Pasture Wise Field Day

Thursday 21st September
9:30am – 2:30pm
Location: Kalgup

A bus tour of some of the latest pasture trial sites in the Geographe Catchment including:

- Pasture Trial Network – Independent annual ryegrass variety testing as part of the national PTN program.
- The Soil Wise NKS trials – designed to give farmers greater confidence in addressing macro-nutrient production constraints using soil testing; and to assess the potential impact of trace elements on pasture production.
- Pasture Challenge trial – Farmer-driven trials aimed at addressing soil constraints and improving pasture production.
- Hands-on training on plant tissue sampling from the experts.

For information, contact:
pclifton@southwestnrm.org.au
or **0409 680 900**

Soil Wise is funded by the **National Landcare Program Smart Farms Small Grants** – an **Australian Government** initiative. It is supported by **Healthy Estuaries WA** – a **State Government** program.

Pasture Wise Field Day

Program / Contents:

9:45 am - Welcome

10:00 am - Bus departs for Pasture Trial Network (PTN) trial. (Page 3)

11:15 am - Bus departs for the Soil Wise NKS trial. (Page 4)

12:30 pm - Lunch - Bus arrives back at Shed.

1 pm - Pasture Challenge trial (in shed and at trial site). (Page 8)

2:00 - Tissue testing demonstration. (Page 14)

2:20 - Closing remarks by MC, feedback forms.

2:30 - End.

Western Dairy Pasture Trials Network - Annual Ryegrass Variety Trial

Western Dairy is supporting independent ryegrass variety evaluations as the principal funder of the Pasture Trials Network (PTN) trial site in Busselton this year.

Thanks to the Haddon family for hosting the site which is a silage block that produced good silage followed by hay yields in 2022. The 2023 trial site was sprayed out after the 2022 silage cut to prevent seed set of the sown ryegrass.

Early opening rains of 46mm (11th to 14th of April) with a follow up of 28mm on the 25th germinated weeds for a knock down spray and seeding on the 26th of April. Rainfall to 14 Sept is 567mm. Average annual rainfall at Busselton Airport is 683mm.

Twelve annual ryegrass varieties have been sown, ten tetraploids and two diploids.

Fertiliser has been applied every three weeks at levels that exceed removal rates to ensure they are not limiting the genetic potential of each variety.

Samples were collected for feed quality analysis on the third cut and will be done again on the fifth cut to assess both yield and quality of each variety.

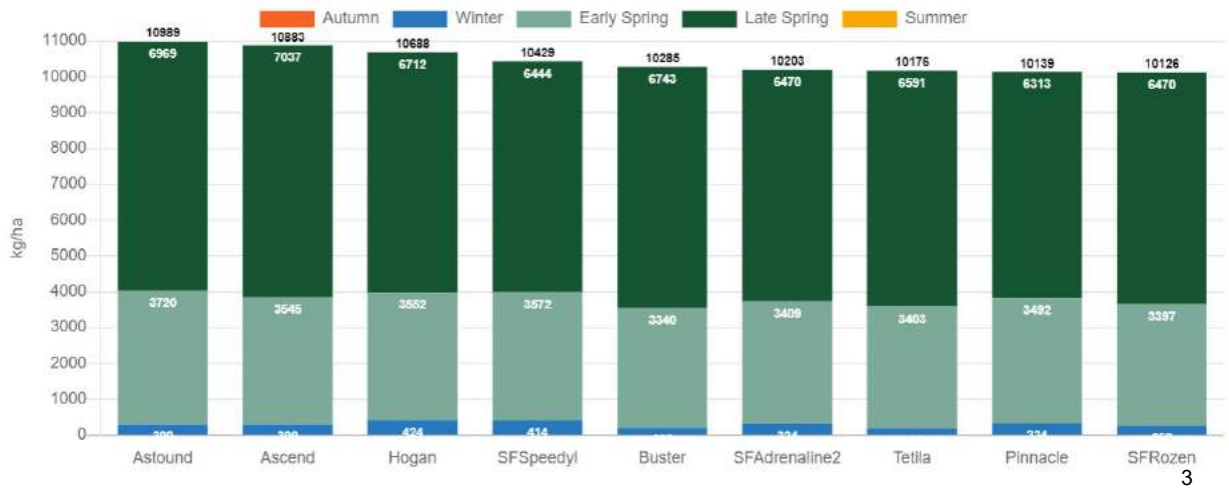
Average yields to date:

Date of Cut	Average DM yield (kg/ha)	Growth (kg/ha/day)
14th June	722	
27th July	1733	39
23rd Aug	1701	65
Total to 23rd Aug	**4156**	

Soil test results:

pH	PBI	P (mg/kg)	K (mg/kg)	S (mg/kg)	Organic C %
5.6	17.7	21	48	21.9	3.24

2022 Busselton PTN Trial results (https://etools.mla.com.au/ptn):



Soil Wise (NKS trial site)

The Soil Wise project is designed to give farmers greater confidence in addressing macro-nutrient and trace element production constraints through evidence-based nutrient management decisions. https://estuaries.dwer.wa.gov.au/soil-wise/

At least eight fertiliser trials will be conducted across south-west regional estuary catchments. The sites will run for two trial years: 2023 and 2024. They build on the work of the uPtake trials (https://estuaries.dwer.wa.gov.au/uptake/).

