

# Potassium removal and use in Australia

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***Better Crops, Better Environment ... through Science***

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# Key Agricultural Industries



Industry	Australia (\$M AUD)	New Zealand (\$M NZD)
Wheat	<b>7,998</b>	
Coarse Grains	<b>3,384</b>	703
Oilseeds	<b>2,129</b>	
Cotton	<b>2,006</b>	-
Sugar	1,227	-
Grapes	1,003	3,306
Other Horticulture	7,943	
Dairy	<b>4,729</b>	<b>14,637</b>
Beef	<b>8,543</b>	2,209
Wool	2,530	580
Sheep	2,641	2,518
Total	53,500	25,822



# Agricultural industry distribution (Australia)

- Rainfall largely determines agriculture systems

- Low rainfall pastoral

- extensive grazing

- Temperate south

- Intensive grazing

- Cropping Industries

- Tropical north

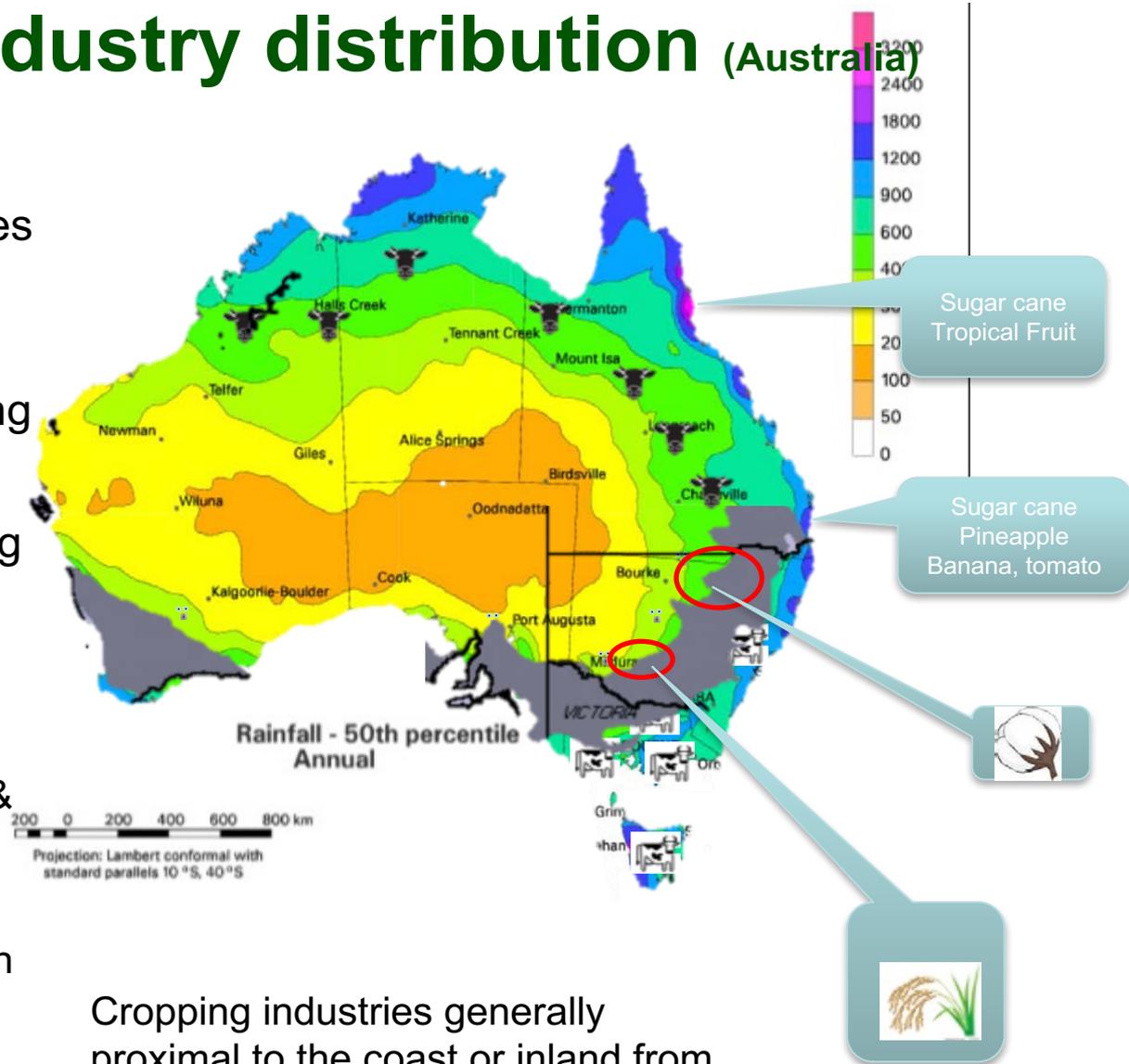
- Sub-tropics

- Located between 300 & 800 mm

- Winter crops south

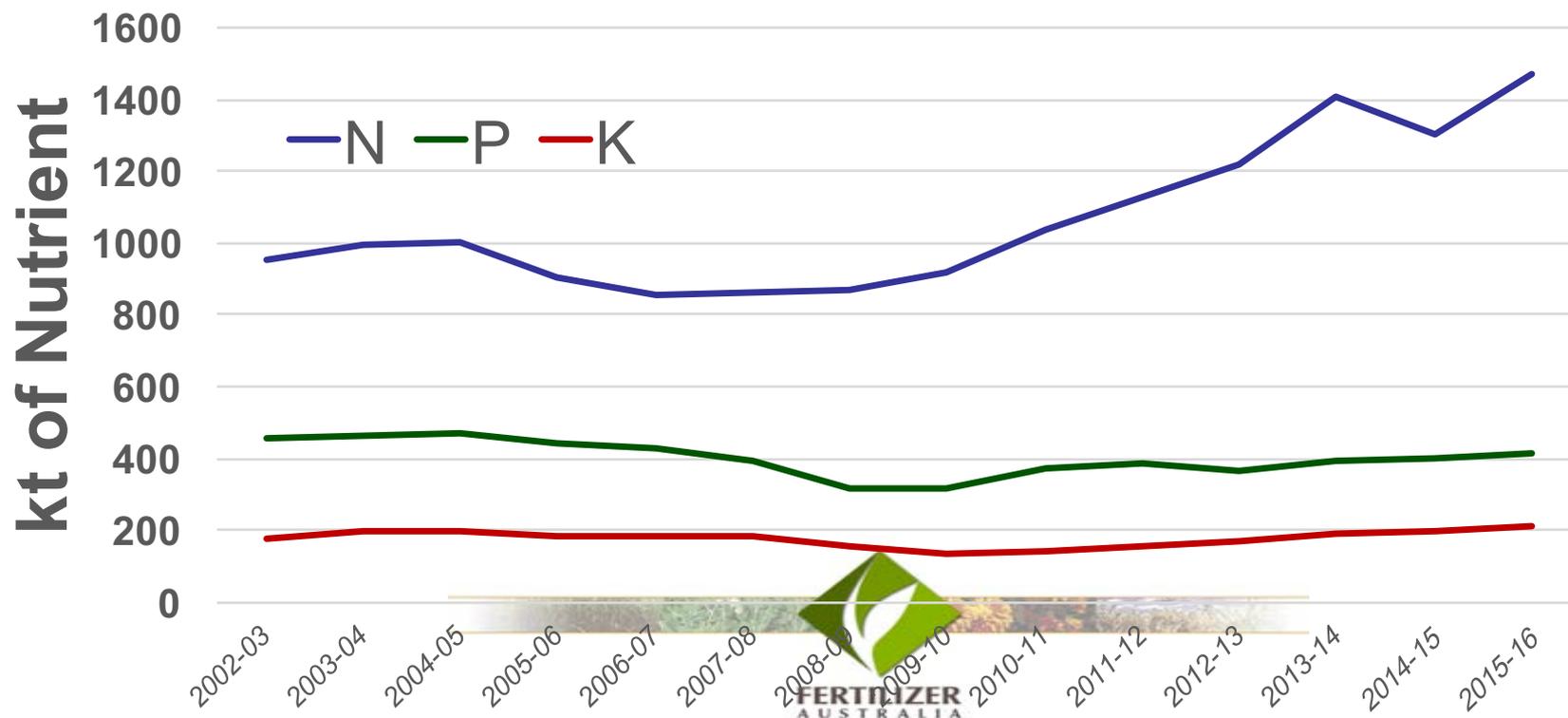
- Summer crops northern

- Irrigated cotton & rice



Cropping industries generally proximal to the coast or inland from the Great Dividing Range

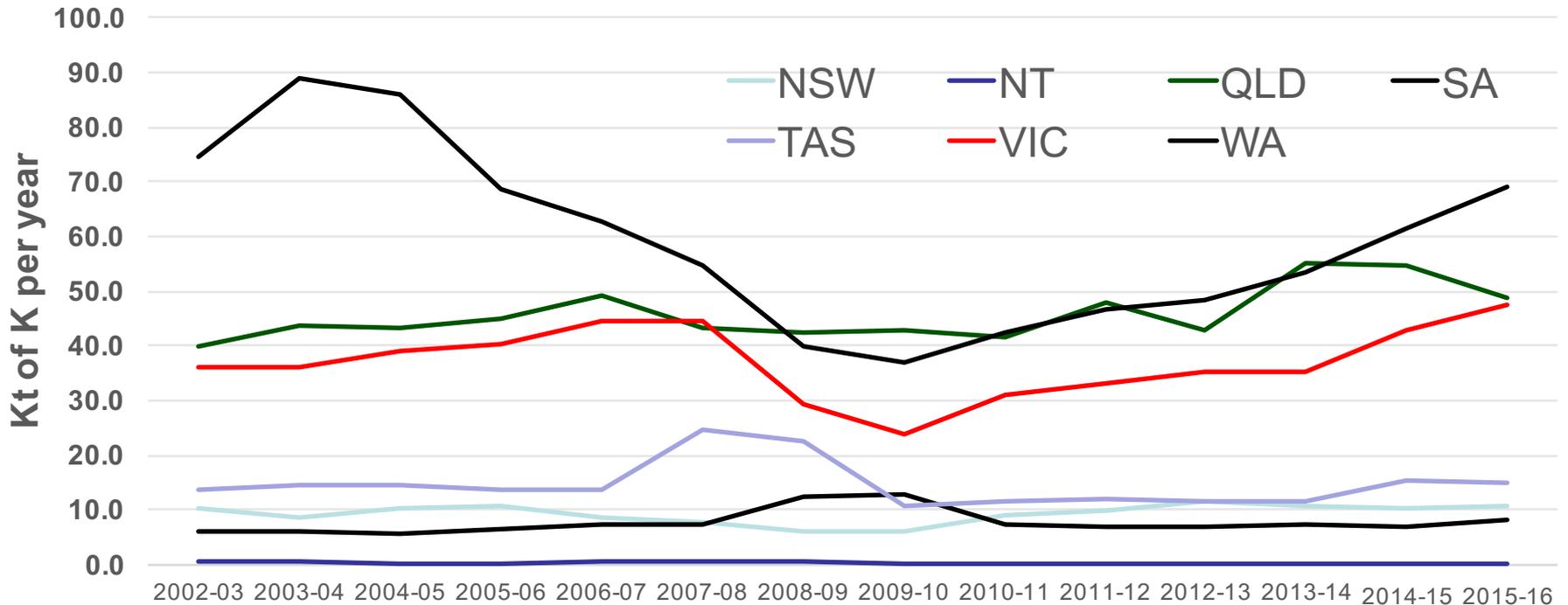
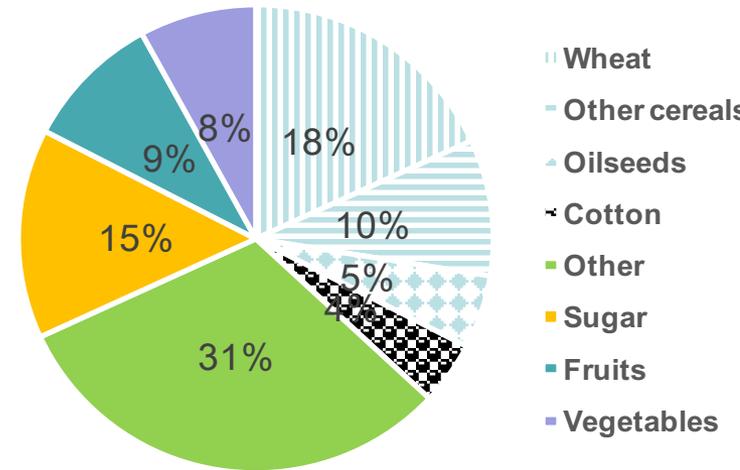
# Fertilizer use in Australia



