

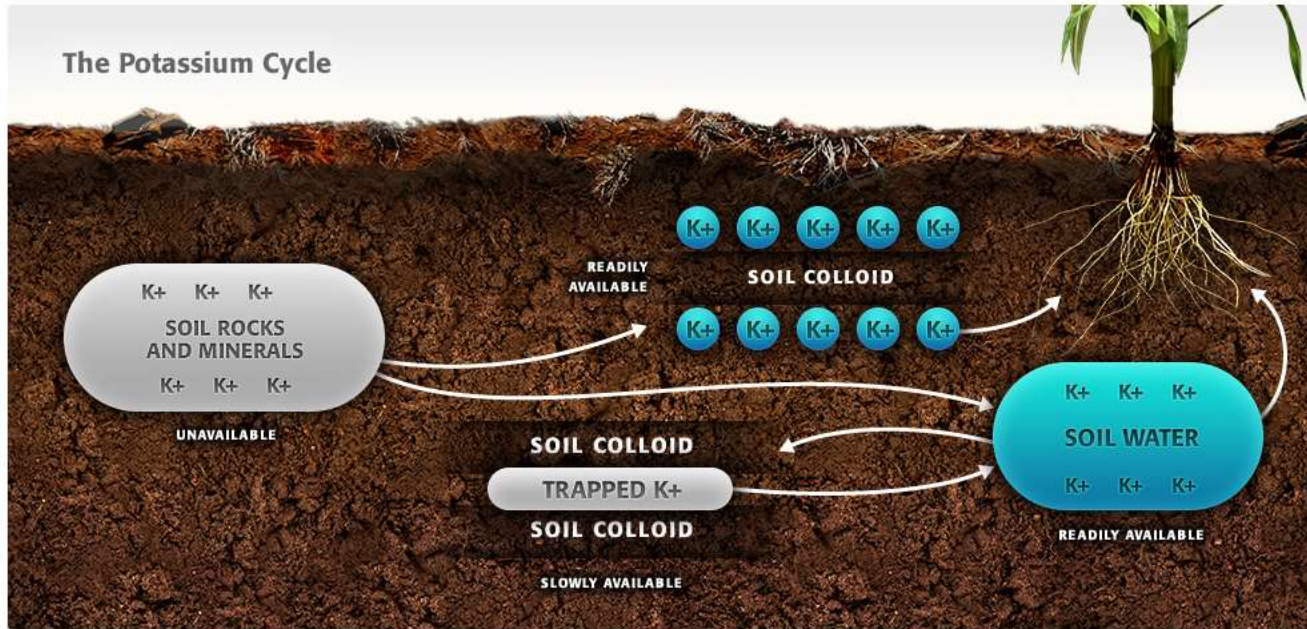


Potassium deficiency in local soils – what do we know?



Potassium pools

Potassium supply to a crop



Structural K

Interlayer K

Exchangeable K

Solution K

Background

Industry feedback?

Do we have confidence in the soil test methods for K?

Providing valuable information on some soil types

Some soil types, questionable recommendations for the economic use of K fertilisers?

Current K lab methods WA

- Colwell K

Colwell P (1963) – 0.5M bicarbonate extract (@ pH 8.5) soil to solution ratio – 1:100, shaking time – 16 hours

Years	Soil depth (cm)	Category	Wheat	Barley - feed	Barley	Oats-Hay	Oats-Grain	Canola
All	0-10cm	<i>R value</i>	0.6					0.69
		<i>Critical value</i>	69					47
		<i>Critical range</i>	57-83					43-53
All	0-10 + 10-20cm	<i>R value</i>	0.46					0.77
		<i>Critical value</i>	45					39
		<i>Critical range</i>	36-56					37-41
2000-2016	0-10cm	<i>R value</i>	0.54					0.78
		<i>Critical value</i>	52					52
		<i>Critical range</i>	42-65					46-60
2000-2016	0-10 + 10-20cm	<i>R value</i>	0.61					0.7
		<i>Critical value</i>	39					41
		<i>Critical range</i>	34-45					37-47
WA - all	0-10cm	<i>R value</i>	0.48					0.69
		<i>Critical value</i>	43					47
		<i>Critical range</i>	37-49					43-53
WA - all	0-10 + 10-20cm	<i>R value</i>	0.65					0.77
		<i>Critical value</i>	37					39
		<i>Critical range</i>	33-41					37-41

