LOWE Environmental Impact

Land Treatment Systems

Evaluating Nutrient Removal Under Operational Conditions

Brian Ellwood

Introduction

Operational Data

This presentation details operational data from a number of land treatment systems.

N Removal

Provides an evaluation of nitrogen removal rates under practical operating conditions.

Key Influences

Key influences such as irrigation methods, soil type, climate, and wastewater strength are discussed.

Land Treatment

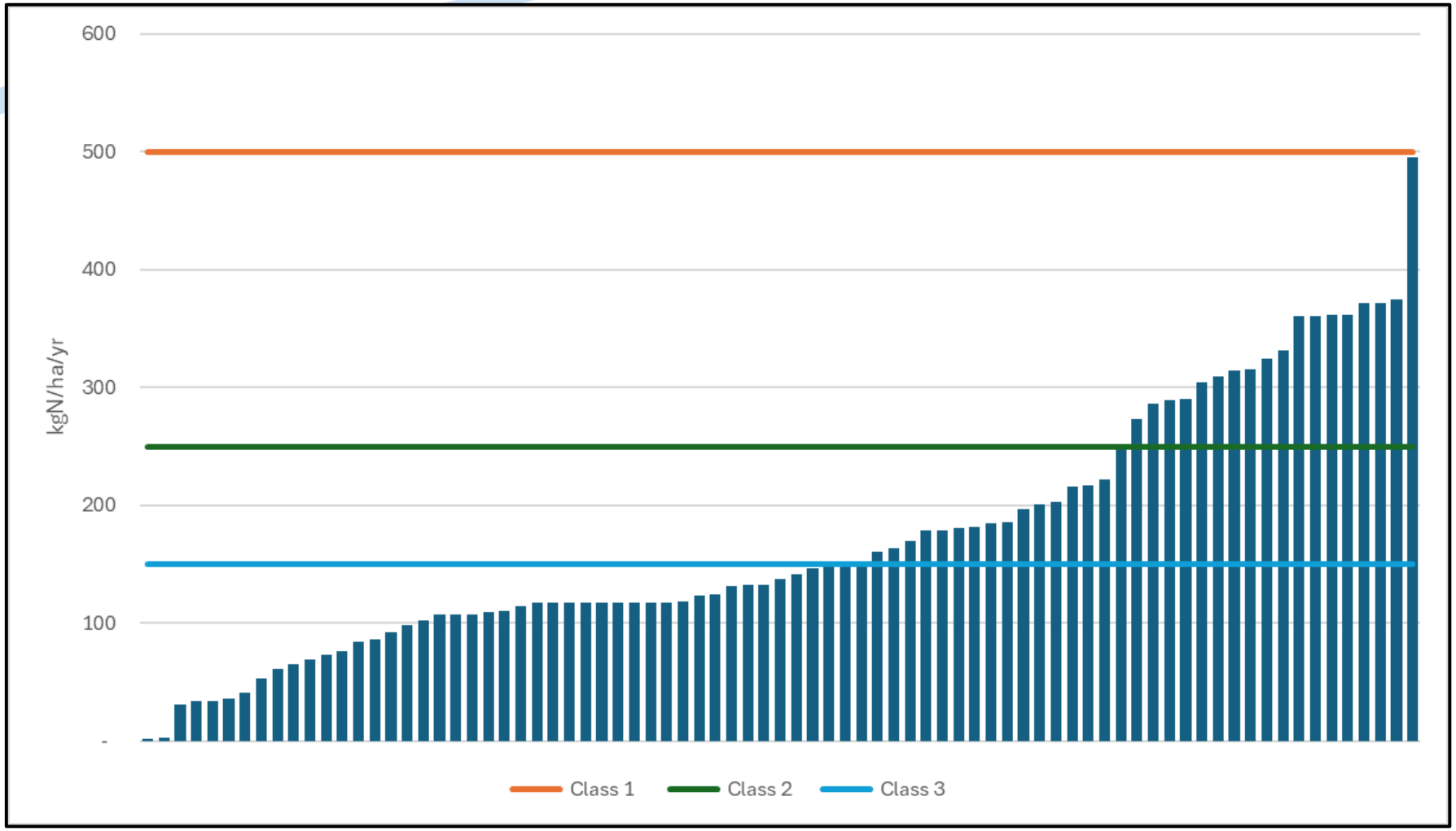
These findings provide insights into the effectiveness of land treatment for nutrient removal, offering a practical benchmark for assessing similar systems.