- K use ~1% of global K use – 200kt K/y, 93% MOP, all imported
- K small recovery since 2009
- N consumption increasing (more crop, less pasture)
- P declined and now in recovery but still low

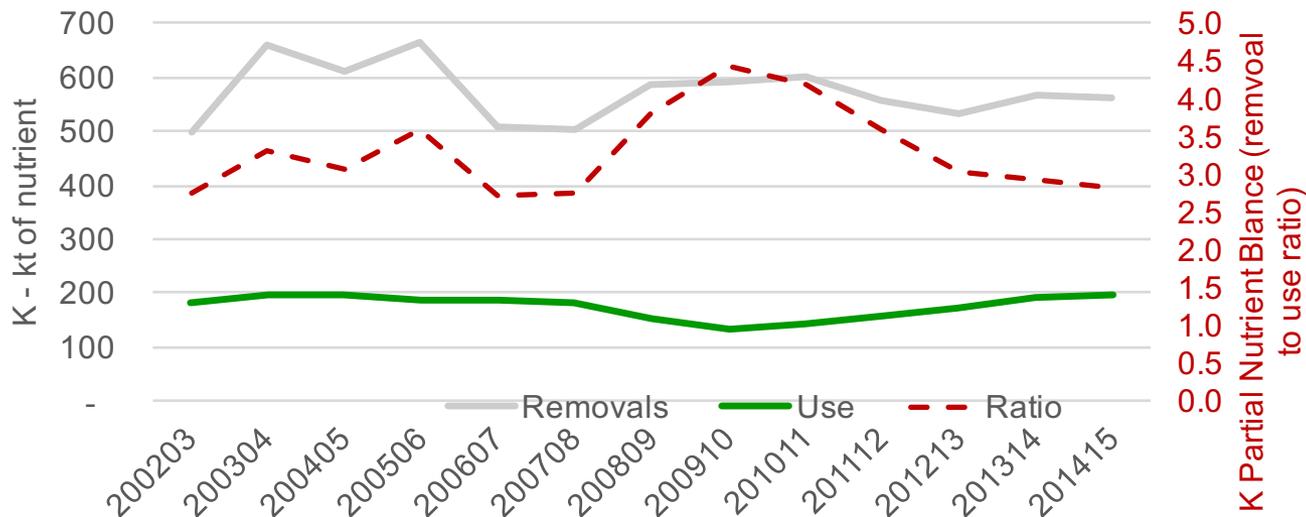
# Patterns of K use

- Use patterns follow industry location
  - WA, grains industry, largest market
  - Queensland. sugar industry
  - Victoria, dairy industry.