Current K lab methods EAST

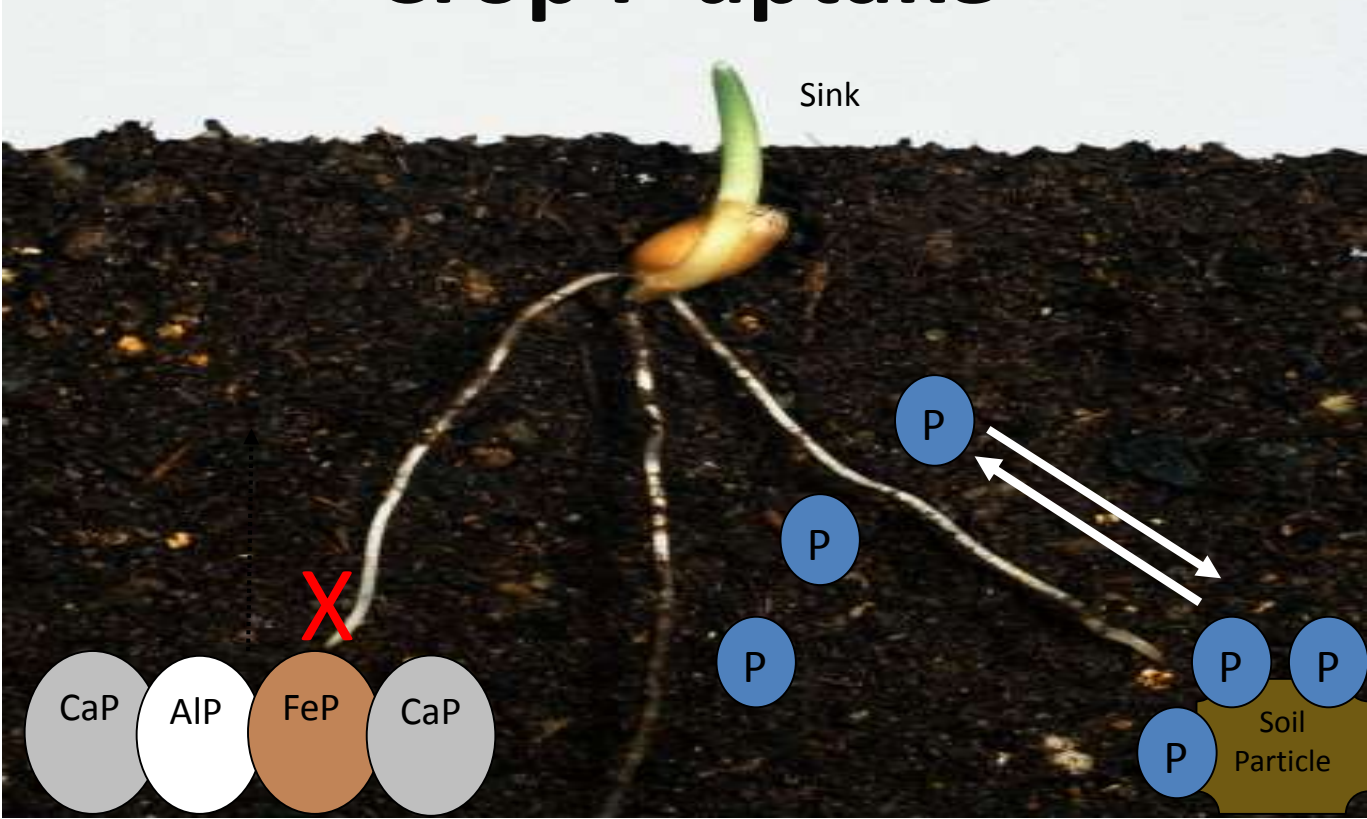
- Exchangeable K
 - Ammonium Acetate
 - Ammonium Chloride/Barium Chloride, WA adoption due to Aluminium

