

# Making No-Till Wheat A Winning Nitrogen Tool

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#### Overview!

- The last 10 years of no-till in Australia
- My visits from farmers, scientist all over
- My own farm experience
- N from C based crops, no legumes
- Practical implications





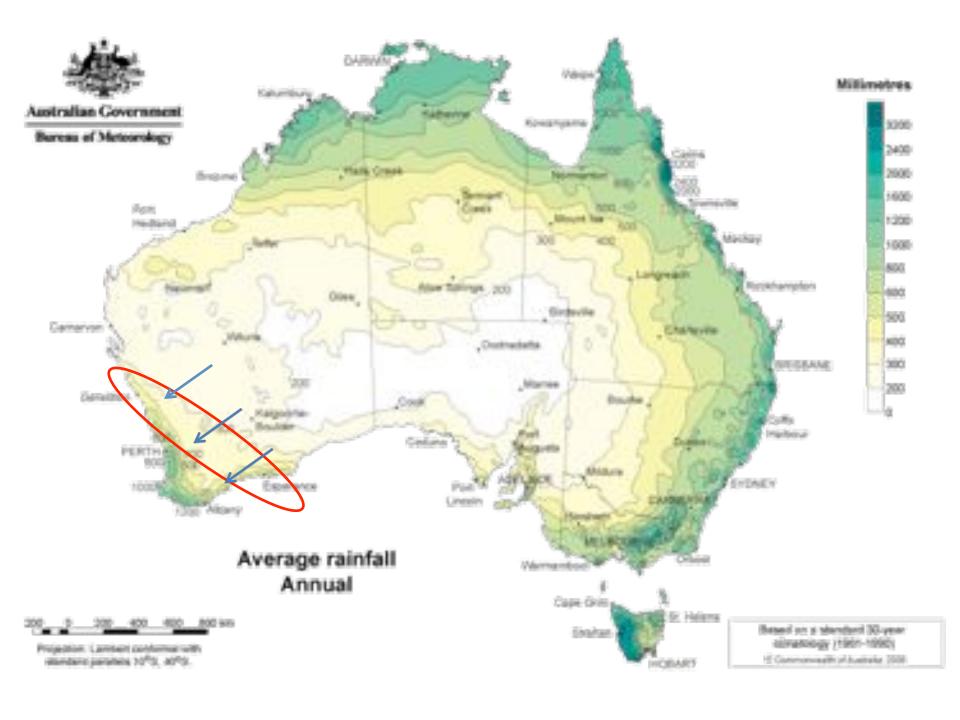




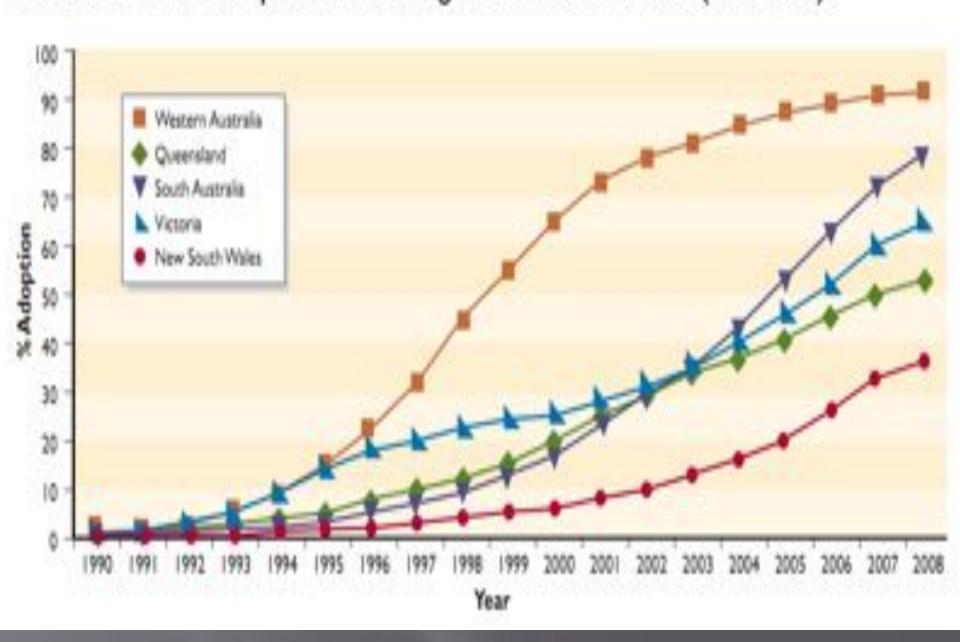




20th Annual National No-Tillage Conference St. Louis, Missouri \* Jan. 11-14, 2012 20th Annual National



#### Estimated rate of adoption of no-tillage for Australia states (Crabtree).





# 10 tough yrs = diversity retreat!

- 2000-2010, most of Australia has had 7 droughts of less than half average
- Good farmers have tightened the belt
- 2001 we were trying cover crops, WSC
- Our main legume yields less
- Lupins are 50% wheat in dry and <\$/t</li>

















## Let's talk N budgets & no-till

- So more wheat and some canola soil spec
- With no legume and no-till plus crop residue
- We are holding OC levels through time
- We are exporting more N than we apply
- Where is the N coming from?
