What is the mineral nutrient status of perennial grasses in the Northern Agricultural Region?

Evergreen pasture updates

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Government of Western Australia
Department of Agriculture

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WEST MIDLANDS GROUP

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Project background

- Part of “Transforming the Northern Sandplain project”

- Designed to determine the nutrient status of perennial pastures in the West Midlands region and ultimately, the fertiliser requirements

Surveying soil and plant nutrient status

- Rather than survey by examining growers' historic soil and tissue test levels and referring them to text book critical levels we decided to lay out a set of "nutrient adequate" strips on perennial pastures.
- We can then measure the soil and species nutrient status. Also, if the strips show significant responses to the fertiliser, we can diagnose which nutrients are deficient for which species

Methods

- 0-10cm soil samples taken from all sites
- Fertiliser strips (200kg/ha DAPSZC plus 100 kg/ha MOP) applied at all sites. Follow up with 40 kgN/ha as urea or ammonium sulphate, topdressed at each sampling date
- Tissue samples by species – on and off fertilised area at some sites
- Problem has been to get responsive situations and this requires having a spell from grazing. We thought we could time our sampling to achieve this without cages or fences – but rarely so ….

Reviewing textbook “critical” levels

- A summary of 19 fertiliser strips showing the percentage of panic grass and Rhodes grass samples which were below the “critical” levels from the literature for a suite of essential elements.

Percentage of observations below the "critical" level – (i.e. deficient)

		panicum	panicum	Rhodes	Rhodes
	"critical"	minus	plus	minus	plus
nutrient	level	% of analyses below "critical" level			
N	**2.0 %**	43	**32**	77	**71**
P	**0.2 %**	36	**19**	64	**42**
K	**1.5 %**	11	**10**	41	**21**
S	**0.15 %**	39	**13**	9	**8**
Cu	**5 mg/kg**	54	**52**	77	**83**
Zn	**13 mg/kg**	29	**19**	55	**50**
Mn	**40 mg/kg**	60	**45**	55	**42**
Mg	**0.15 %**	11	0	41	33
Ca	**0.2 %**	0	0	0	0
B	**5 mg/kg**	14	13	27	25
	number	28	31	22	24

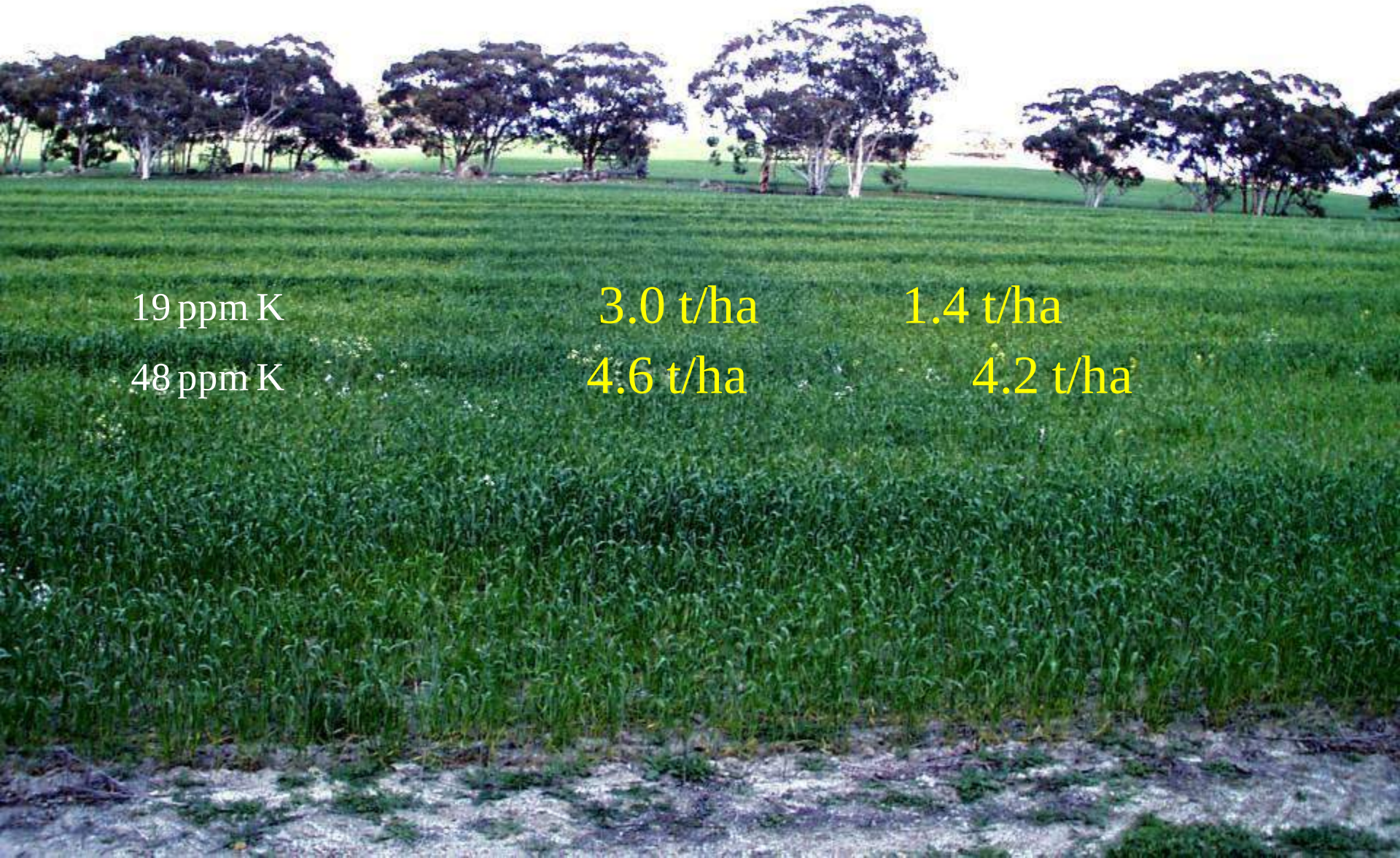
note values in bold (red,shaded) received adequate nutrient