Current K lab methods

- DGT K

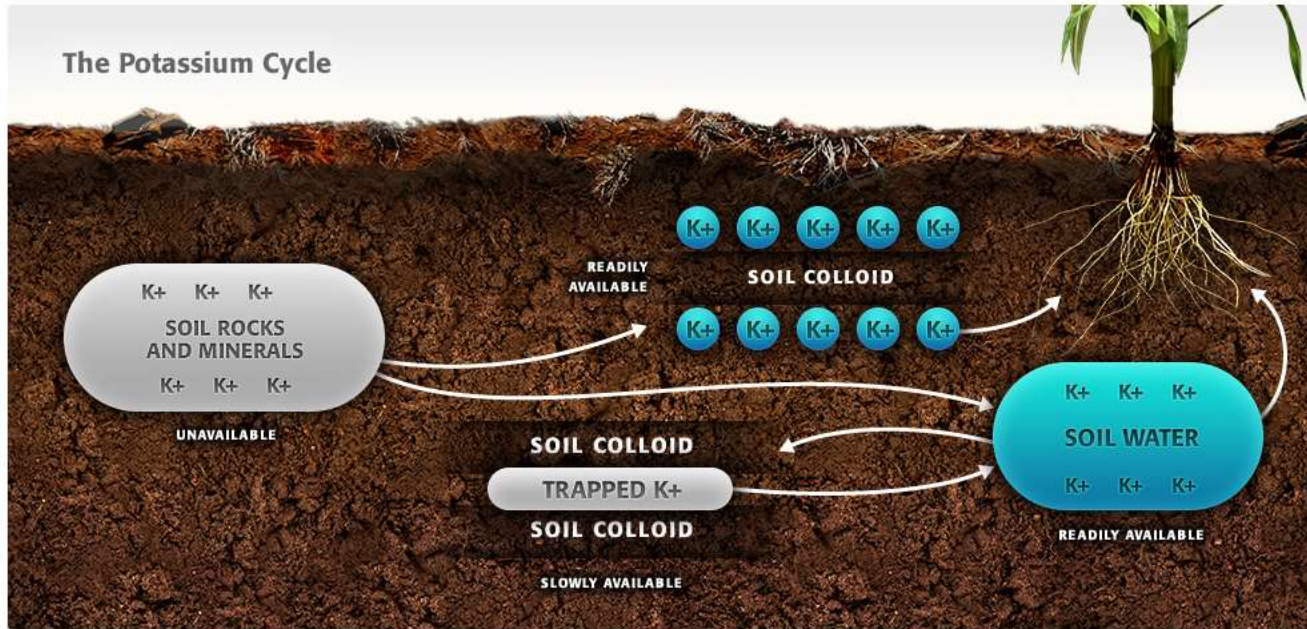


Crop P uptake



Potassium pools

Potassium supply to a crop



Structural K

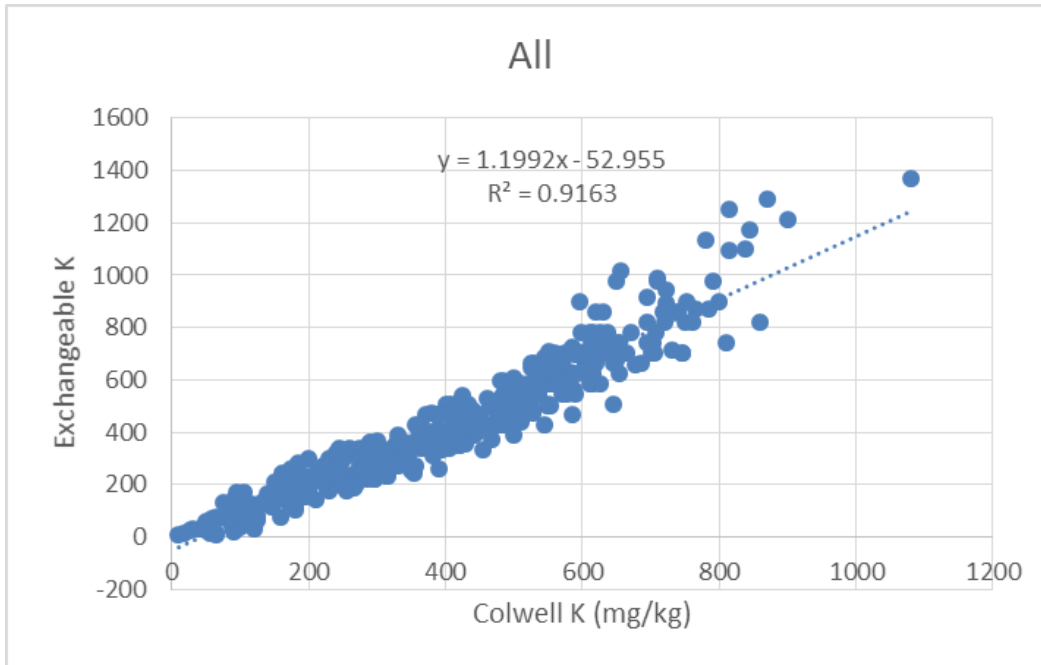
Interlayer K

Exchangeable K

Solution K

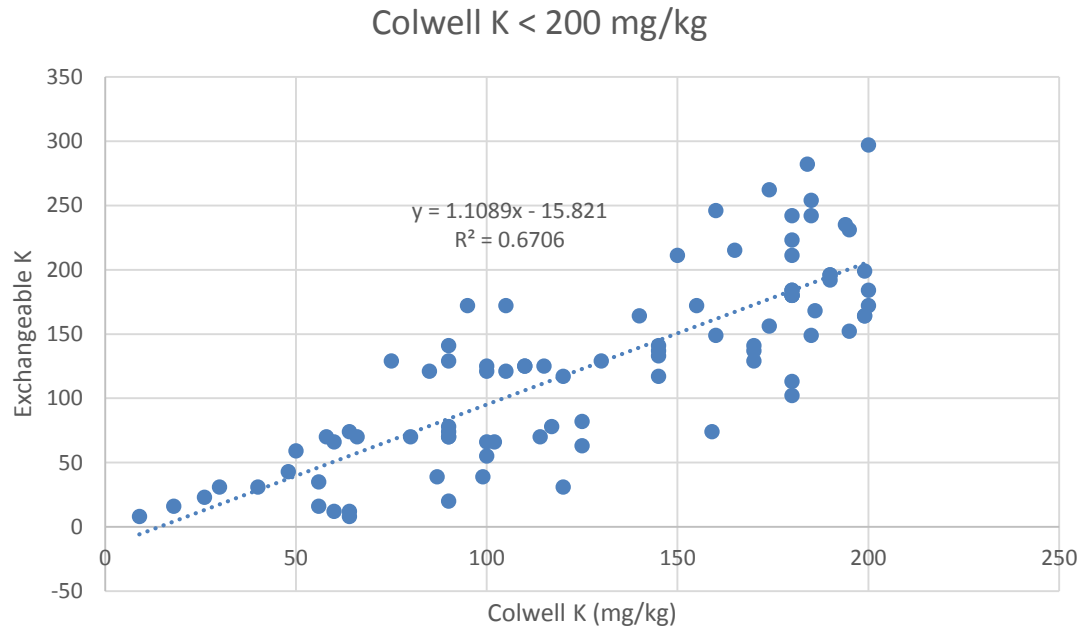
Is there a relationship between the methods?