Types of WW Applications

- Solid sets
- K-Lines
- Sub surface drip
- Pivots
- Travelling irrigators

Spray Irrigation

Organic WW Added to Block

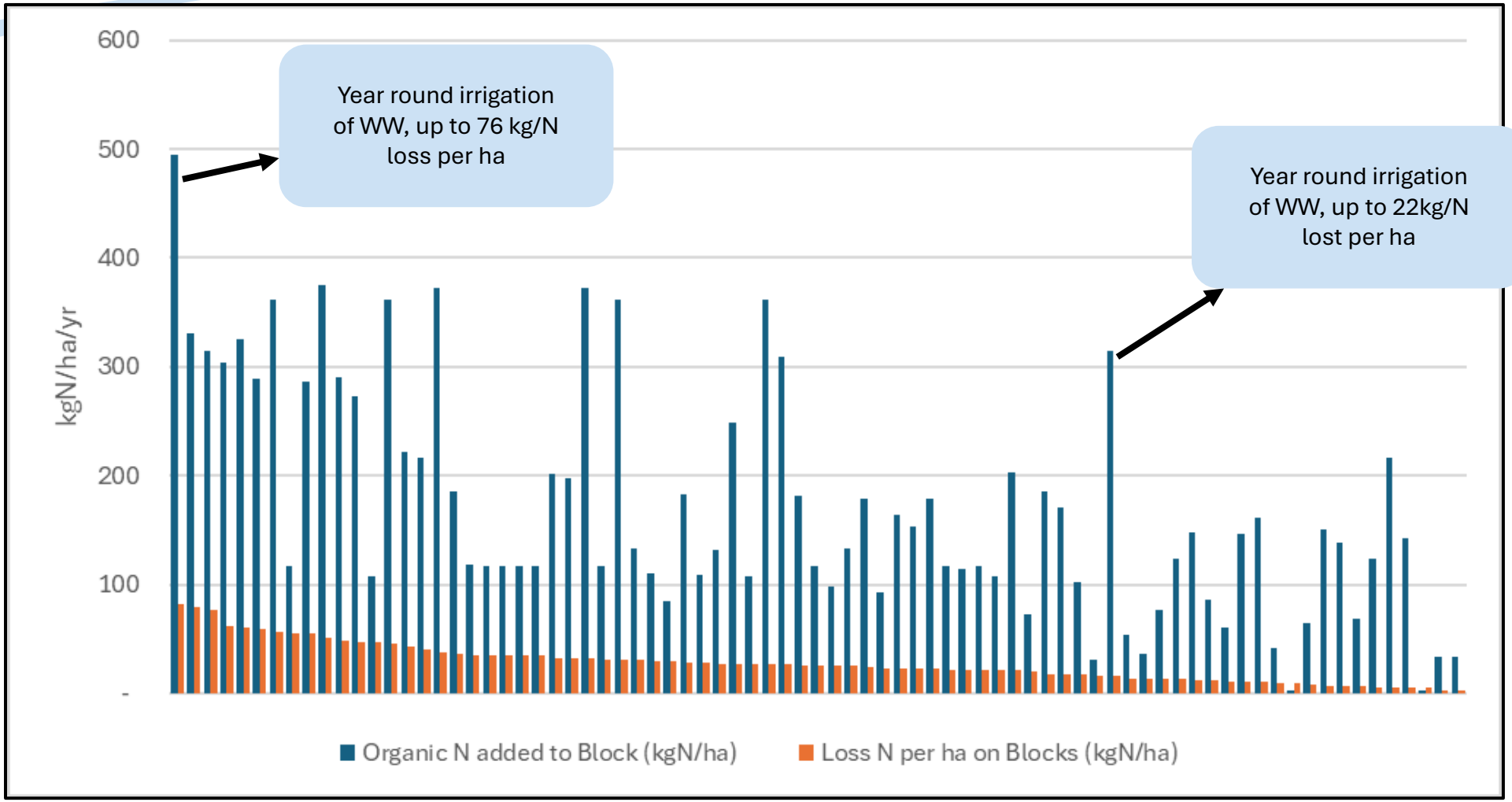


The Nitrogen Loading Classes based on Technical Advice on Wastewater Performance Standards:

Discharge to Land Advice on Proposed Standards Taumata Arowai 25 Feb 2025

WW Applied vs Leaching Losses

Overseer Data



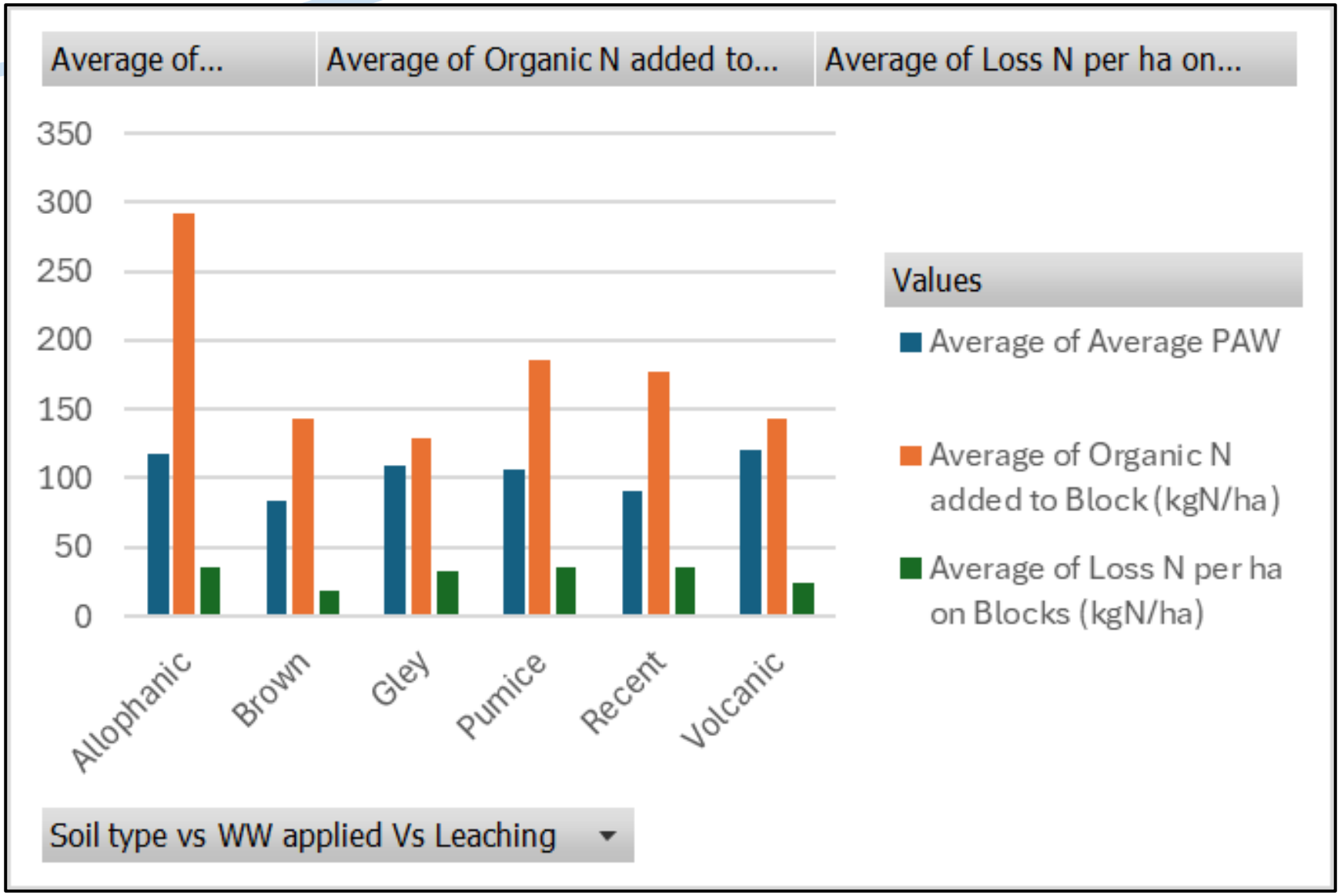
WW Applied vs Leaching Losses

Overseer Data

Region	Dairy NZ Average pasture growth	Average of Pasture Growth modelled (kg DM/ha)	Average of Organic N added to Block (kgN/ha)	Average of Loss N per ha on Blocks (kgN/ha)
