



# Key Findings and Recommendations from the National Biosolids Research Program Introduction and Welcome

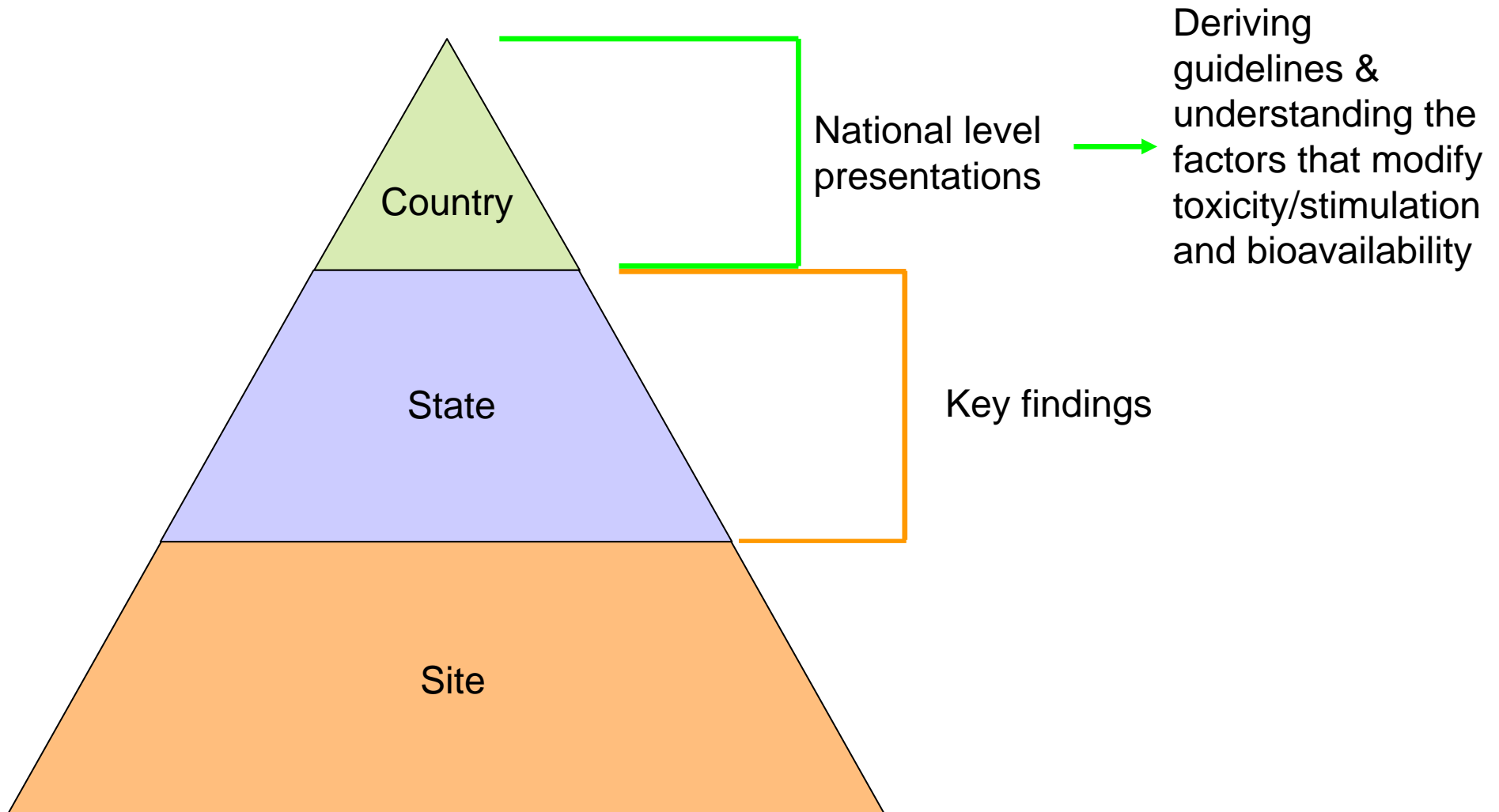
Michael Warne on behalf of the NBRP team

7 December, 2007





# Welcome





## Program for the seminar

<b>Topic</b>	<b>Presenter</b>
Welcome, Introduction and Overview	Michael Warne
Key findings from the WA component	Deb Pritchard
Derivation of recommended guidelines for Cu and Zn	Michael Warne
Derivation of recommended Cd guidelines	Mike McLaughlin
Key findings and recommendations on nutrient guidelines	Deb Pritchard Mike McLaughlin
Where to from here	Michael Warne
General discussion	All