- BFDC summary



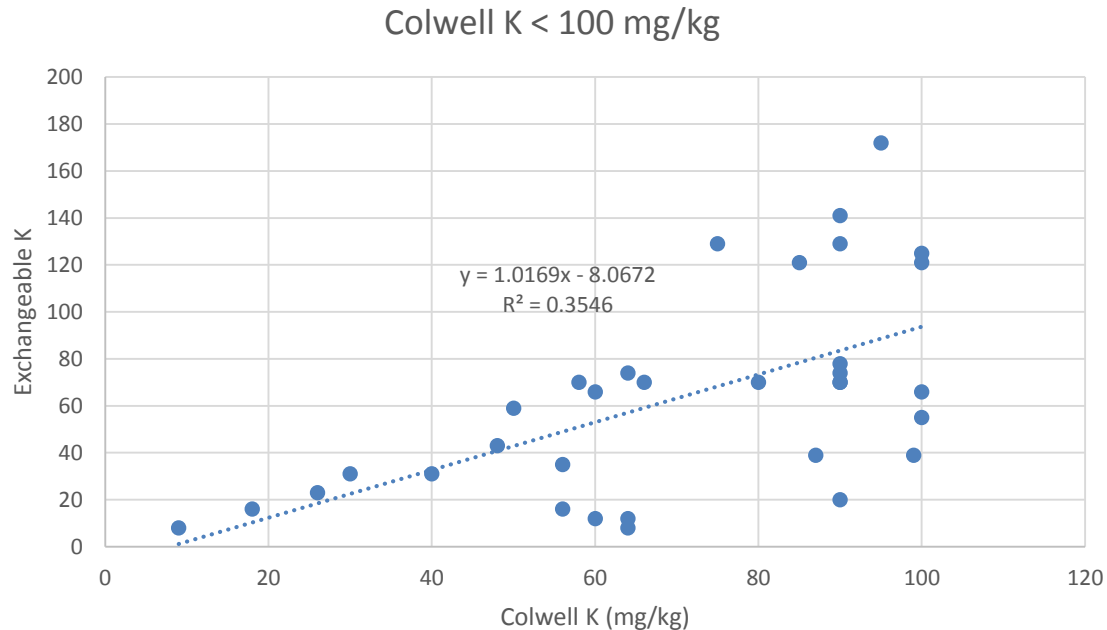
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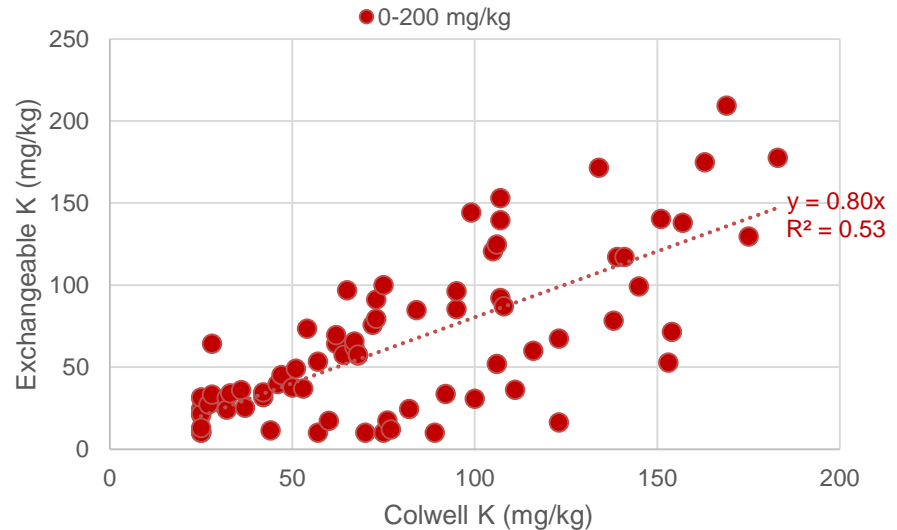
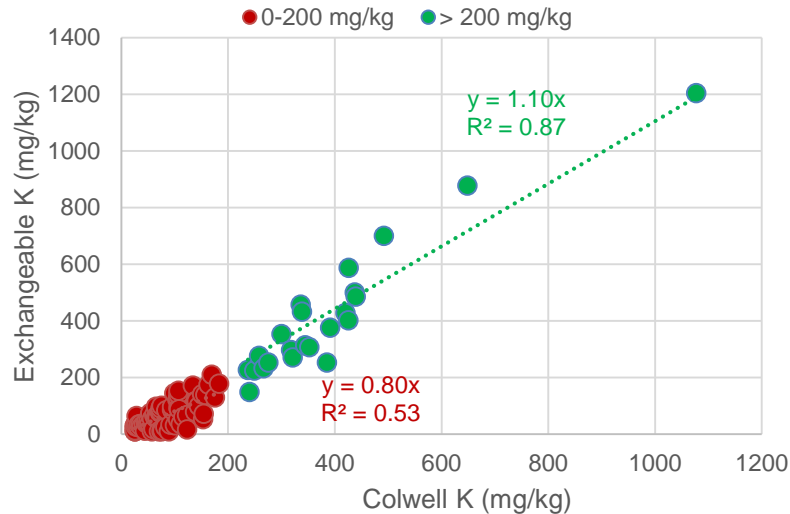
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- BFDC summary



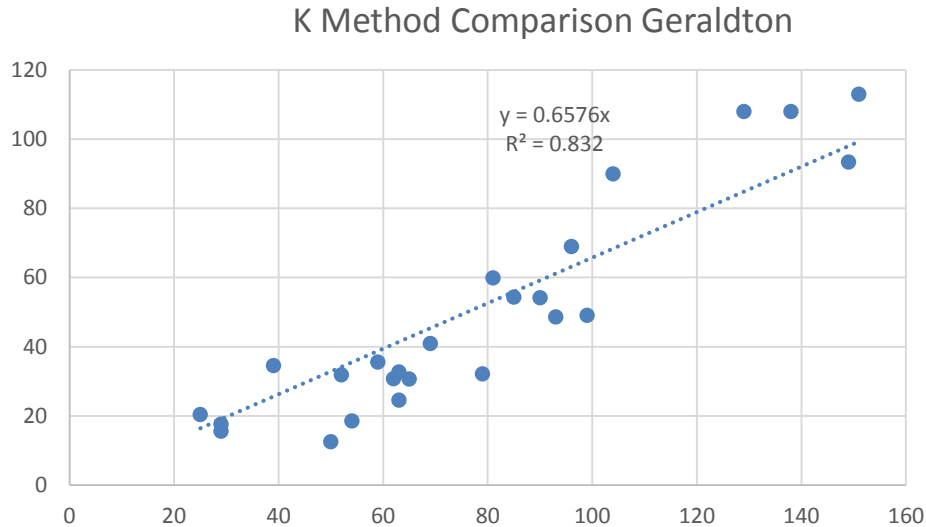
Is there a relationship between the methods?