Northland	13,625	7,315	143	24
Waikato/Coromandel	15,020	10,321	274	43
Bay of Plenty	14,375	9,857	227	43
Manawatu/Wanganui	13,617	10,165	119	30
Canterbury	19,333	9,666	170	18
Average	15,194	9,762	172	28

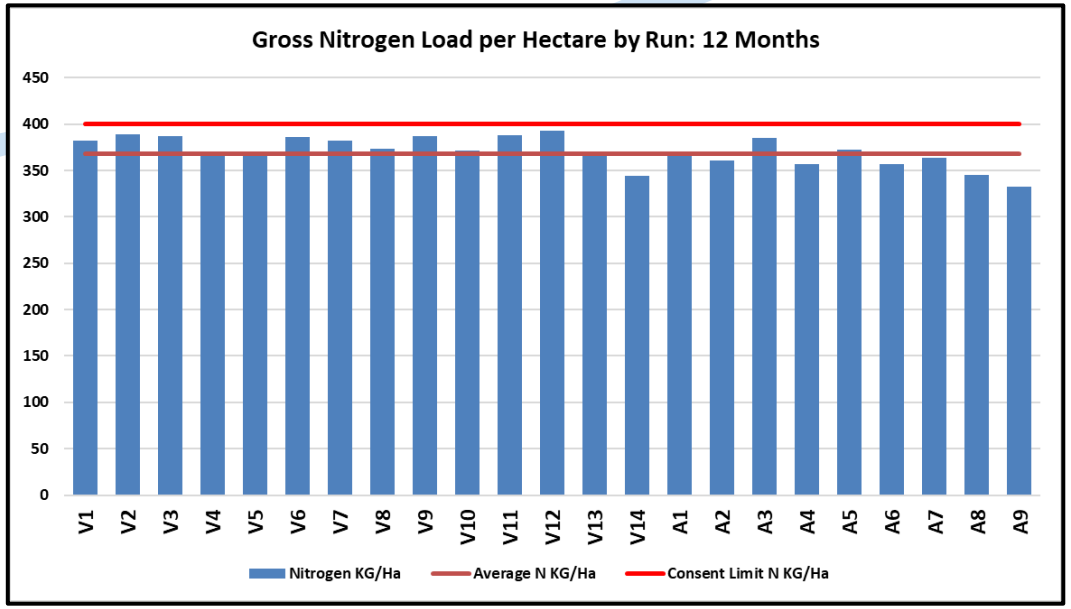
Pasture
Low DM Modelled vs Dairy NZ reflects the different drivers of the systems