# Removal & Use in Australia

K Removals and Use, Australia 2002-2015



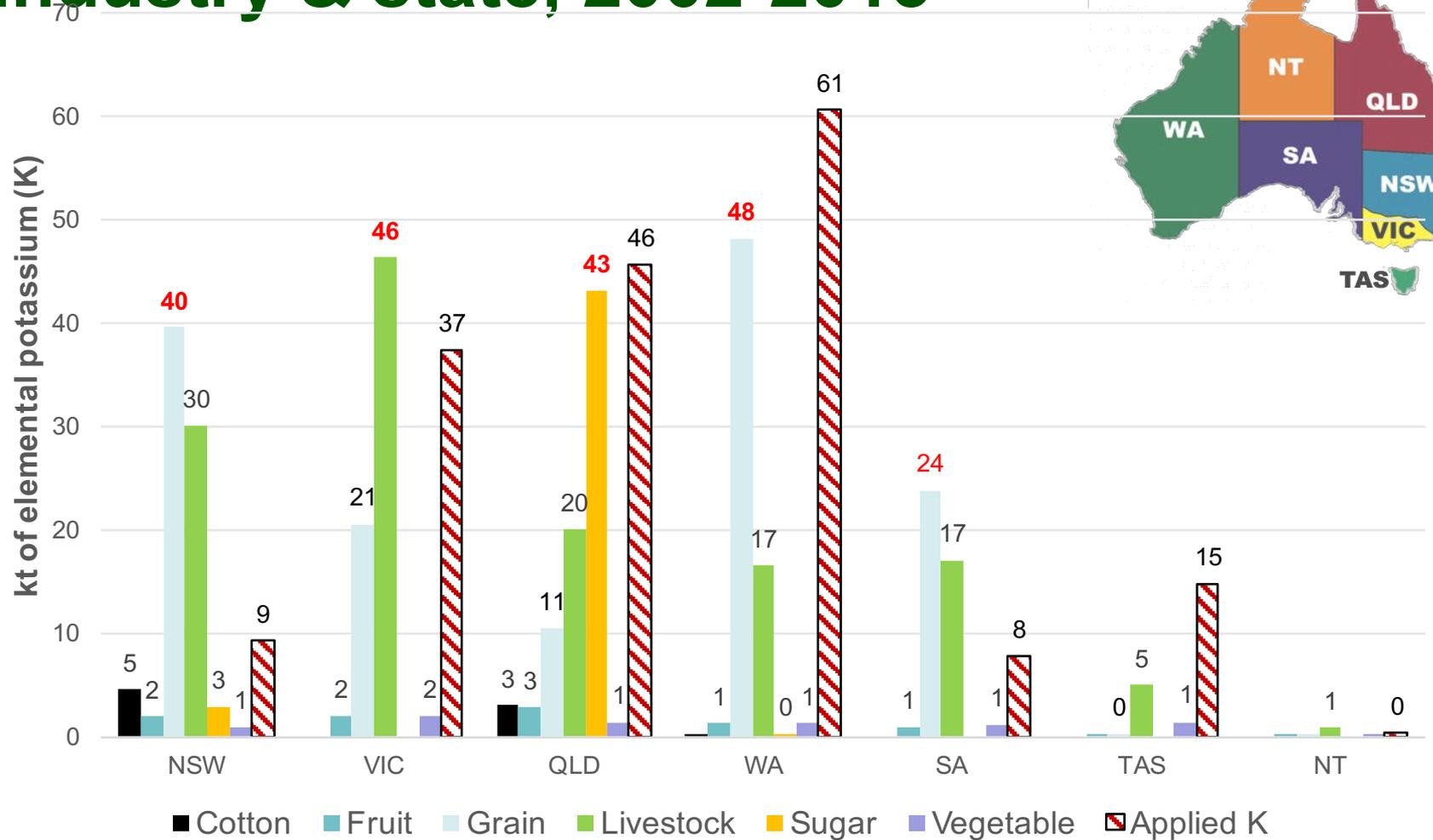
## K PNB, Cereals only\*\*

	K PNB
Australia	3.9
Brazil	0.6
Canada	2.1
China	1.5
Indonesia	2.3
Mexico	7.5
Morocco	3.8
Russia	3.1
South Africa	4.1
Turkey	8.3
USA	1.0
Vietnam	1.0
<b>World</b>	<b>1.5</b>

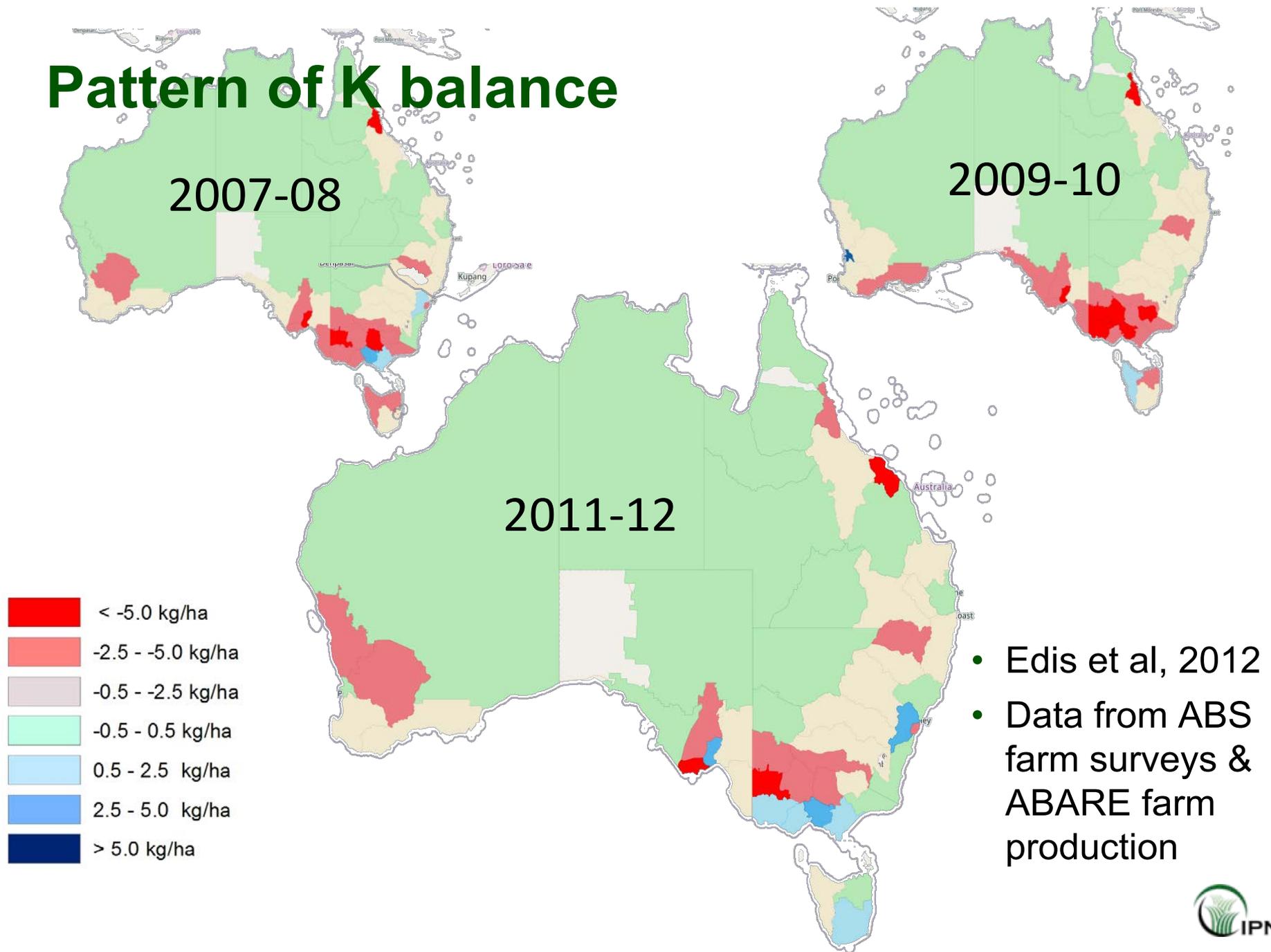
Nutrient	Western Australia	South Australia	Victoria	Tasmania	New South Wales	Queensland*
<b>Grazing</b>						
Potassium	negative/positive	negative	positive/negative	neutral/positive	neutral/negative	negative
<b>Cropping</b>						
Potassium	negative	negative	negative	neutral	negative	negative