The design and methodology of the fertiliser trials have been developed through a collaborative Technical Reference Group with members from the fertiliser industry, dairy and beef industries, state government departments, independent agronomists, research scientists and farmers.

Broad objectives of the Soil Wise trials

- Test national critical soil test K and S values for relevance to south-west WA.
- Promote best practice in sustainable agriculture and increase confidence in farmers and industry in evidence-based fertiliser recommendations.
- Promote the efficient use of fertiliser products to ensure their potential is maximised on farm and losses to waterways are minimised.

Take Home Messages

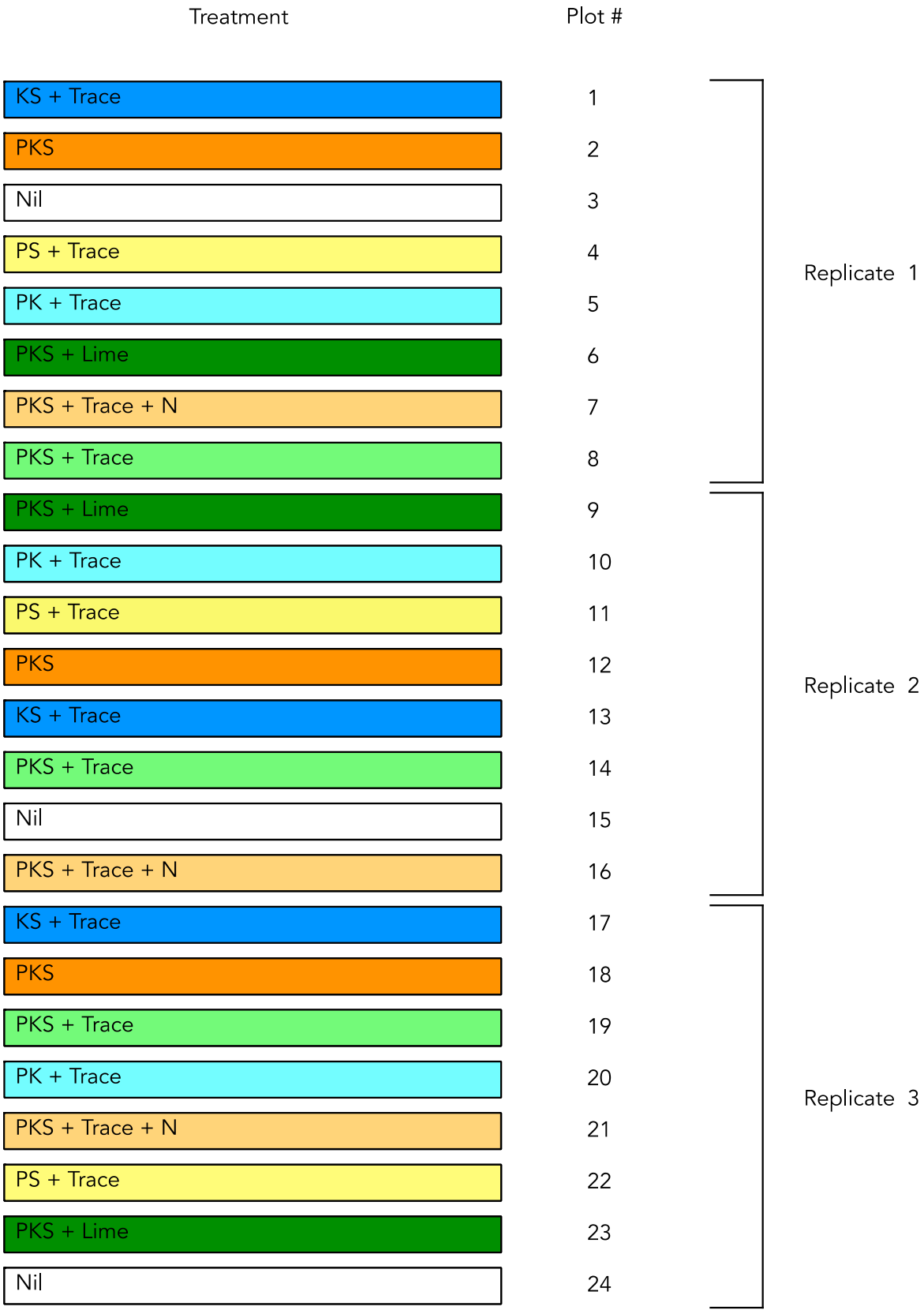
- Fertiliser can influence pasture species composition.
- Timing of fertiliser application is important, especially in soils with a very low Phosphorus Buffering Index (PBI).