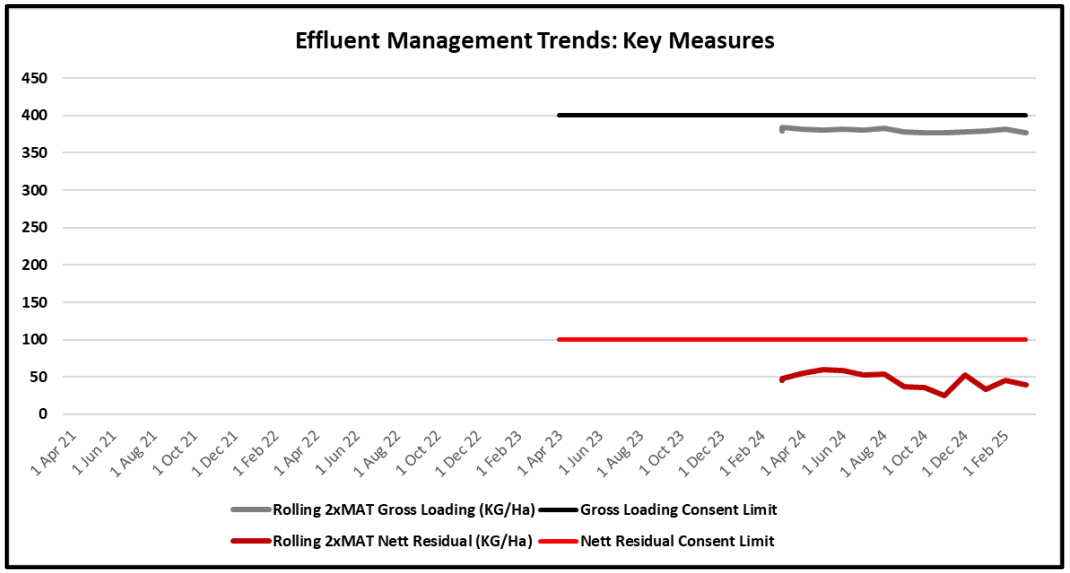
Comparison of Soil, PAW, Nitrogen Additions and Losses



Actual Data Results

Actual Data Results – Industrial 1





	Applied Nitrogen (kg N/ha/yr)	Harvest (kg N/ha/yr)	Residual (kg N/ha/yr)
Consent	400	-	100