K use based on FUBC, IFA  
Production, based on FAO  
Mean K contents, IPNI

# Mean annual K removal & use by industry & state, 2002-2015



# Pattern of K balance

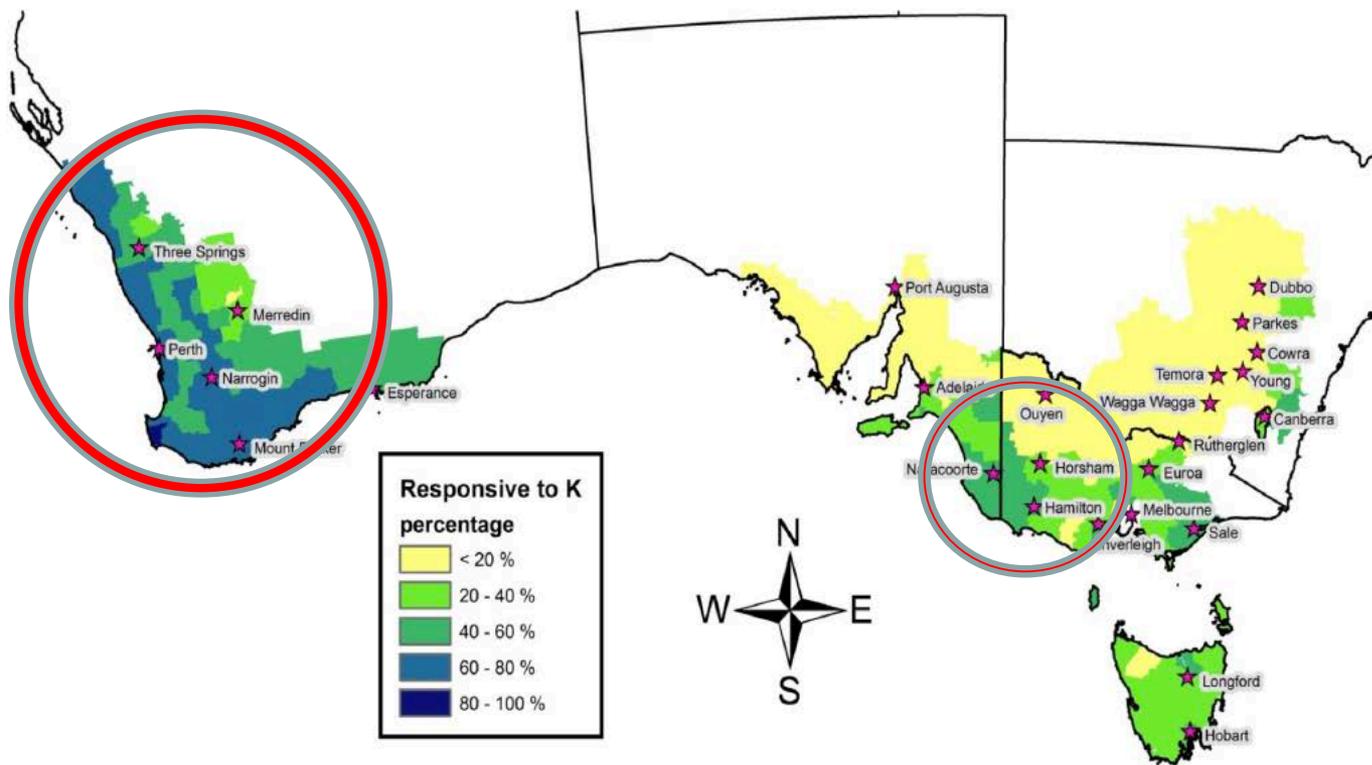
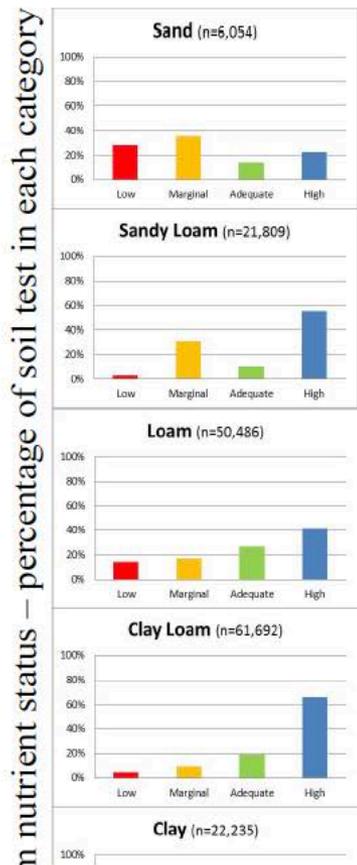