- Local Data WA

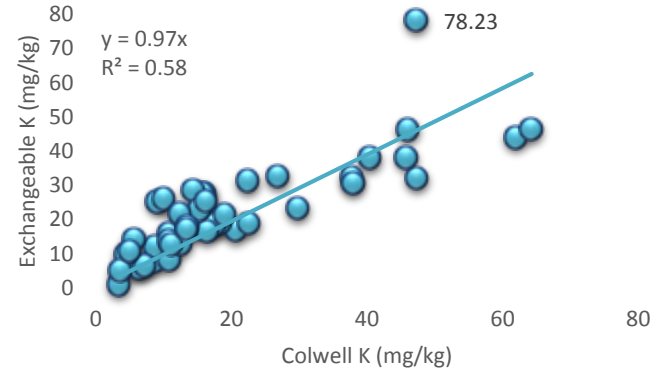


Is there a relationship between the methods?

- Local Data Geraldton



The trial site



Investigation – The trial

Site Characterisation & soil K manipulation

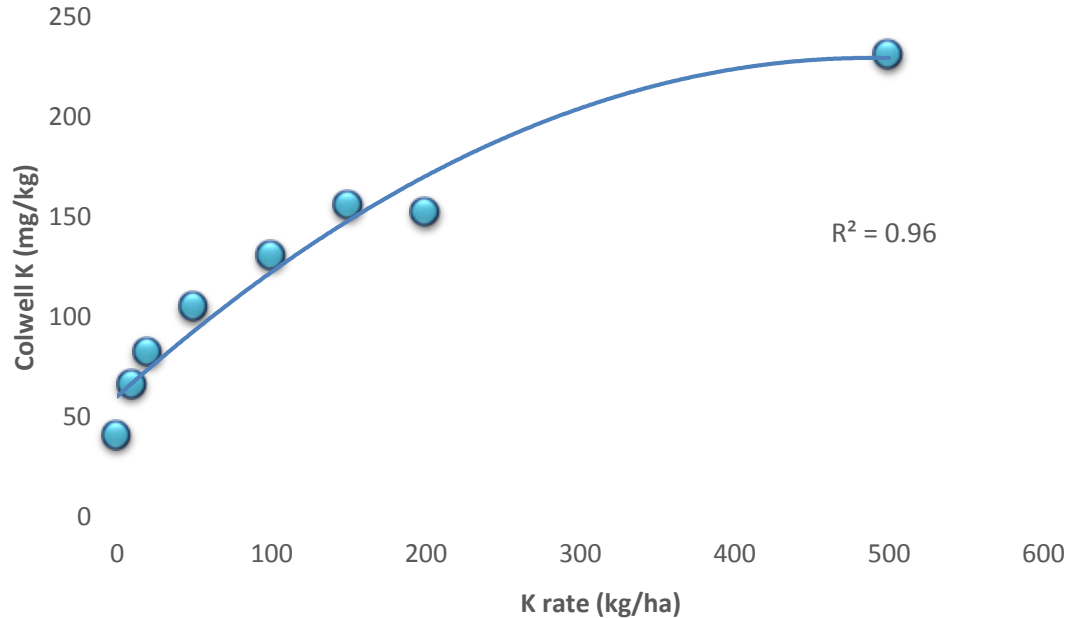
K averaged at 20-25 mg/kg (control plots)

TMT	K	At seeding – banded product kg/ha				Blended	IBS	PSPE	4-5 WAE
		N	N,S	N,P,S	N,P,K,S	K	K	K	N
1	0	35 Urea	15 MAXam	50 MAPSZC					85 UAN
2	10	35 Urea	9 MAXam		85 Vigour				85 UAN
3	20	35 Urea	9 MAXam		85 Vigour	20 MOP			85 UAN
4	50	35 Urea	9 MAXam		85 Vigour	40 MOP	40 MOP		85 UAN
5	100	35 Urea	9 MAXam		85 Vigour	60 MOP	120 MOP		85 UAN
6	150	35 Urea	9 MAXam		85 Vigour	60 MOP	160 MOP	60 MOP	85 UAN
7	200	35 Urea	9 MAXam		85 Vigour	60 MOP	260 MOP	160 MOP	85 UAN
8	500	35 Urea	9 MAXam		85 Vigour	60 MOP	460 MOP	460 MOP	85 UAN