Actual	369	273	96

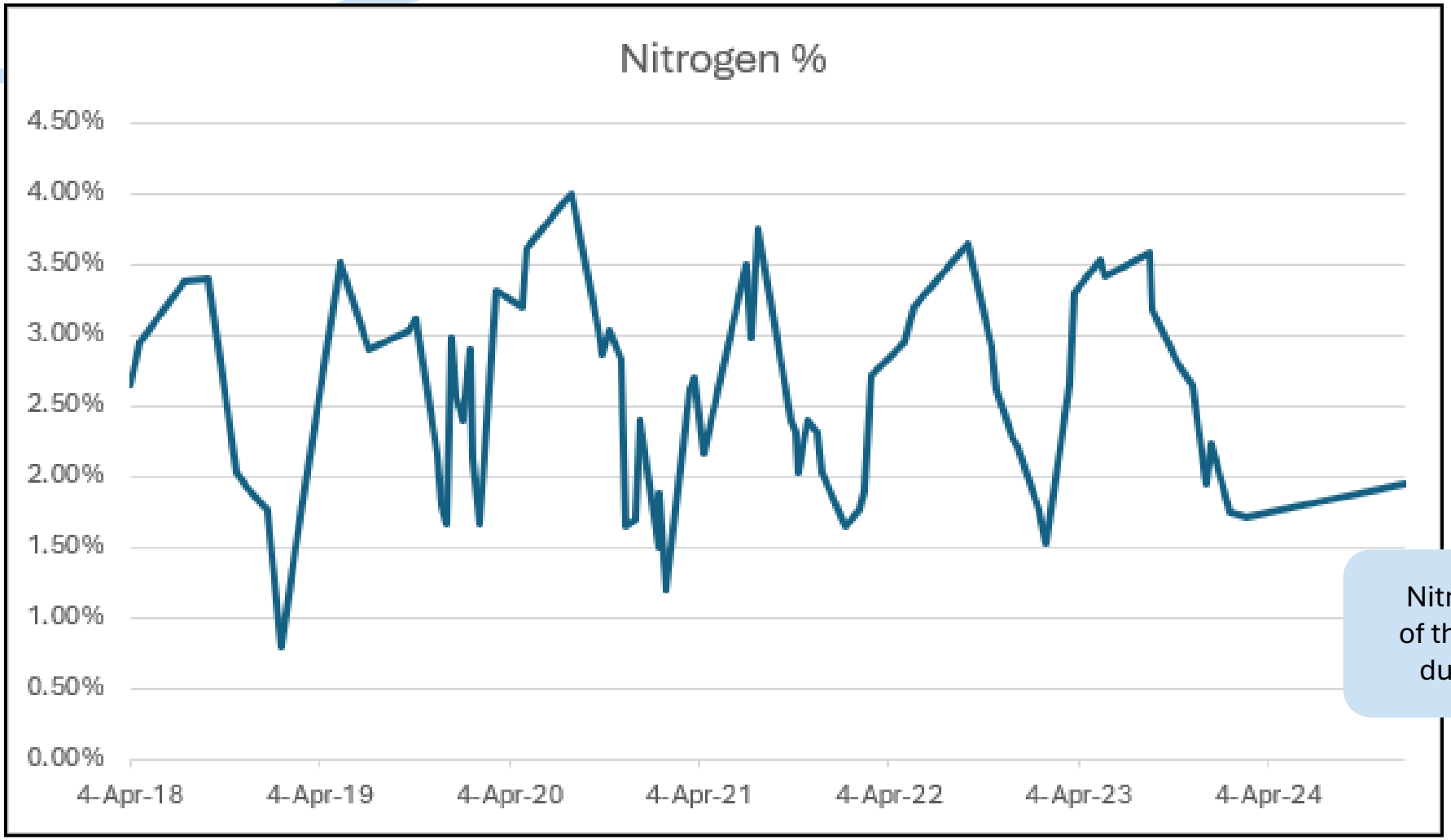
- Harvesting 10,200 kg DM/yr
- Averaging 6 cuts per year
- Average N content 2.78 %
- Average application depth 1 mm/day
- Average N content 103 mg/L
- Summer dry is impacting pasture production