# ACKNOWLEDGEMENTS



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Australian Government  
Australian Centre for  
International Agricultural Research





# The NBRP Team

SA	M. McLaughlin, M. Warne, K. Broos, D. Heemsbergen, Mark Whatmuff, B. Zarcinas, G. Cozens, M. Smart, C. Fiebiger, C. Baldock, R. Correll, M. Barnes, S. Rogers, G. Pollard, D. Stevens, T. Biswas, A. Pastuhova, B. Tomczak.
Qld	M. Bell, G. Barry, A. Jeffrey, G. Harch, X.Liu, G. Pu, P. Want, formerly T. Cokely, K. Rose.
NSW	M. Whatmuff, M. McLaughlin, M. Warne, D. Harvey, formerly K. Langdon, T. Micevska.
WA	D. Pritchard, D. Collins, N. Penney, B. Bowden, K. Crute.
Vic	D. Nash, C. Butler, M. Boomsma, A. Surapaneni, J. Cody, M. Davey, formerly J. Stokes.



# Housekeeping

Location of toilets -

Security -

Emergency exit procedures -

Thank you for attending this workshop and we look forward to your questions, comments and discussion throughout today.



# Preliminary hazard assessment of metals in biosolids

Element	Maximum conc in biosolids (mg/kg)	Mean conc in biosolids (mg/kg)	EIL (mg/kg)	Ranking of hazard based on maximum conc	Ranking of hazard based on mean conc
arsenic	12	5	20	6	6
chromium	307	92	300	4	5
copper	1500	645	100	1	1
lead	190	60	600	7	7
manganese	370	180	500	5	4
nickel	80	32	60	3	3
zinc	2000	740	200	2	2



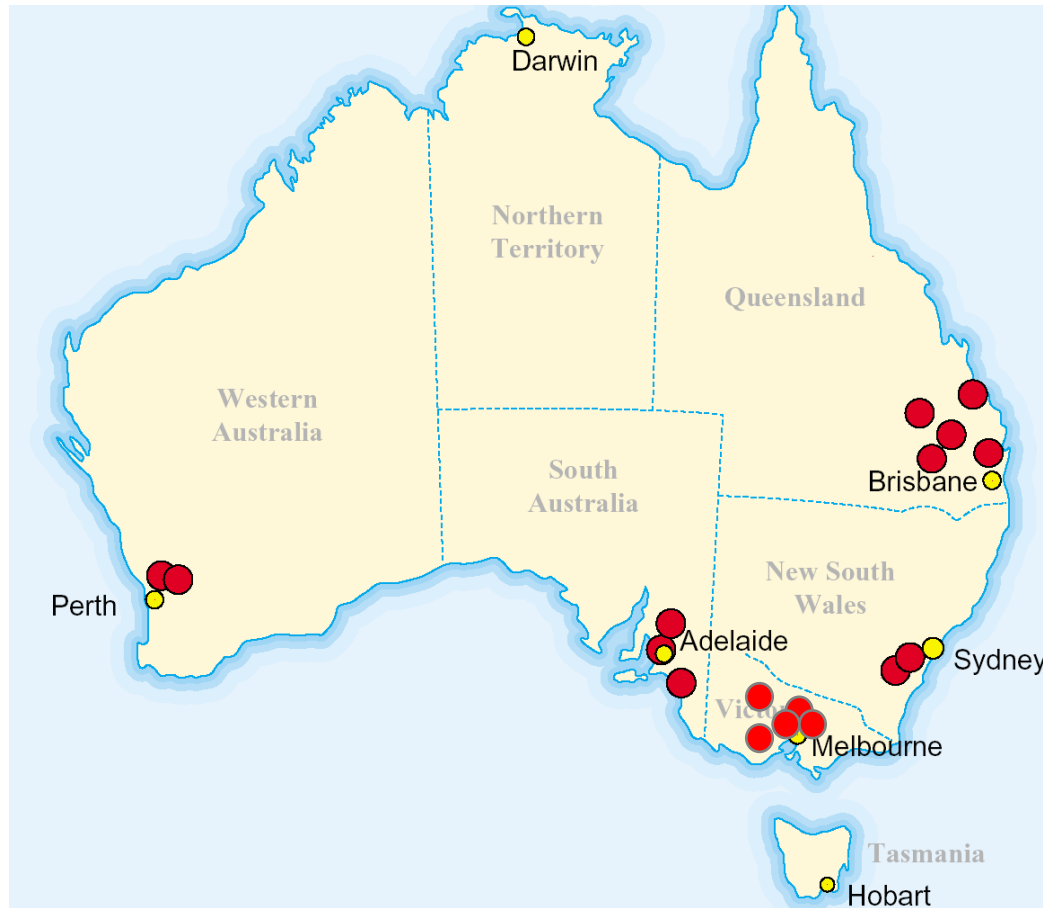
# Preliminary hazard assessment of metals in biosolids