Investigation – The trial, K manipulation

2 cores per plot, 6 treatment reps - every plot sampled and analysed in 0-10

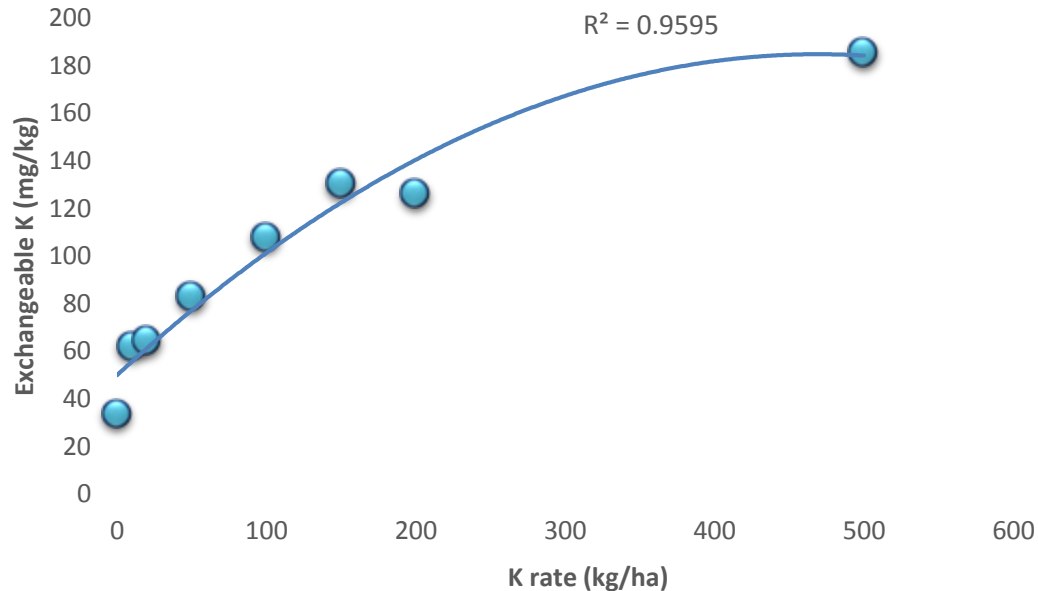
Sampling time July 17



Investigation – The trial, K manipulation

2 cores per plot, 6 treatment reps - every plot sampled and analysed in 0-10

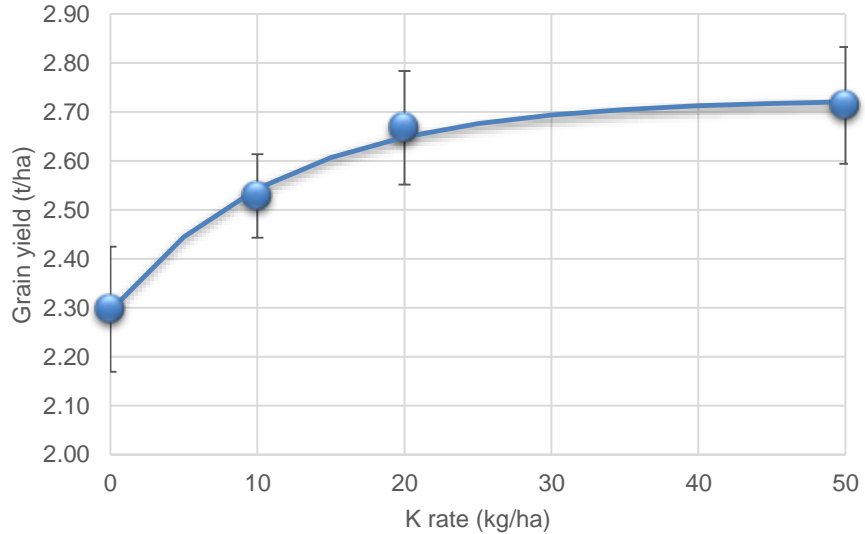
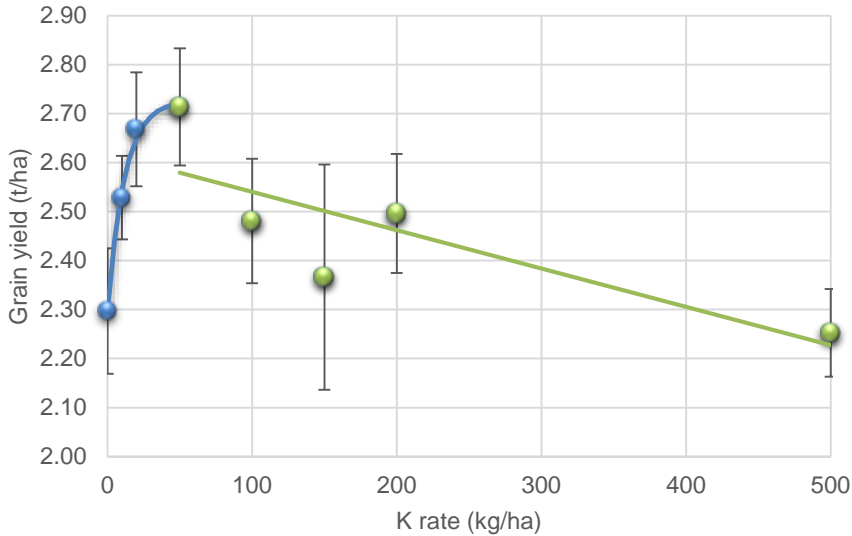
Sampling time July 17