Treatments

The Soil Wise trials established in 2023 include the eight treatments listed below. Each treatment is replicated three times.

1. Nil
2. P, K, S and Trace elements
3. K, S and Trace elements
4. P, S and Trace elements
5. P, K and Trace elements
6. P, K, S only
7. P, K, S, Trace elements, and N
8. P, K, S and Lime

Fertiliser Trial Design Diagram



Site soil nutrient levels at the start of the 2023 growing season

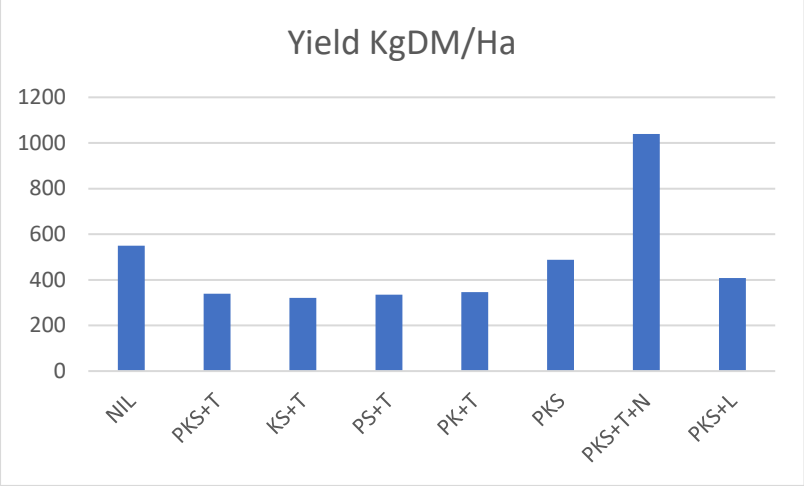
Paddock	Year	Yield target	Texture	pH	PBI	P	K	S	Fertility indices P	Fertility indices K	Fertility indices S
Batley ...	2023	95	Sand	5.1	24.9	13	92	31	0.52	0.74	4.03

Rates and timing of fertiliser applications and products used

Nutrient	Rate of nutrient (kg/ha)	Timing of application	Product	Rate of product (kg/ha)
P	20	Autumn and Spring	Allphos	100
K	100	Autumn and Spring	Muriate of Potash	204
S	40	Autumn and Spring	Sulfoprill	250
N	25	6 weeks after the break	Urea	54
N	50	Mid to late August	Urea	109
Trace elements:				
Mg	6	Autumn	Valagro EDTA Mg	60
Mn	6	Autumn	Valagro EDTA Mn	46.2
Cu	2	Autumn	Valagro EDTA Cu	13.3
Zn	2	Autumn	Valagro EDTA Zn	13.3
Bo	1.5	Autumn	Boric Acid	8
Mo	0.12	Autumn	Sodium Molybdate	0.3
Iron	2.8	Autumn	Valagro EDTA Fe	10
Lime		Establishment	Boranup Lime	5 t/ha

Dry matter yield to date

First pasture growth assessment - 4 August 2023



Site Information – preparation, monitoring and measurements

16 March - Site soil sampled.

5 May - Site sprayed with non-selective herbicide and then reseeded (50kg/ha ryegrass and 10kg/ha balansa/persian clover mix).

5 May - Red mite control applied to trial site.

10 May - Trace elements applied to plots on bare ground prior to germination.

11 May - Lime treatment applied.

8 June - Autumn PKS treatments applied.

15 June - First N treatment applied.

23 June - Diagnostic plant tissue samples taken from Nil, PKS Only and PKS+T plots. Results showed that Boron was the only trace element that was notably higher.

4 August – First pasture cut to determine yield.

11 August - Spring application of PKS and N applied.

25 August - Red mite control applied to trial site.

11 September - All Plots tissue sampled.

Diagnostic plant tissue results

Samples taken from Nil, PKS Only and PKS+T plots - 23 June 2023.