Using test strips to diagnose nutrient deficiencies

- Process is analogous to how I have used responses to windrow residues to diagnose nutrient deficiencies. (Could possibly use the same method for on and off dung and urine patches if they are obvious in ungrazed pastures)
- A direct comparison of nutrient levels in tissue for species on and off the strips is a far better method of diagnosis than referring tissue or soil levels to standard critical levels in text books – provided you have a significant, positive growth response (>15% increase)

Hardie, Walebing, 3 September 2001

Wheat after canola, K strip applied 31 July 2001



Examples of the diagnostic method

	bowran on strip	bowran off strip	romily on strip	romily off strip
weigh per /plant	**0.49**	**0.18**	**1.95**	**0.95**
NITROGEN	4.40	4.90	**1.64**	**1.15**
PHOS	0.37	0.44	**0.19**	**0.13**
POTASSIUM	**2.46**	**1.50**	**1.97**	**1.48**
SULPHUR	0.33	0.39	**0.14**	**0.11**
SODIUM	0.11	0.14	**0.66**	**0.45**
CALCIUM	0.53	0.62	0.26	0.27
MAGNESIUM	0.33	0.43	**0.16**	**0.13**
COPPER	5.37	6.25	**2.50**	**2.19**
ZINC	29	38	7	8
MANGANESE	158	191	**56**	**29**
IRON	256	451	82	117
BORON	4.8	5.8	**4.4**	**3.4**
Conclude		**K deficiency**		**root problems**

AA North

AA spring	species	rhodes grass	rhodes grass	panic grass	panic grass	Perennial	rhodes grass	panic grass
element	site	on	off	on	off	"critical"	off/on	off/on
Nitrogen	%	2.1	2.3	3.5	2.9	2.0	1.10	0.84
Phosphorus	%	0.51	0.34	0.69	0.38	0.2	0.67	0.55
Potassium	%	2.1	1.8	2.4	2.1	1.5	0.85	0.89
Sulfur	%	0.31	0.26	0.21	0.16	0.15	0.84	0.76
Copper	mg/Kg	3.7	3.9	6.2	3.5	5.0	1.06	0.57
Zinc	mg/Kg	12.0	9.7	19.0	13.5	13	0.81	0.71
Manganese	mg/Kg	78	42	76	33	40	0.54	0.43
Iron	mg/Kg	98	87	87	78	50	0.89	0.90
Boron	mg/Kg	3.5	3.5	5.9	6.1	5	0.98	1.03
Calcium	%	0.46	0.38	0.58	0.73	0.20	0.83	1.26
Magnesium	%	0.18	0.17	0.35	0.41	0.15	0.94	1.17
soil test	Amm N	Nitr N	Min N	P	K	S	OC	pH Level
units	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	%	CaCl2
	3	5	8	10	29	2.1	0.41	6.3

The process

1. What are the current fertiliser strategies for perennial pastures and on what are they based?
2. Survey the nutrient status of the pastures using soil and tissue analyses
3. Determine if pastures are responsive to fertiliser and if so, which nutrients are deficient?
4. Develop a fertiliser recommendation system for perennial pastures in the region, or better, adjust existing recommendation systems to serve this industry

1. Current fertilising practices

We have NOT determined what current fertilising practices – except growers tend to believe they can use less fertiliser on perennial pastures than on crops and annual pastures because of more efficient use of fertiliser inputs and better recycling of nutrients from depth …….

Fertiliser used

- The fertiliser was a blend of 200 kg/ha of DAPSZC plus 100kg/ha of MOP which equates to 34 kg N/ha, 36 kg P/ha, 50kg K/ha,17kg S/ha, 100 g Cu/ha, 300 g Zn/ha, 2 g Mo/ha and 40 g Mn/ha
- Additional N and S was applied as ammonium sulphate (200 kg/ha of sulphate of ammonia (SOA) - 21%N, 24%S - at the first re-visit and 140 kg SOA/ha at the second visit.
- Summit Spud: 8%N, 12.8%P, 11.2%K, 7.9%S, 2.24%Ca, 0.9%Mg, 0.14%Cu, 0.13%Zn, 0.007%Mo and 0.15%Mn