Investigation – Yields and response

Response up to 50 kg/ha K

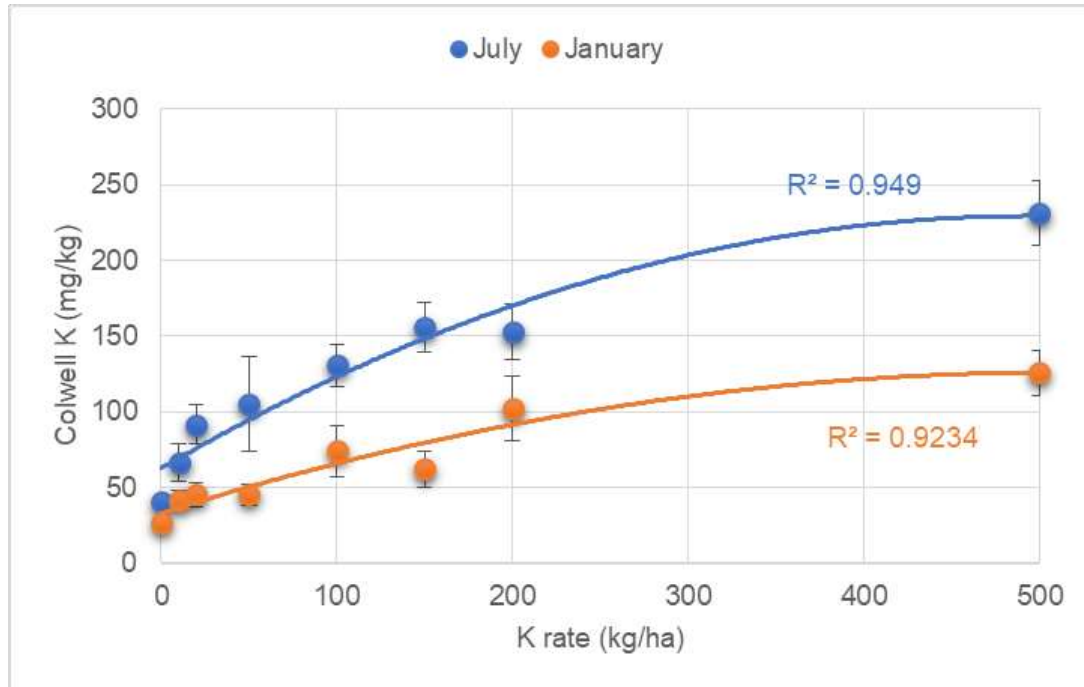
Yield reduction with higher rates



Investigation – Soil testing, January 18

0-10cm comparison

2 cores per plot, 6 treatment reps - every plot sampled and analysed in 10cm increments to 50cm

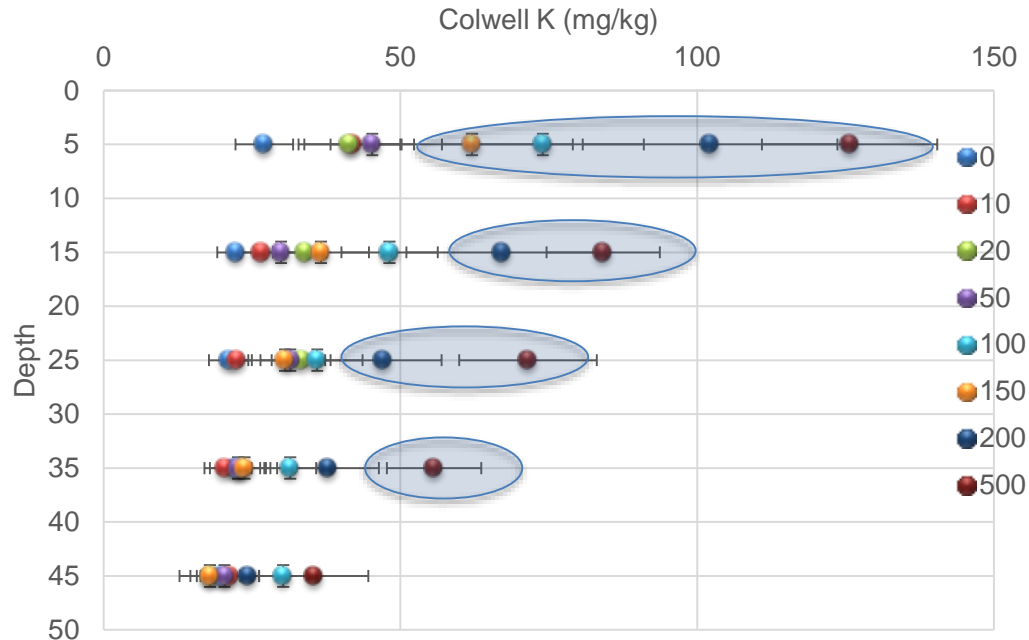


Investigation – Soil testing, January 18

2 cores per plot, 6 treatment reps, every plot sampled and analysed in 10 cm increments to 50cm