Cadmium and mercury are limited by the dietary exposure of humans expressed as a percentage of the then current food safety limits set by Food Standards Australia New Zealand (FSANZ, 2002).

The most recent Total Diet Survey results for metals (FSANZ, 2003) shows that cadmium is approximately twice as hazardous to human health (via food) as mercury.

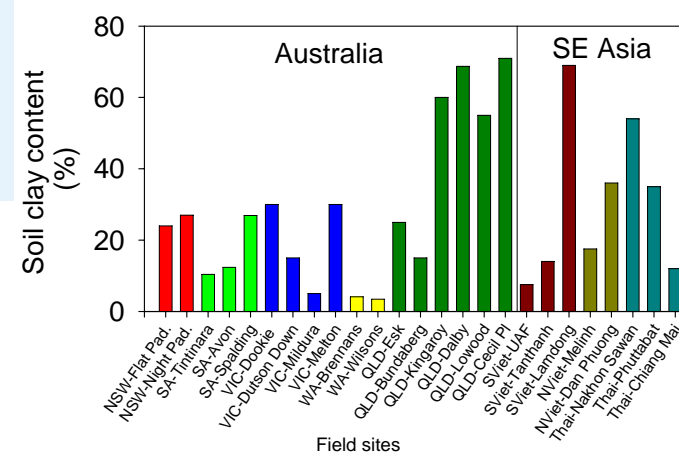
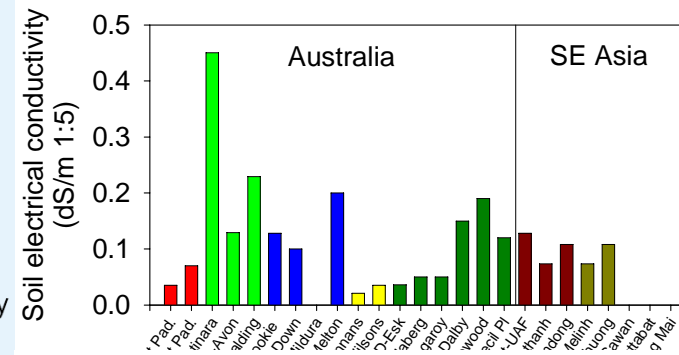
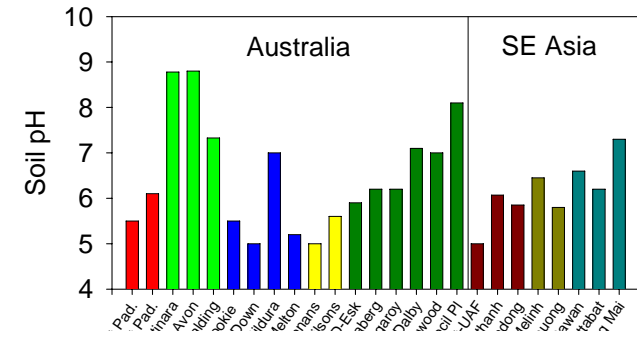