- Is it from N that is mineralised from OC?
- No! If this was so then OC would decrease
- Therefore the answer is not mineralised N

# N Budget: Avon, SA 1979-96

#### **Continuous wheat rotation**

- Total grain harvested= 19.7 t / ha
- N removed = 394 kg / ha
- Total N 1979 = 0.140%
- Total N 1996 = 0.135%
- N from soil pool = 60 kg/ha
- Fertiliser N added = 0 kg/ha

#### **Unexplained N**

334 kg/ha (394-60)

= 19.7 kg N/ha/year

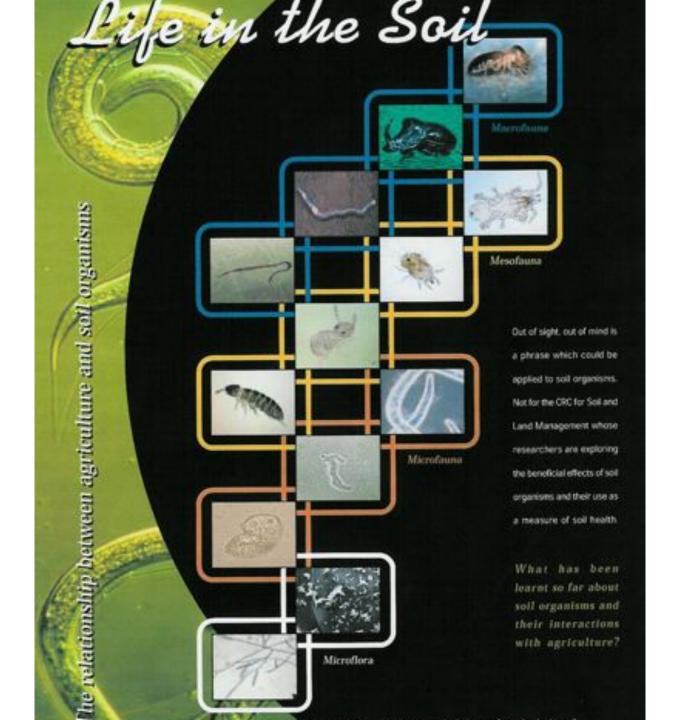
The bacteria responsible are those that three in the absence of available soil. N and the absence of legames. Sometime without legames, and where stubble is retained for erveral years, other produce crops that exceed the N budget expected and are proof of this phenomenon of introgen-fixing bacteria. Further poor that this occurs is that soil organic matter levels rise, and crops perform leaver than expected, given the amount of N applied. Some approximates have suggested the N must be coming from lightning but this could only account for about 7 kgN/ha, not the 30+40 kgN/ha that is often calculated to be happening.