Name	Boron	Calcium	Copper	Iron	Magnesium	Manganese	Molybdenum	Nitrate Nitrogen	Phosphorus	Potassium	Sulfur	Total Nitrogen	Zinc
	mg/kg	%	mg/kg	mg/kg	%	mg/kg	ug/kg	mg/kg	%	%	%	%	mg/kg
PKS Only	2.67	0.45	5.98	89.68	0.15	52.28	1193.02	119.92	0.49	3.44	0.30	3.71	23.84
PKS + Trace	4.54	0.42	6.55	79.36	0.15	56.43	2173.79	174.43	0.46	3.13	0.30	3.85	24.37
Nil	2.74	0.45	5.90	72.98	0.16	48.78	2477.78	94.44	0.36	2.65	0.28	3.65	23.20

Funding Acknowledgement

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Pasture Challenge Trial

Farmer-designed trials based on soil tests

Groups and Management

Three strips per group, each split by landform – slope and flat.

Date	**pH and barley grass**	$/ha
15-Apr	Limed 5t/ha	$212
16-Apr	Cultivated	$20
17-Apr	Dragged & rolled	$15
4-May	Sprayed 1.5 L glyphosate + 100 mls bifenthrin	$15
5-May	Sown: 10 kg Willams, 10 kg Harpoon, 10 kg Astound, 10 kg Kidman, 3 kg Pillar, 1.5 kg Tiapan, 1.5 kg Shaftal	$212
21-Jun	Graze 600 kg/ha DM	
26-Jun	Reset to 6 cm with mower	
28-Jun	75kg/ha SoA (15kgN, 18kgS); 3kg/ha ZnSO4 (1kgZn), 2kg/ha CuSO4 (0.25kgCu), 4kg/ha MnSO4 (0.68kgMn); 50kg/ha MOP on flats (25kgK).	$71.5/$131.50
3-5 Aug	Graze 1300kg/ha DM	
7-Aug	Reset to 6 cm with mower	
30-Aug	Topdress 55kg/ha urea (25kgN)	$44
	Cost per hectare to date (higher cost on flat):	**$590/$651**
Spring	55kg/ha Urea after Sept cut	$44

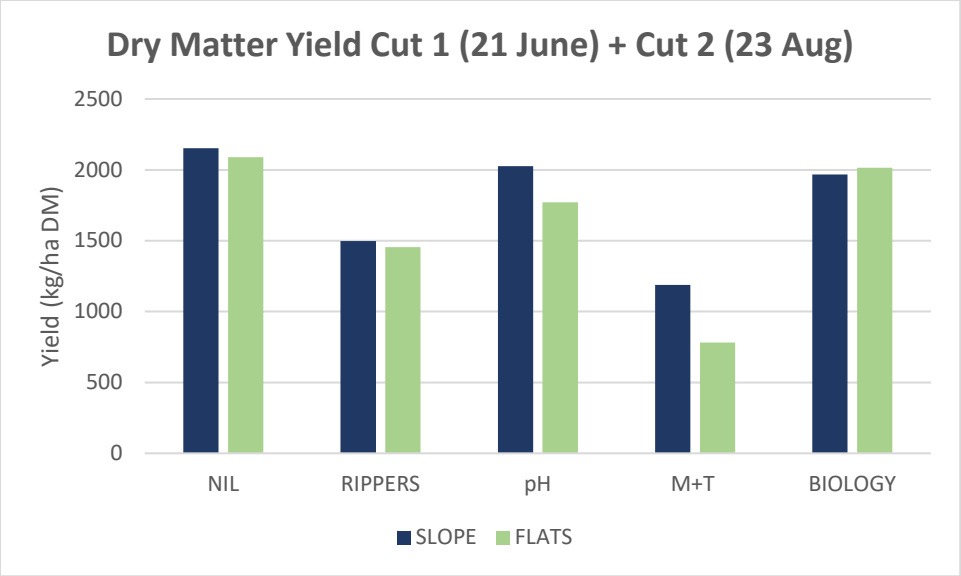
Date	**Biology**	$/ha
15-Apr	Limed 2.5t/ha	$106
17-Apr	Sown: 15 kg humates, 25 kg cover crop blend, 2 kg pillar, 2 kg sodbuster - rolled	$220
20-Apr	Sprayed 450 mls/ha glyphosate (500 g/L)	$12
1-May	Sprayed 100 mls/ha bifenthrin RLEM ctl	$11
12-May	Top-dressed 50 kg/ha urea (23kgN) 20/ha kg kieserite (3.2kgMg, 3.6kgS) 0.6 kg/ha Selcote (6gSe)	$66
21-Jun	Graze 1100 kg/ha DM	
26-Jun	Reset to 6 cm with mower	
20-Jul	Sprayed 40 L/ha Biosoil Bio+Min	$210
3-5 Aug	Graze 900kg/ha DM	
7-Aug	Reset to 6 cm with mower	
21-Aug	Spray 250g/ha Boron (0.5kgB)	$11
30-Aug	Topdress 66kg/ha super (6kgP, 6.6kgS), 43kg/ha urea (20kgN), 48kg/ha Sulphate of potash (20kgK, 8kgS)	$156
	Cost per hectare to date:	**$792**