# NBRP has a total of 17 field sites



**12 sites have metals and biosolids added**

**5 sites have only biosolids added**





# So why use field based trials?



Laboratory

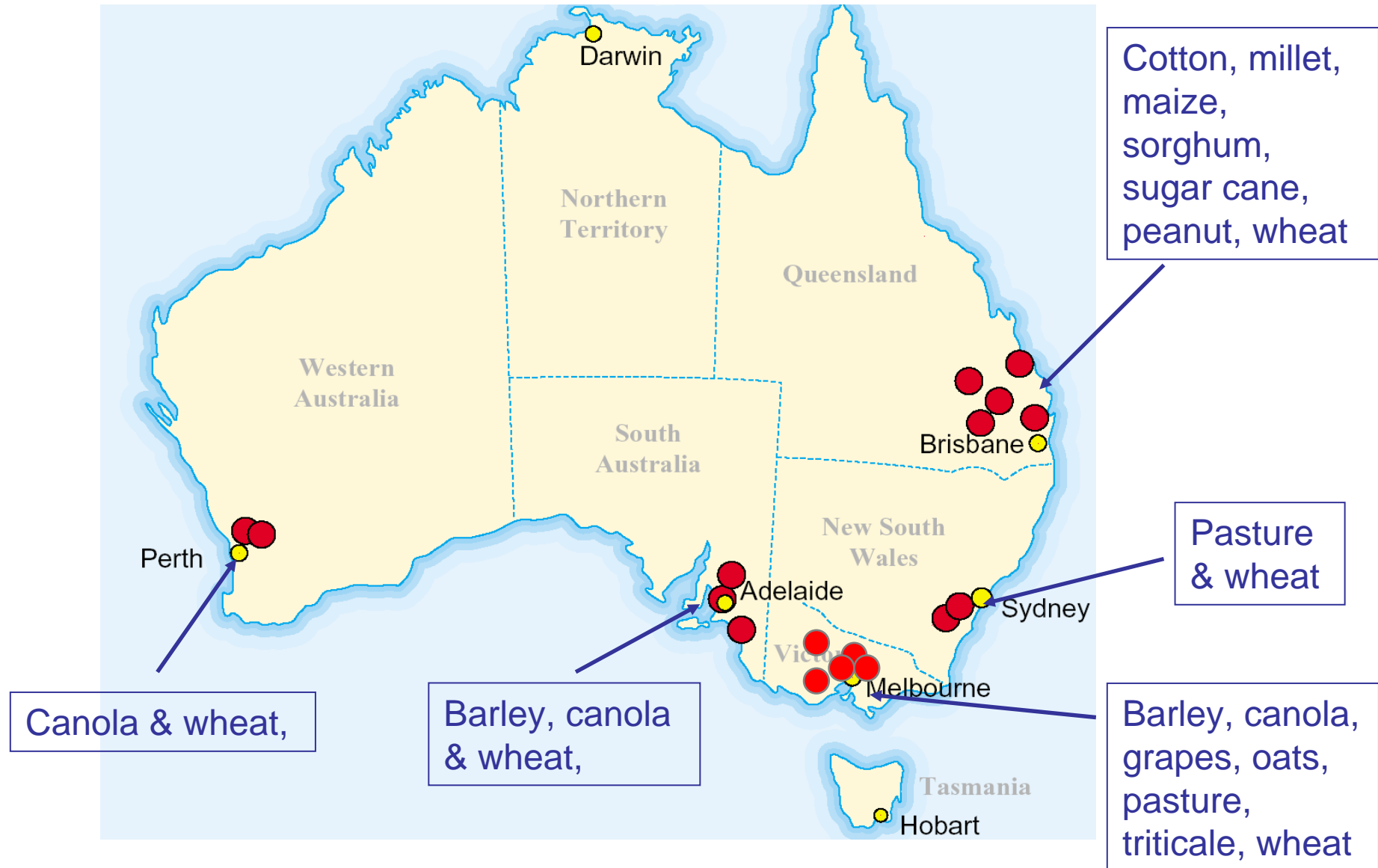
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Field



# 14 crops were grown in the NBRP





# The NBRP has two components



Examining the effects of biosolids.



Examining the effects of cadmium, copper and zinc metal salts.