Actual Data Results – Industrial 2

Year	Total N Applied as Wastewater (kg N/ha/yr)	N Removed in Products (kg N/ha/yr)
13/14	401	341
14/15	663	357
15/16	521	321
16/17	446	384
17/18	459	338
18/19	643	339
19/20	549	299
Average	526	340

- Harvesting 13,000 kg DM/yr
- 4 to 6 cuts per year
- Average N content 172 mg/l
- Summer dry and winter wet is impacting pasture production
- Soil type: Pallic soil

Seasonal Variation in Nitrogen Content of the Grass



Nitrogen content of the grass varies during the year

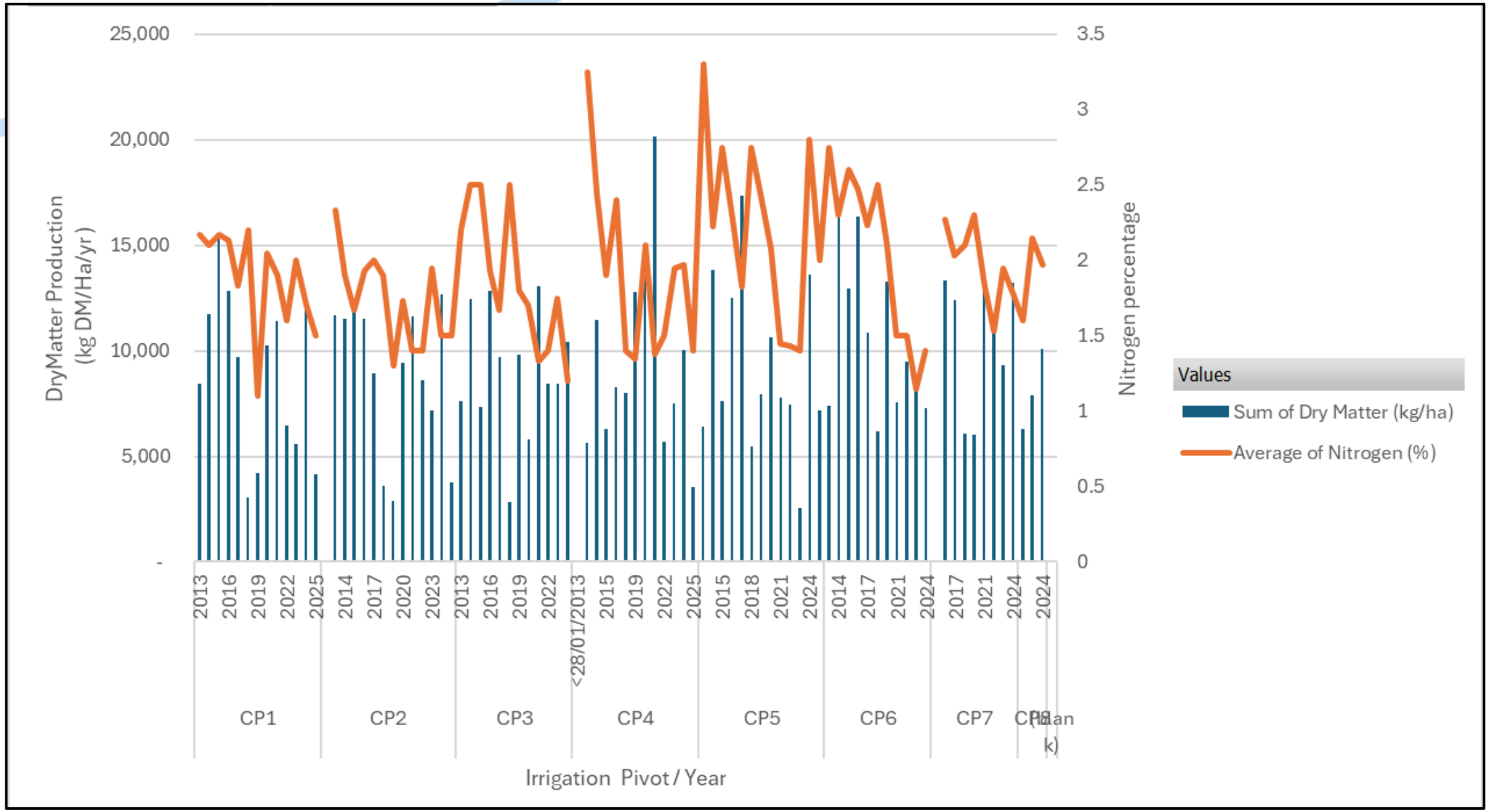
Community WWTP

Pivot	1	2	3
5 years average applied	423	441	350
5 years average removed	346	349	320
Difference	78	92	30
DM estimate	13,829	13,962	12,799

Pasture growth N and moisture limited

	Total N Applied (KgN/ha/yr)			Total Nitrogen Harvested (kgN/ha/yr)			Annual irrigation depth (mm/yr)		
Year	CP1	CP2	CP3	CP1	CP2	CP3	CP1	CP2	CP3
2019	421	344	225	267	320	138	714	597	374
2020	300	306	303	373	339	336	709	540	386
2021	260	281	216	280	317	311	661	579	396
2022	461	481	387	362	350	336	628	592	428
2023	550	622	463	355	344	383	577	592	460
2024	549	611	505	437	426	416	560	534	488

Dry Matter Production



Published Data

The potential nutrient uptake for pasture

Crop / Land use	N uptake (kg/ha/year)	P uptake (kg/ha/year)	Reference
Pasture – irrigated, cut and carry	500 - 600	130 - 160	**Morton et al. (2000)**
Pastoral – irrigated grazed system	**200 - 240**	**52 - 64**	**FLRC (2009), Williams and Haynes (1990)**

Table 9: Crop Nutrient Uptake

Conclusions

RYE

The potential nutrient uptake for pasture

Nitrogen

- Nitrogen loads 250 to 450 kg N/ha/yr
- Concentration of 2 to 3.5%
- N export of 75% to 80% applied N

Pasture Yield

- Harvest 4 to 6 times yield
- 9,000 to 13,000 kg DM/ha/yr

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office@lei.co.nz | www.lei.co.nz | 06 359 3099