# Drawing those threads together

- Inconsistent data between Farm Surveys (eg ABS) & Industry information (eg Fertilizer Australia)
- By industry
  - Sugar (Queensland) appears the most "imbalanced"
    - Data collected ignores recycled materials (mill wastes)
  - Dairy (Victoria) also appears "imbalanced"
    - Data does not include purchased feeds
    - Gourley & Weaver (2012) farm survey reported annual mean K surplus of 77 kg K/ha (13-452 kg K/ha/y)
  - Grains industry
    - All regions being depleted, but there are regional differences in soil supply.
  - Cotton industry use is very variable depending on water storages
    - 70 kha to 700 kha.

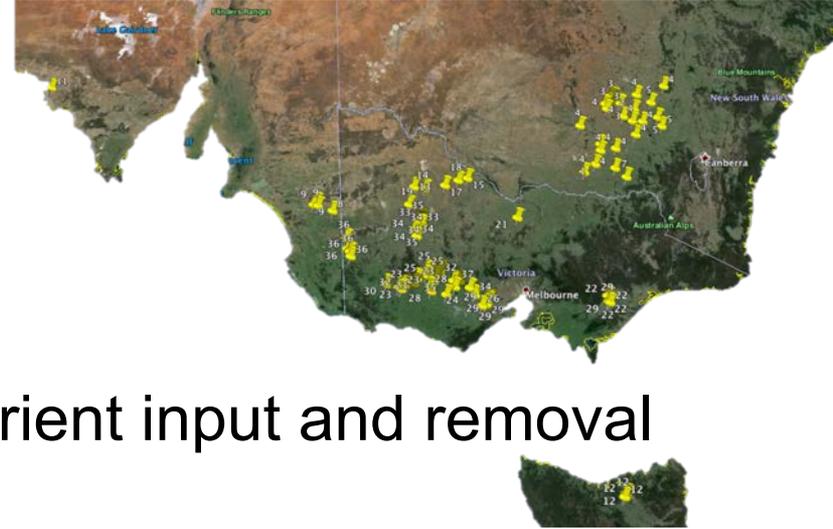
# S<sup>th</sup>n Australia predicted K responses: based on soil test K levels from 1990's

## % soil tests Responsive to Potassium



Soil test is either bicarbonate extractable (Colwell K) or ammonium acetate extractable (ex-K) top 10 cm.

# K use in southern cropping systems



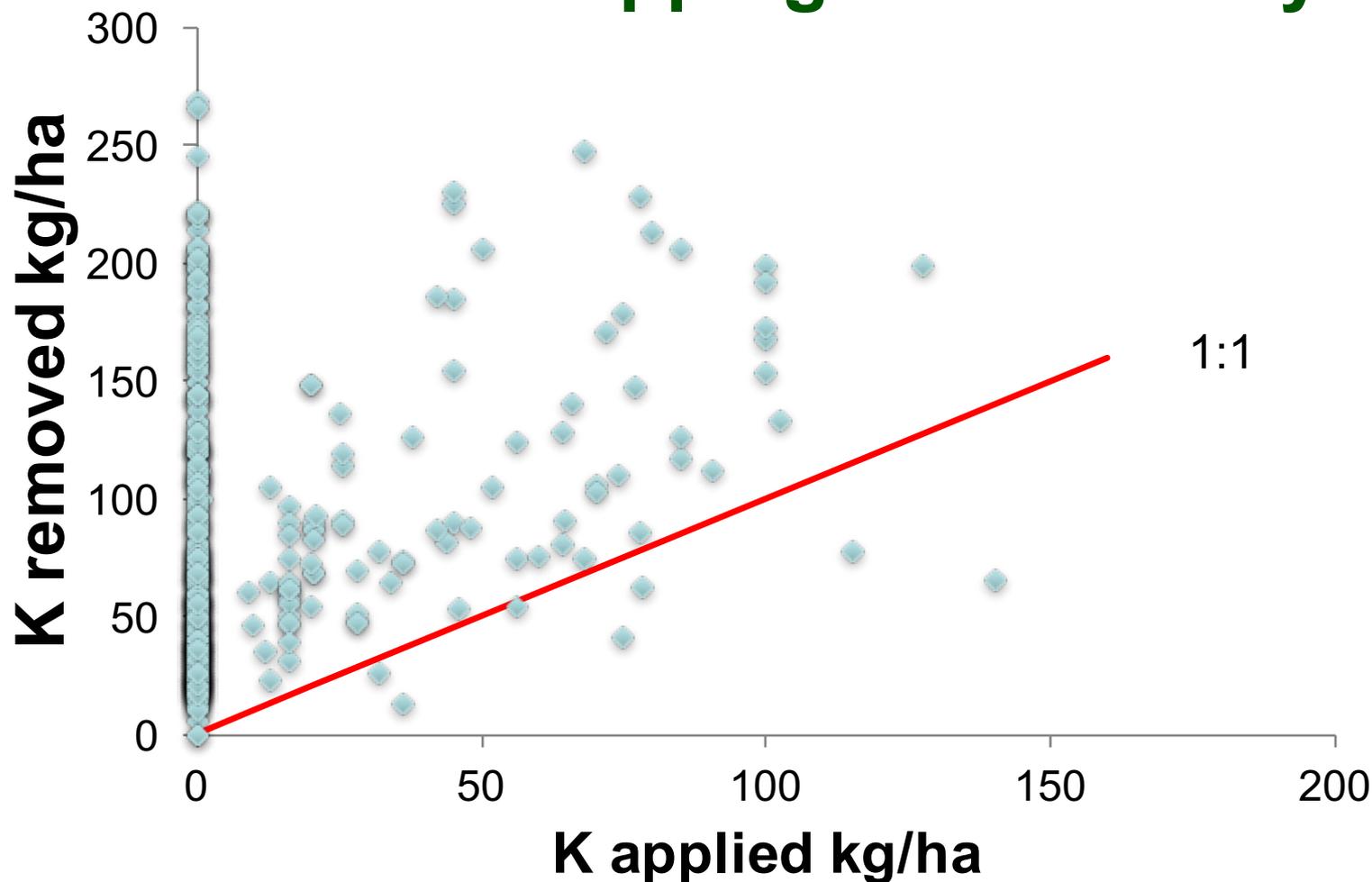
- Collected farm/paddock level nutrient input and removal from farmers and consultants
  - 3-5 years of paddock records, 2555 paddock/years
    - Crops, yields, protein, hay, stubble management
    - Nutrient densities derived from earlier wheat and canola nutrient concentration surveys.
- K was particular interest in the high rainfall zone of southern Australia,
  - Another 1 Mha plus of production area
  - High yielding (cereals 3-5 t/ha) ~ half potential
  - 3 fold increase in grain production to 10 Mt plus
  - Balanced nutrition a key part of meeting this potential.



