Deep banding improves access to K in central Queensland cropping systems

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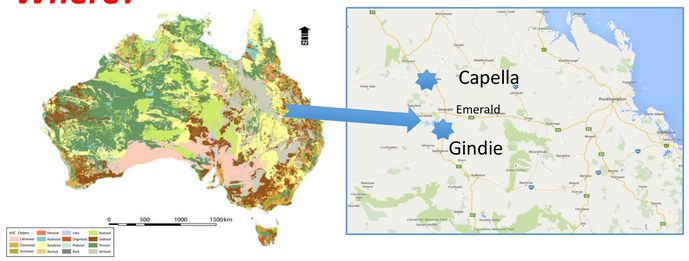
Where?



Two experimental sites were located in Central Queensland, around 300 km from the coast. This region has summer rainfall, on vertosols and the farming systems is based on opportunity cropping depending on the amount of stored water. Winter crops are wheat, chickpea; summer crops sorghum, mungbean.

Why?

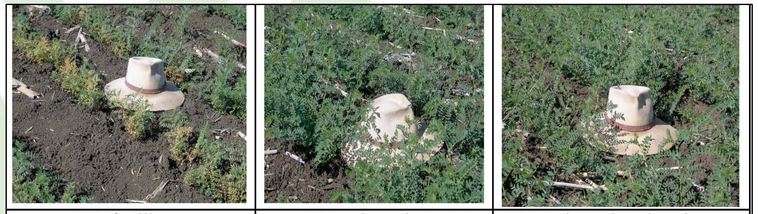
Gindie		
0-10	Colwell-P	13
	ExK	0.17
	KCl40-S	3
	DTPA Zn	0.2
10-30	Colwell-P	<5
	ExK	0.07
	KCl40-S	2
	DTPA Zn	0.1

Capella		
0-10	Colwell-P	10
	ExK	0.46
	KCl40-S	3
	DTPA Zn	0.3
10-30	Colwell-P	<5
	ExK	0.16
	KCl40-S	2
	DTPA Zn	0.1

Low subsoil multi-nutrient supply because the roots cannot exploit the topsoil which is usually dry when winter crops are grown. The question is how can nutrients supply in the subsoil be enhanced in a minimum tillage system with uncertain crop sequences and minimal soil disturbance.

What was done?

- 2011 Autumn, nutrients banded at 20 cm pre-crop, bands 50 cm apart.
- 40 kg P/ha, 200 kg K/ha, 30 kg S/ha, enough for several crops
- Nutrients factorially combined, 6 replicates.
- Cropped over the whole experimental area with normal fertilizer practice (starter P and tactical N) by the landholder.
- Biomass, nutrient concentration, grain yields measured at crop maturity.

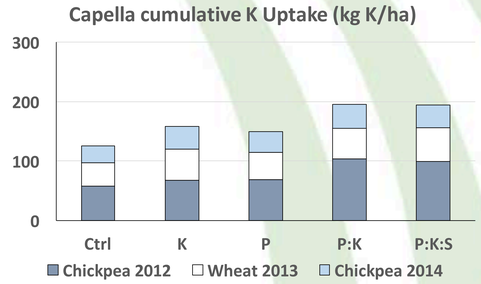


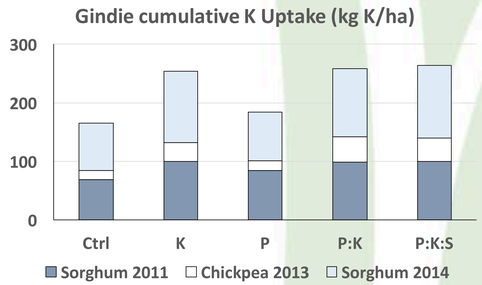
No fertilizer (1.00 t/ha)	Potassium alone (1.27 t/ha)	Potassium plus phosphorus (1.51 t/ha)

What happened?

Site and crop/year	Control	K	P	S	PK	PS	KS	PKS	LSD (P<0.05)
'Stranraer' Capella									
Chickpea 2012	2.33	2.34	2.75	2.32	2.89	2.79	2.30	2.83	0.17
Wheat 2013	2.08	2.19	2.25	2.19	2.36	2.25	2.20	2.34	0.09
Chickpea 2014	1.51	1.59	1.57	1.53	1.69	1.65	1.60	1.75	0.10
Sorghum 2015	3.05	3.10	3.10	3.10	3.06	3.16	3.10	3.22	ns
Chickpea 2016	2.37	2.36	2.36	2.32	2.46	2.57	2.33	2.62	0.12
'Bendee' Gindie									
Sorghum 2011/12	2.32	2.39	2.78	2.36	2.90	2.81	2.35	2.81	0.14
Chickpea 2013	1.15	1.47	1.32	1.21	1.74	1.18	1.52	1.61	0.26
Sorghum 2014/15	2.94	3.40	2.99	2.90	3.38	3.25	3.19	3.25	0.20
Chickpea 2016	2.35	2.48	2.45	2.43	2.49	2.41	2.23	2.40	†

- Since 2011, when the nutrients were supplied the total yield increases over the control were 11% and 2% to K alone, and 6% and 9% to P alone at the Gindie and Capella sites respectively.
- However, when P and K were supplied together, yields increased by 20% and 10% at the two sites.
- At the Capella site over three crops, P application increased K uptake compared to adding K alone, while at the Gindie site P and K application had an additive effect on K uptake.
- Seasonal conditions and crop both affected the response to deep placement.





What's it mean?

There are multiple nutrient limitations in these systems that need to be addressed, and at these sites P and K banded at 20 cm showed responses over 7 crops in 5 years and over different seasons.

When supplied together, there can be synergy between P and K in terms of accessing and taking up K.

This research shows that deep placement of P and K at the start of a cropping cycle can meet nutrient demands in this opportunity cropping system without annual disturbance.

The sites continue to be monitored for residual effects after 5 crops.

For more information see:
http://anz.ipni.net/topic/managing-k-in-northern-cropping-systems

Supported by: GRDC Grains Research & Development Corporation | The University Of Queensland Australia | QAAFI Queensland Alliance for Agriculture and Food Innovation | Canpotex | IPNI International Plant Nutrition Institute