Sampling time Jan 18, 1040 K tests

Soil test value decrease from 220 to 125 from July sampling

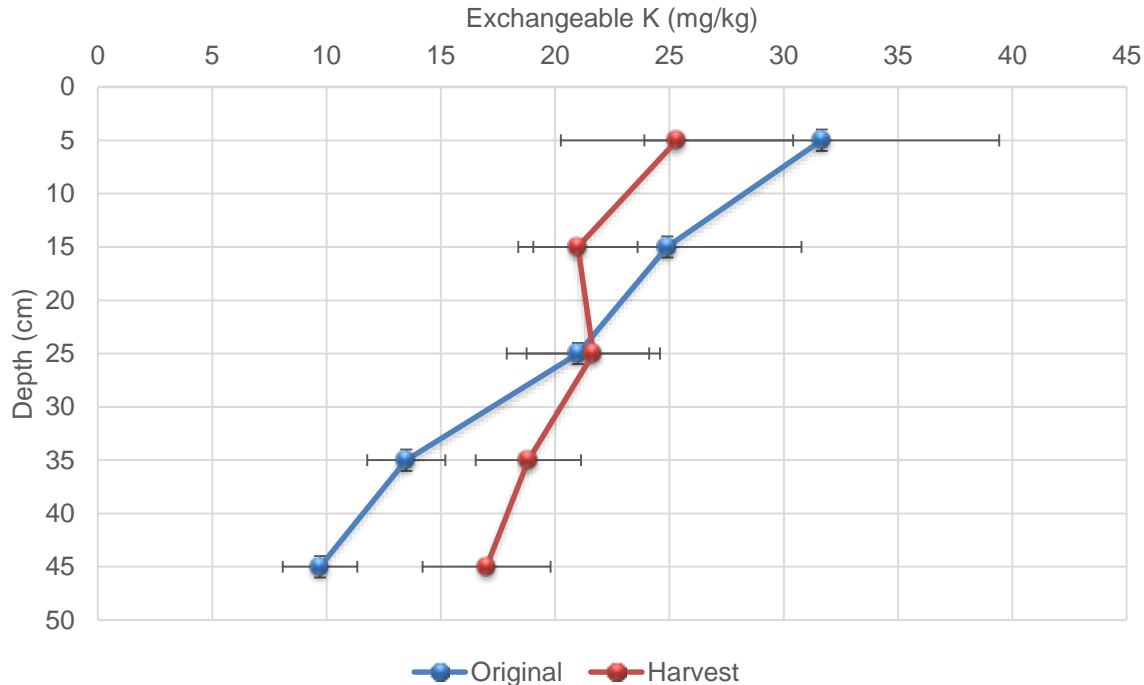


P < 0.05 to control

Investigation – Soil testing, January 18

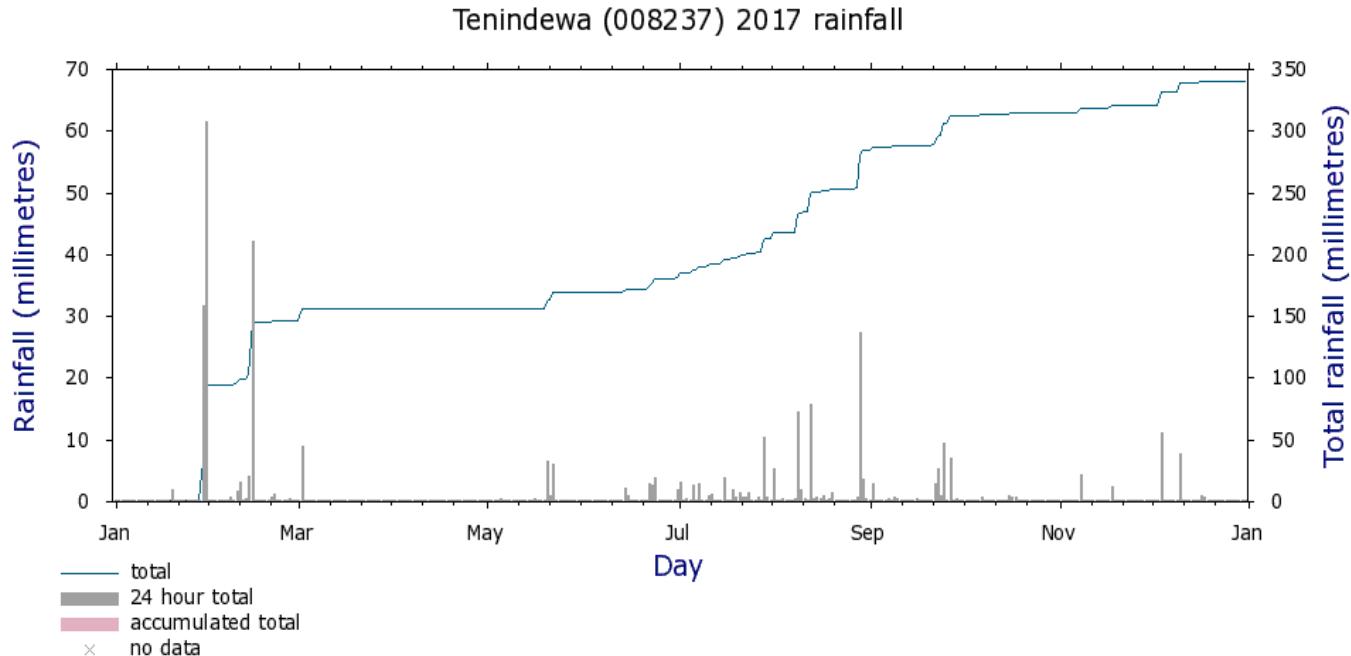
Comparison to original site classification, 0 K treatment

History – 20 kg/ha K annually




Investigation – Rainfall

175 mm since July sampling



Note: Data may not have completed quality control.

Climate Data Online, Bureau of Meteorology
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8 kg/ha K drilled every year
30 kg/ha K topdressed in 2012
25 kg/ha K topdressed in 2014
25 kg/ha K topdressed in 2016
Occasional windrow burn

Photo: Erin Cahill (agVivo) 2016



Quantities and concentrations – Nutrient redistribution

	Dry matter (t/ha)	N (%)	P (%)	K (%)
Canola				
Soil-attached residue	2.6	0.49	0.02	1.33
Harvestable biomass:				
Stems/leaves/pods – direct-headed	2.9	0.49	0.03	1.48
Stems/leaves/pods – swathed	2.8	0.58	0.04	1.22
Seed	1.3	3.27	0.59	0.72
Straw/chaff out the back of header	3.1	0.59	0.03	0.95
Wheat				
Soil-attached residue	2.5	0.63	0.01	1.03
Harvestable biomass:				
Stems/leaves/pods – direct-headed	2.3	1.27	0.13	0.67
Seed	4.5	1.80	0.24	0.44
Straw/chaff out the back of header	2.4	0.40	0.02	1.72

Summary

Trial to continue with Lupins in 2018 (3-5 years)

Soil K levels established – no K application ongoing to review responses to soil test levels

Track K movement (leaching) down the profile with rainfall
K Buffering INDEX?

A lot to learn about the K cycle – tools to differentiate soils and response

Sampling strategies – Are we going deep enough to budget for K?

Research funded by:



Special thanks to contributors:

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