Region	High Rainfall Zone	Southern New South Wales	Wimmera	Mallee
Annual Rainfall (mm)	>600	450-600	450-350	<350
Growers	45	33	17	23
Fields & Years	829	316	411	1030
Area	7,600	5,300	4,200	17,800
% Cereal	57	56	46	70
% Oilseed	34	34	14	11
% Legume	9	9	34	16
No of fields where K used	85	0	7	0
Rate on canola (kg/ha)	90	-	25	-
Rate on cereal (kg/ha)	66	-	81	-

K used on 9% of fields in HRZ – an area where low K is recognized

# K balance from cropping fields survey



Look at 500+ fields over 3-5 years

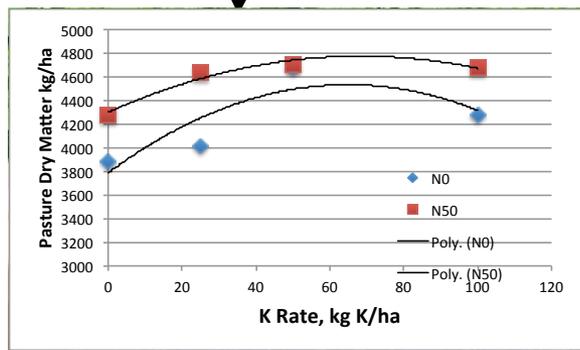
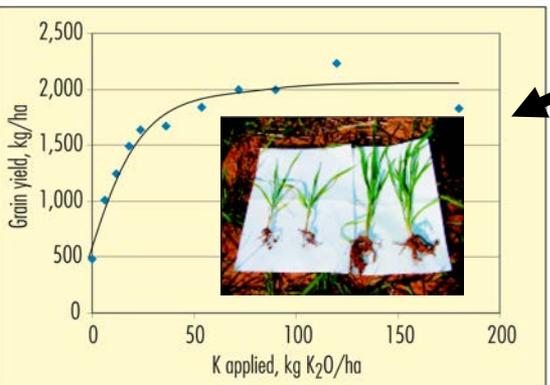
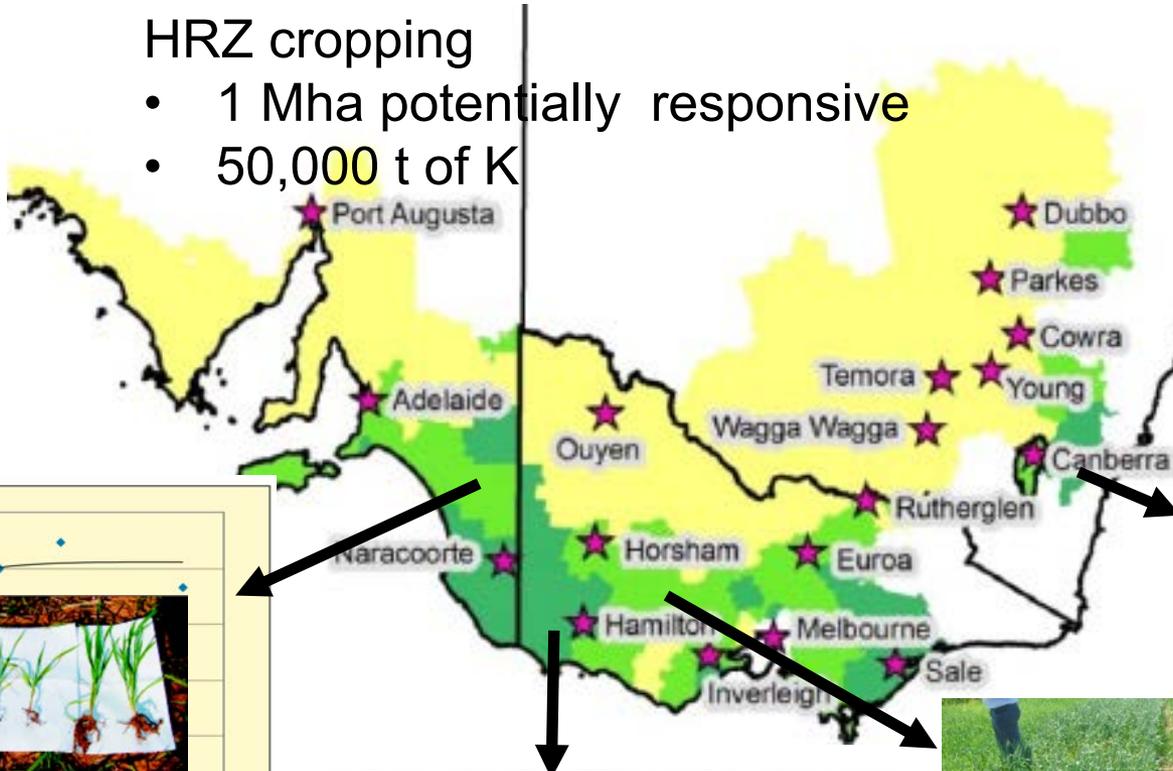
Less than 10% of fields received K in the most K responsive area