Date	Rippers	$/ha
15-Apr	Limed 2.5 t/ha	$106
16-Apr	Cultivated	$20
17-Apr	Dragged & rolled	$15
4-May	Sprayed 1.5 L glyphosate + 100 mls bifenthrin	$15
5-May	Sown: 30 kg Astound, 2 kg Sodbuster, 2 kg Taipan, 2 kg Shaftal (treated)	$180
15-Jun	Ripped to 400 mm depth	$60
21-Jun	Graze 300 kg/ha DM	
26-Jun	Reset to 6 cm with mower	
28-Jun	50kg/ha urea (23kgN); 180kg/ha Super Potash 31 flats (12kgP, 22K, 14kgS)	$35/$188
3-5 Aug	Graze 1163kg/ha DM	
7-Aug	Reset to 6 cm with mower	
30-Aug	Slope 60kg/ha Super Potash 3:1 (4kgP, 7kgK); Flat 180kg/ha Super Potash 3:1(12kgP, 22K, 14kgS); 100kg/ha urea on both (46kgN)	$121/$223
	Cost per hectare to date (higher cost on flat):	**$554/$807**

Date	Meat & Potatoes (M+T)	$/ha
16-Apr	Cultivated	$20
17-Apr	Dragged & rolled	$15
4-May	Sprayed 1.5 L glyphosate + 100 mls bifenthrin	$15
5-May	25 kg Astound, 2.5 kg Taipan, 2.5 kg Shaftal (treated)	$147
10-May	Spray 3 kg/ha CuSO4 (0.75kgCu) on soil	$29
21-Jun	Graze 280 kg/ha DM	
26-Jun	Reset to 6 cm with mower	
28-Jun	90kg/ha NS31 (31kgN, 10kgS); 750 ml/ha Tigrex + 25g Broadstrike	$91.50
3-5 Aug	Graze 1163kg/ha DM	
7-Aug	Reset to 6 cm with mower	
7-Aug	120kg/ha NKS32 (30kgN, 15kgK, 6.6S)	$108
30-Aug	180kg/ha grazeburst (45kgN, 7kgP, 15kgK, 11kgS)	$180
	Cost per hectare to date:	**$606**

Name	Species Sown
Williams	Oats
Harpoon	Barley
Astound	Annual tetraploid ryegrass
Kidman	Perennial ryegrass
Taipan	Balansa
Shaftal	Persian clover
Pillar	Forage rape
Sodbuster	Tillage radish
Cover crop mix	Peas, ryecorn, oats, ryegrass, balansa, crimson clover, chicory, plantain

Yield Quantity and Quality



Ranked feed test results (ranked by ME, then protein, then digestibility) collected 23rd Aug:

Group/Landform	ME	Protein	Digestibility
	MJ/kg DM	%	%
M+T - Flat	12.7	21.6	82.0
M+T - Slope	12.4	23.5	79.0
RIP - Slope	12.1	21.1	78.0
RIP - Flat	12.0	23.3	77.0
pH - Flat	11.9	18.6	76.0
pH - Slope	11.9	18.0	77.0
BIO - Flat	11.6	20.2	75.0
BIO - Slope	11.5	19.6	74.0
NIL - Flat	11.5	19.4	73.0
NIL - Slope	11.2	23.4	70.0

Clover nodulation and root disease.

Twenty clover plants from each treatment were dug up on the 16th of August, washed out and scored for nodulation and disease. Roots were then dried, weighed and sent to SARDI for DNA disease testing.

Nodule scores and disease ranking:

	Pink Nodules	**Disease**	**Dry root wt**
	Ave count	% brown	(g/plant)
pH - Slope	16	31.3	0.126
BIO - Slope	14.9	58.8	0.109
RIP - Flat	13.3	48.8	0.094
M+T - Slope	9.5	45	0.069
M+T - Flat	9.25	48	0.085
pH - Flat	9	41.3	0.060
RIP - Slope	8.6	41.9	0.093
NIL - Slope	8.3	65	0.065
BIO - Flat	7.6	66.3	0.071
NIL - Flat	4.6	71.3	0.059

SARDI pathogen DNA test results:

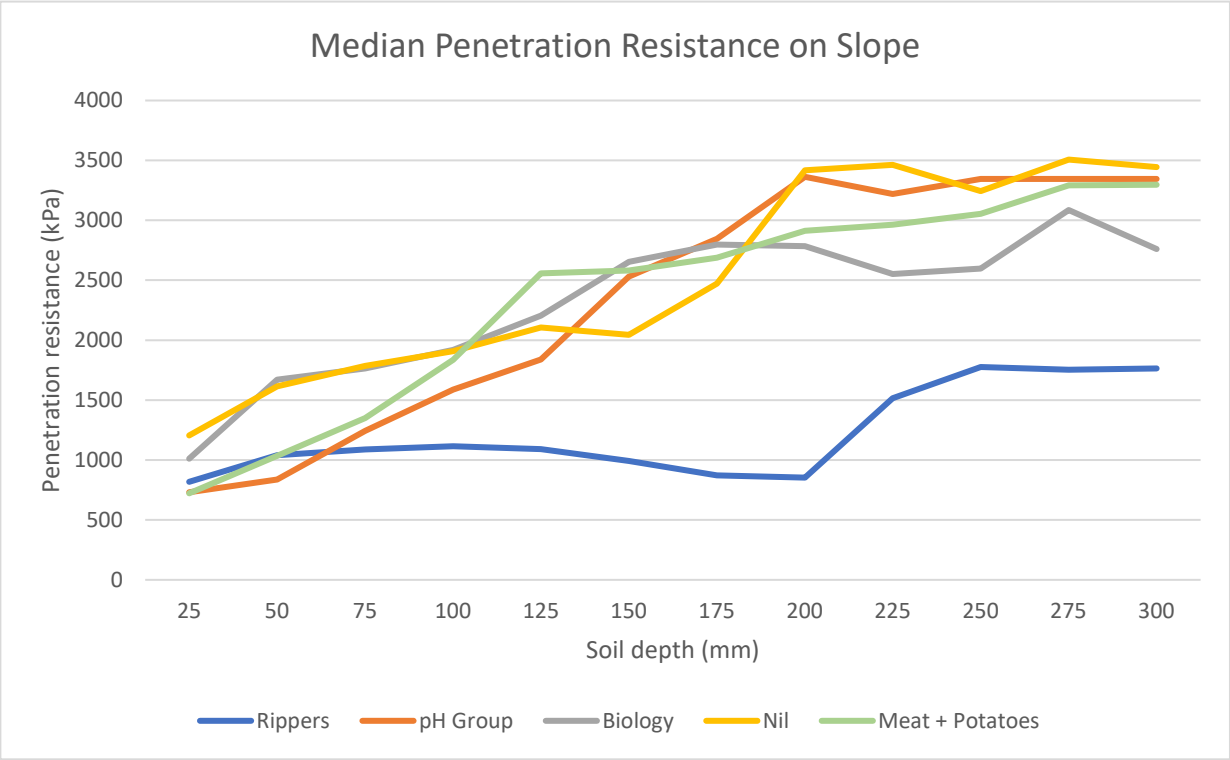
Comments from Martin Barbetti - Prof. Plant pathology and Mycology UWA:

"The results from SARDI are indeed very interesting. Roughly, they mean that there are multiple pathogens across most treatments

- There is plenty of *Rhizoctonia solani* AG2.2 that attacks clovers in particular.
- Seven of the sites have Aphanomyces that causes serious root disease – you just need it to be present to be a problem as it multiplies exponentially.
- There is masses of *Phytophthora clandestina* at 8 of 10 sites, enough to massively debilitate the clovers – you just need it to be present to be a problem as it multiplies exponentially.
- Heaps of *Pythium*, most likely *P. irregulare* and enough to cause severe root disease and short stumpy roots - – you just need it to be present to be a problem as it multiplies exponentially.
- Interesting that you have *Pratylenchus* nematode at 5 of the sites but probably only an issue at 2 of the sites. (nematodes detected on slope only).

"If you have any productivity in the clover that will be a miracle for the first month or 2 of season but now onwards (late August) surviving plants do have a tendency to recover as weather warms."

Compaction tested 15th September 2023



In general, root growth starts to be restricted above 1500 kPa and is severely restricted above 2500 kPa. Results suggest that ripping in June has removed severe compaction.

Tissue tests – June 21st 2023

Aim: To demonstrate the effect of incorporating 5 tonnes of lime per hectare on micronutrient availability. Lime can reduce availability of copper, zinc and manganese, and increase moly.

Method: We took ryegrass from two "pH" plots and compared micronutrient content with neighbouring "Meat and Potatoes (M+T)" plots. **NOTE:** M+T plots were not limed but did get 3 kg/ha of copper sulphate in May 2023 after a low 2022 copper plant test (results next page).

Average Results across two plots per treatment (mg/kg):

Name	Copper	Zinc	Manganese	Molybdenum
pH (+5t/ha lime)	6.3	30.77	33.88	2936
M+T (+ 3kg/ha CuSO4)	7.74	32.52	50.55	1942

The effect of the lime was greatest on manganese and molybdenum, which is commonly observed. Manganese deficiency can be corrected by a foliar spray. High molybdenum increases risk of inducing copper deficiency if copper is low. While the result for copper is adequate, copper sulphate was sprayed on pH plots in June to reduce risk.