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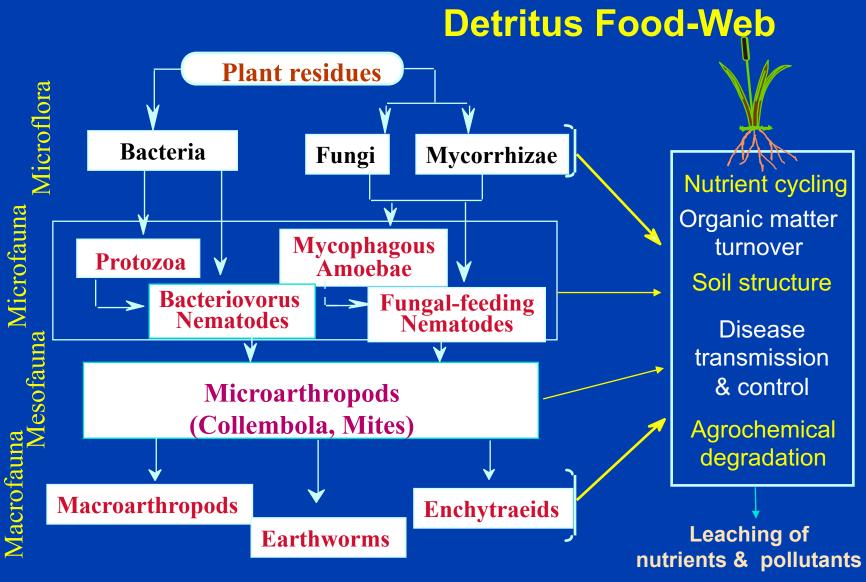


### Supporting N story from no-tillers

- Gary and Darryl Hine, at Wellstead
- Geoffrey Marshall at Hyden
- John Young at Calingiri
- Owen Brownley (dec) at Lake King
- Steve King, Lake Grace
- Scott Day, Manitoba
- John A., from Washington State
- Jack Human, South Africa
- North Dakota State
- Farmer Bill Crabtree (4 years)