Only 6 fields were in K surplus.....

# Are there responses to K?

- HRZ cropping
- 1 Mha potentially responsive
  - 50,000 t of K

Light soils  
Acidic  
High rainfall  
“Hay cutting”

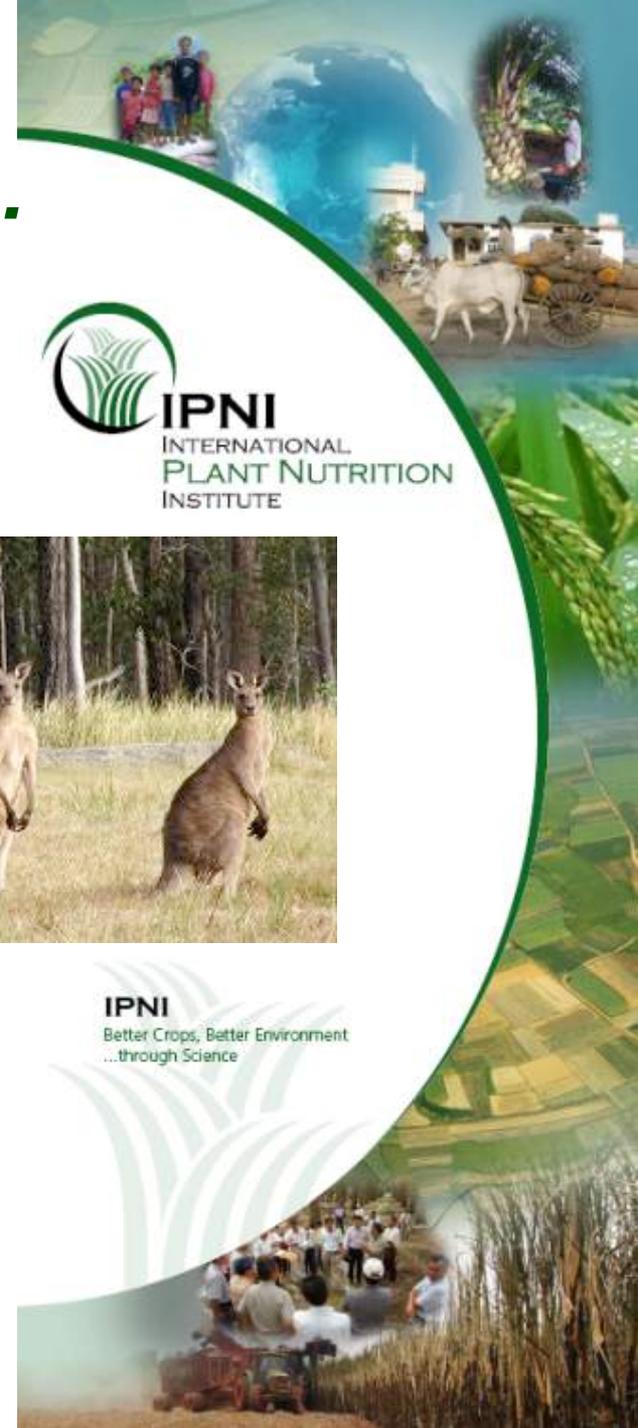


Northern systems - see paper by Dr Lester, Friday 0945

# Summary

- In global terms, Australia is a small market for K.
  - The main K uses are in sugar (Queensland), dairy (Victoria), grains (Western Australia). Cotton also important (seasonal).
- K removal nationally is around 4 times more than is supplied as fertilizer.
  - Areas of imbalance are consistent with regional industries.
- In the grains industry, even where K is used, there are few situations where K input/output is balanced.
  - There are areas of potentially responsive soils co-incident with the developing high yielding grains industry – *co-limitations*
- *Current research is improving the reliability of soil testing for K – depth of sampling, crop specific, soil types.*

# Thanks for your attention.....



 Agrium Inc.	 الپوتاش العربیة Arab Potash Company	 BHP Billiton	 CF Industries Holdings, Inc.
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 Compass Minerals Plant Nutrition	 International Raw Materials LTD	 Kingenta Ecological Engineering Group Co., Ltd.	 K+S KALI GmbH
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 The Mosaic Company	 OCP S.A.	 PHOSAGRO PhosAgro	 PotashCorp
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 Shell Sulphur Solutions	 Simplot	 Sinofert Holdings Limited	 Uralchem, JSC
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 Uralkali	 Yara International ASA
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 Arab Fertilizer Association (AFA)	 Associação Nacional para Difusão de Adubos (ANDA)	 Fertiliser Association of India (FAI)	 Fertilizer Canada
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 The Fertilizer Institute (TFI)	 International Fertilizer Association (IFA)	 International Potash Institute (IPI)	 The Sulphur Institute (TSI)
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