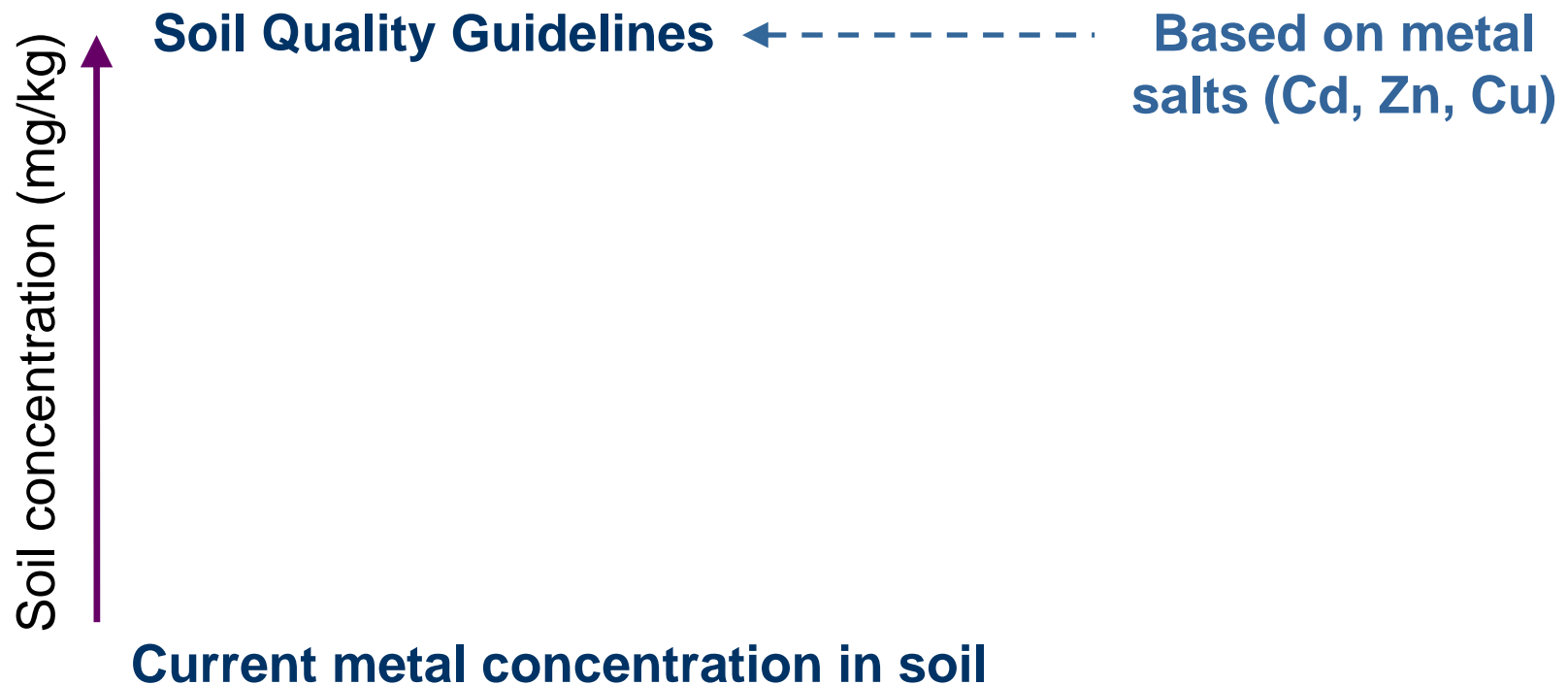
Soil → Plant → Human (Cd)

Soil → Plant & microorganism (Cu, Zn)



# Why derive soil quality guidelines???

To manage sustainable land application of biosolids:





## Measurements made

**Plant endpoints:** 8 week total and mean biomass. At harvest stalk yield, grain yield, % protein, % N, 100 grain weight, grain concs of Cd & other metals.

**Microbial endpoints:** substrate induced nitrification, substrate induced respiration and microbial biomass carbon.

**Soil chemistry:** total metal soil concs, metal soil solution concs, pH, electrical conductivity,  $\text{CaCl}_2$  and  $\text{NH}_4\text{NO}_3$  extracts.

