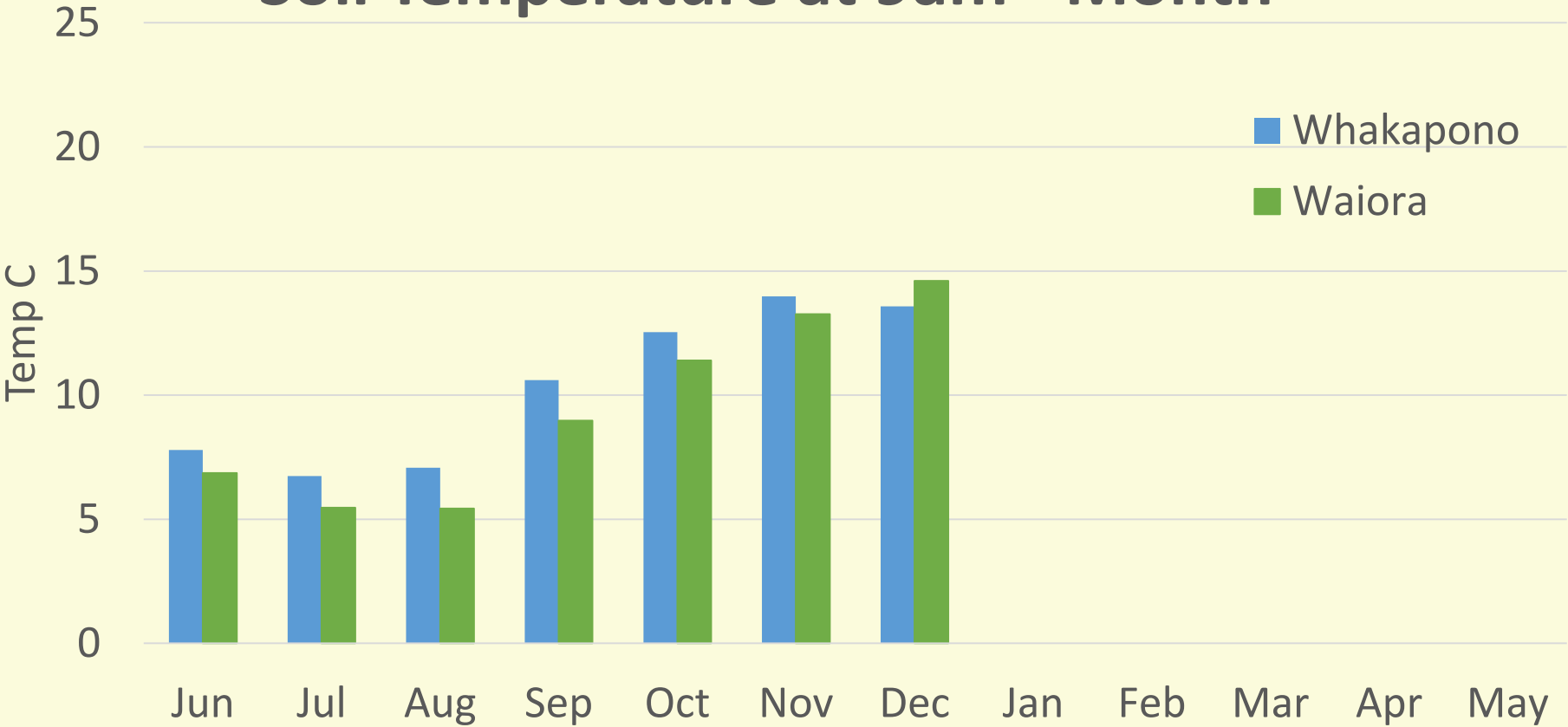
Supplements Fed to Date



Compiled Benchmark Report - 2016/2017 Season November 2016 Period

	Waiora	Whakapono	LUDF	MRB Average
Milking Area	210	144	138	256
Current Stocking Rate	3.0	3.4	4.0	3.6
Cows Milked	633	483	553	922
Month End - Milksolids/Ha/Day	5.92 kg	6.22 kg	7.43 kg	6.43
Month - Milksolids/Cow/Day	1.96 kg	2.00 kg	2.12 kg	191
Season YTD	570 kg	592 kg	768 kg	642 kg
Season Forecast	1,476 kg	1,536 kg	1,792 kg	1,558 kg
Average Cover Month End	2,774 kg	2,650 kg	2,650 kg	2,238 kg
Average Month Growth	60 kg	65 kg	89 kg	62 kg
Forecast Milking Days/Ha	814	842	938	865
Season Total Feed Costs/kg MS	\$1.40	\$1.53	\$1.16	\$1.66
EBIT/Ha	\$2,790	\$3,712	\$5,500	\$3,394
EBIT/Cow	\$925	\$1,191	\$1,583	\$1,022
Revised Pasture Harvest/Ha	12.9 t	12.6 t	15.7 t	13.7 t

Soil Temperature at 9am - Month



Cost Of Nutrients		year 1	year 2	year 3	year 4	TOTAL
Incl. Freight & Spreading		2012/13	2013/14	2014/15	2015/16	
Whakapono	KA	\$178,424	\$235,957	\$151,966	\$114,614	\$680,961
Waiora	Conventional	\$169,232	\$168,781	\$132,075	\$139,632	\$609,720
Per Hectare						
Whakapono	KA	\$1,151	\$1,522	\$980	\$739	\$4,393
Waiora	Conventional	\$806	\$804	\$629	\$665	2,903

Key Points on Farm Program

- Low Stocking Rate farm program.
- Very low input farm system.
- Low cost structure (\$/kgMS basis).
- Low Nitrogen use, even on conventional system. (130 kgN Vs MRB Client. 240 kgN).
- High per cow production.