Site Background

Tissue test results 21/9/2022

Paddock		Flat	Slope	Target	Flat	Slope	Target
Plant collected		**Ryegrass**	**Ryegrass**	**RYEGRASS**	**Clover**	**Clover**	**CLOVER**
Boron	mg/kg	6.26	4.33	4-20	17.8	18.04	15-100
Calcium (Ca)	%	0.42	0.32	0.2-0.6	1.07	1.24	0.8-2.5
Chloride (Cl)	%	1.49	0.95	0-2	0.91	0.46	<1.6
Cobalt (Co)	ug/kg	104.83	73.62	>40/100	193.48	165.86	>40/100
Copper (Cu)	mg/kg	2.5	4.25	4-15	4.72	6.02	>3.5
Iron (Fe)	mg/kg	76.48	54.46	>50	97.82	81.6	>50
Magnesium (Mg)	%	0.17	0.13	0.15-0.4	0.17	0.21	0.15-0.7
Manganese (Mn)	mg/kg	35.58	24.88	30-650	37.08	38.34	20-300
Molybdenum (Mo)	ug/kg	1443.9	2342.92	200-2000	3201.45	1711.54	200-2000
Phosphorus (P)	%	0.25	0.34	0.2-0.5	0.21	0.28	0.22-0.5
Potassium (K)	%	3.25	2.52	1.3-2.5	2.26	2.32	1-2.5
Selenium (Se)	ug/kg	25	6.35	30-3000	10.6	20.81	30-3000
Sodium (Na)	%	0.22	0.17	0.18-0.7	0.42	0.46	0-0.8
Sulphur (S)	%	0.39	0.21	0.2-0.45	0.3	0.24	0.22-0.4
Total Nitrogen (N)	%	2.83	2.35	3.5-5	3.73	4.18	3.5-5.5
Zinc (Zn)	mg/kg	17.84	21.29	15-70	29.04	27.26	15-70
N/S ratio		7.3	11.2	15-17	12.4	17.4	0-20
Grass Tetany risk		2.4	2.4	0-2.2	0.9	0.7	0-2.3

Soil test results 01/12/2022

		Phosphorus	Potassium		Organic		pH		Aluminium
		Colwell	Colwell	Sulfur	Carbon	Conductivity	Level	Clay	CaCl2
Site/depth	PBI	mg/kg	mg/kg	mg/kg	%	dS/m	(CaCl2)	%	mg/kg
Slope 0–10	17.1	21	141	7.6	3.0	0.2	4.8	8.1	1.81
Slope 10–20	11.3	**29**	36	3.4	0.7	0.1	**4.2**	5.0	3.91
Flat 0–10	73.4	20	96	50.8	4.0	0.3	5.1	10.5	2.32
Flat 10 –20	22.3	11	42	10	0.8	0.1	**5**	6.2	1.4

For interpretation, see https://www.agric.wa.gov.au/sites/all/modules/submodules/nutrient-calculator/

Soil compaction

Soil compaction was assessed with a digital penetrometer on 21 September 2022.

	Depth where root growth restriction starts (1.5 MPa)	Depth of severe restriction (> 2.5 MPa)
Slope	40 mm	120 mm
Flat	60 mm	170 mm

Sub clover root health

Sub-clover root health was assessed on 21 September 2022. Clover appears to be nodulating poorly with signs of severe disease, as indicated by the presence of dark and stubby roots.

This project is delivered by the South West NRM and supported by Western Beef Association Inc under the Soil Wise project, funded by the National Landcare Program – an Australian Government initiative, and supported by Healthy Estuaries WA – a State Government program.

Plant Sampling Instructions

What to analyse plants for:

The standard plant test from an ASPAC certified laboratory typically includes: Nitrogen, Nitrate, Phosphorus, Potassium, Sulphur, Copper, Zinc, Manganese, Iron, Calcium, Sodium, Chloride, Magnesium and Boron.

For additional cost Molybdenum, Cobalt and Selenium can be added to the test.

Thinking about and planning your sampling:

Plant sampling is undertaken for a reason. Your reasons may be to:

- Diagnose the nutrient status of your pasture at a point in time.
- Identify whether plant nutrition is the reason for poor or good performing pasture.
- Monitor the effects of your fertiliser program on plant nutrient status.
- Examine trends in pasture nutrient status.
- Provide supporting information about pasture nutrient status following on from a recent soil testing and fertiliser program.