**Nutrients:** total C & N, mineral N, bicarbonate P.



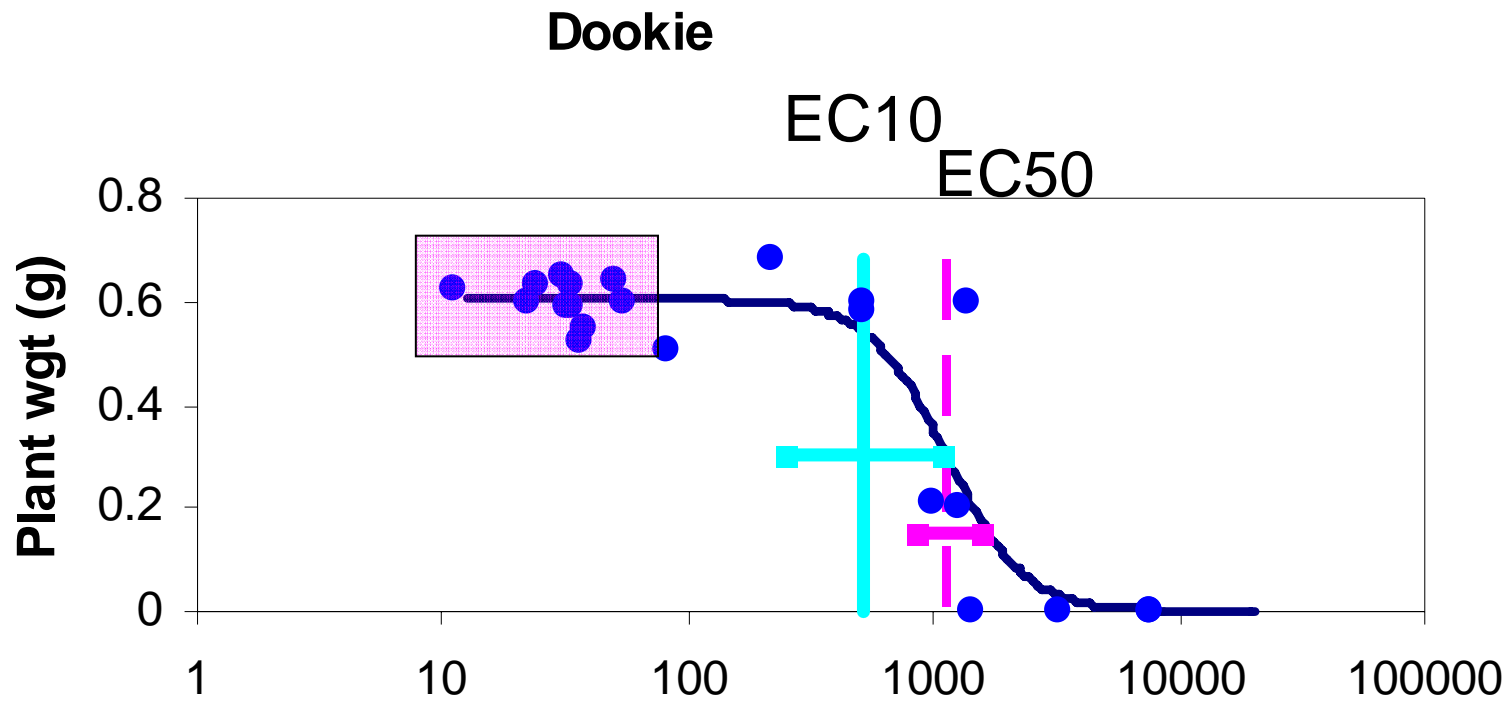
# Microbial endpoints: Why bother?

They are essential in a number of soil processes such as

- degradation and cycling of organic matter
- cycling of nutrients like N, P and S (stimulate plant growth)
- soil structure (aggregation)



# Conducting toxicity tests





## Overall aims of the NBRP

To quantify and demonstrate the benefits of land application of biosolids in agriculture in a range of diverse climates and soils around Australia.

To assess the potential risks from land application of biosolids from metal contaminants and nutrients in the materials.

To ascertain if the current guidelines (for metals and nutrients) are appropriate and if not to recommend new guidelines (metals only).



# The challenge

**Provide sound science to underpin land application of biosolids and the regulations that control this**

**Beneficial use**

**Environ. Protection**

**Manage Food Quality**





# The Position Paper

Referees of the Position Paper are:

**Prof Nick Basta** – (Soil & Environmental Chemistry), Ohio State University.

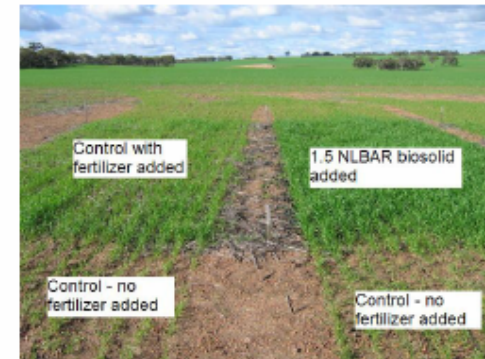
**Prof Murray McBride** – (Soil Chemistry), Cornell University, New York.

**Dr Graham Merrington** - Watts & Crane Associates, ex UK Environmental Agency.

**Dr Hamish Reid** – Manager Research and Technology, SEWL, ex Vic EPA

**Prof Erik Smolders** – (Land Management and Economics) Katholieke Universiteit Leuven, Belgium.

## Position Paper Recommendations of the Australian National Biosolids Research Program on Biosolids Guidelines



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Daryl Stevens, Grant Pu



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Thank You