Your reasons for sampling will guide your sampling strategy, where samples are collected, and how many. Think carefully about your reasons for sampling, and the questions you want to answer from the exercise.

Decide where and what to sample:

- Collect representative samples from either:
  - Paddock of interest, or
  - From areas of good and poor growth within the same paddock.
- Refer to your fertiliser recommendations from your agronomist. They may have suggested which paddocks to consider for plant testing.
- Sample the plant species of interest e.g. ryegrass or sub clover. You can collect different species, but they must go in separate bags. Do not mix samples from different species or different varieties in the same sample bag.

When to sample:

- Sample fresh tops of actively growing plants just prior to flowering or at early flowering. Earlier sampling is ok if diagnosing a problem. Paired good and bad samples with a paddock are very useful.
- Do not sample if fertiliser has been applied in the previous four weeks, or if the plants have been sprayed.
- Sample plants early in the day to avoid heat stress.
- Collect samples early in the week and send to the lab immediately. The fresh plant material must arrive at the lab as soon as possible and should not sit in the mail over the weekend. Keep samples in the fridge overnight if they are not posted on the same day as collection.

Preparation for sampling:

- Wear disposable gloves. It is good practice to take some water with you to wash your gloved hands in-between sampling so as not to cross contaminate samples.
- Avoid contaminating gloves e.g. opening zinc coated gates, using sunscreen.
- Take a pen to label the sample bags and to fill-in the forms.

Collecting samples:

- Your purpose for sampling will guide the sampling pattern you take.
- If you are collecting a sample for diagnostic purposes, you could walk across the paddock in a random or zig-zig pattern over a minimum distance of 200-300m, collecting plant material every 20-30 steps, from areas of average or representative growth. If you want to build confidence in your fertiliser program following on from recent soil sampling, follow the transect used for soil sampling.
- "grab" or "snap" samples as per what the animals would chew off. Collecting only the tops of the youngest or newly grown leaves.
- Take samples that represent the area from which they are collected.
- Avoid obvious urine or faeces patches where growth is prolific, or livestock camps. Do not sample waterlogged areas, drainage lines, near gateways or troughs, old fertiliser or lime dumps, or anywhere that is atypical.
- Make sure you collect the correct plant material (see next page).
- Check each handful carefully before placing into the sample bag. Remove any root material if you pull up any tops with roots attached.
- Collect a minimum of two generous handfuls of plant material.

Which plant and part to sample:

- Clover - whole leaves and petioles.
- Ryegrass - whole shoots above 5 cm, avoid dead older leaves.
- Avoid woody/stemmy growth in the lower canopy, roots and soil.
- Do not sample dying, diseased, damaged or dusty plants.
- Do not collect weeds.
- Collect only one species of plant per bag. Do not mix plant material from different species or varieties.

What to do with the samples:

- Place each sample in a paper bag. You will need two generous handfuls.
- Label bags with a unique ID and fill out information forms provided by the laboratory.
- Pack the sample bags into an envelope to post.
- As the plant material is fresh, it is important that it doesn't sit in the bags for longer than necessary. So, collect samples early in the week and post as soon as possible. Check that postage will be delivered before the end of the week. Keep samples in the fridge overnight if they can't be posted on the day of collection.

Lab services available:

There are a few laboratories that offer plant analysis. For example:

CSBP: https://csbplab.com.au/tests/plant

Eurofins APAL: https://www.apal.com.au/PlantTesting

EAL: https://www.scu.edu.au/environmental-analysis-laboratory---eal/analytical-services/plant-testing/

SESL: https://www.sesl.com.au/tests

- Check that the laboratory is certified by the Australasian Soil and Plant Analysis Council (ASPAC) for the tests you are interested in: https://www.aspac-australasia.com/certified-labs
- Obtain a quote from the laboratory and any information sheets you need to return with your sample.
- Ask how to submit samples for testing.
- Some laboratories will provide sample bags.

Making better nutrient management decisions:

In addition to plant tissue testing, we recommend regular soil testing and consultation with a Fertcare accredited agronomist to plan profitable and responsible fertiliser use.

How to sample in a snapshot

Plan your sampling

→ Why are you sampling
→ Where will you sample
→ When to sample
→ What species of plant will you sample

Collect your samples

→ Wear gloves

→ Sample correct part of the plant (no roots)

→ Take samples that are representative of the area

→ Fill the bag with plant material (single species)

→ Fill in details on sample bag

→ Complete an analysis information form and send it with the samples to the lab early in the week

→ Consult an agronomist for help with interpreting results

Healthy Estuaries WA catchment officers are available to help you:

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Leschenault Catchment Council
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GeoCatch
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Lower Blackwood LCDC
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Wilson Inlet Catchment Committee
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Oyster Harbour Catchment Group
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Contact your local independent agronomist:

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