**Gupta et al. (1997)** 

### Biological food web - complex, interactive



Collembola spp (springtails) Litter transformers





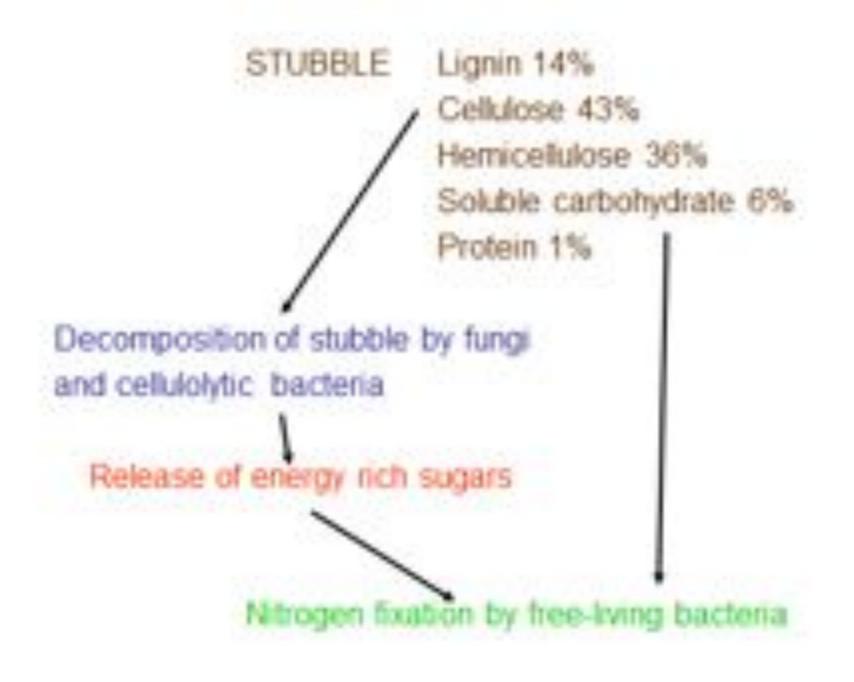


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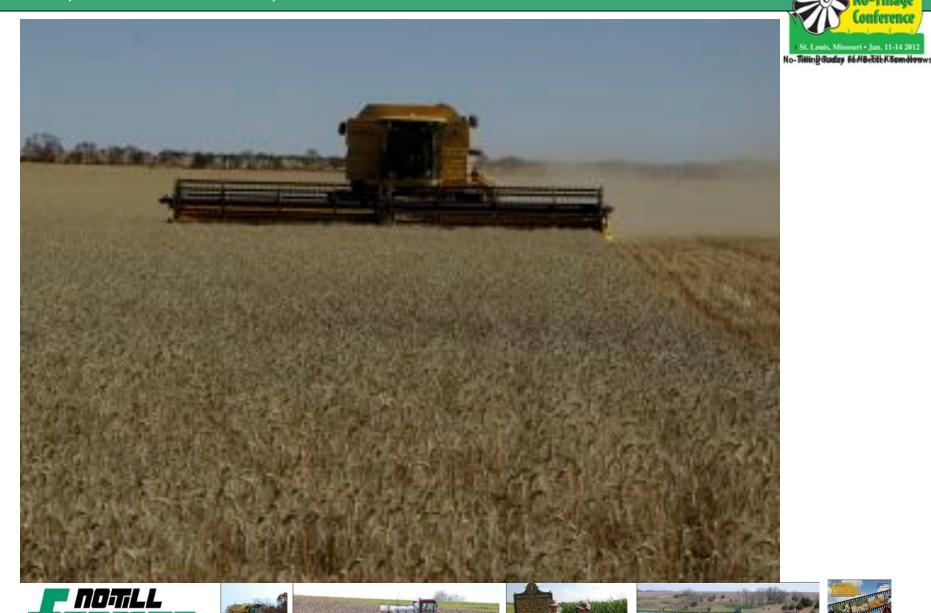




### What could be happening?

- How can N be generated from C
- Life requires amino acids
- Amino acids consist of CHONPS
- First 3 are plentiful (CO<sub>2</sub>, H<sub>2</sub>O)
- N, P and S are often applied as fertiliser
- N can be extracted from air, which is 78% N
- In the form of  $N_2$ , or  $N \equiv N$
- Such N is inert it needs to become a chemical  $(NO_3^-)$  or  $NH_4^+$ ) first
- Provide C-energy and something will eat it
- Restrict N and they will come





















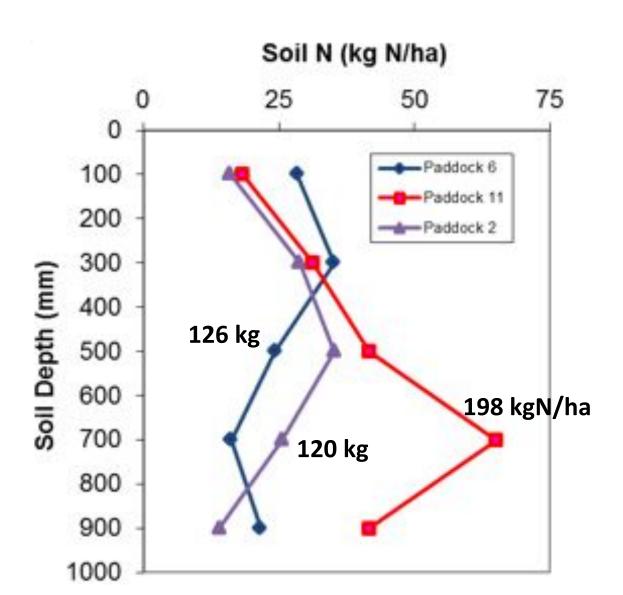




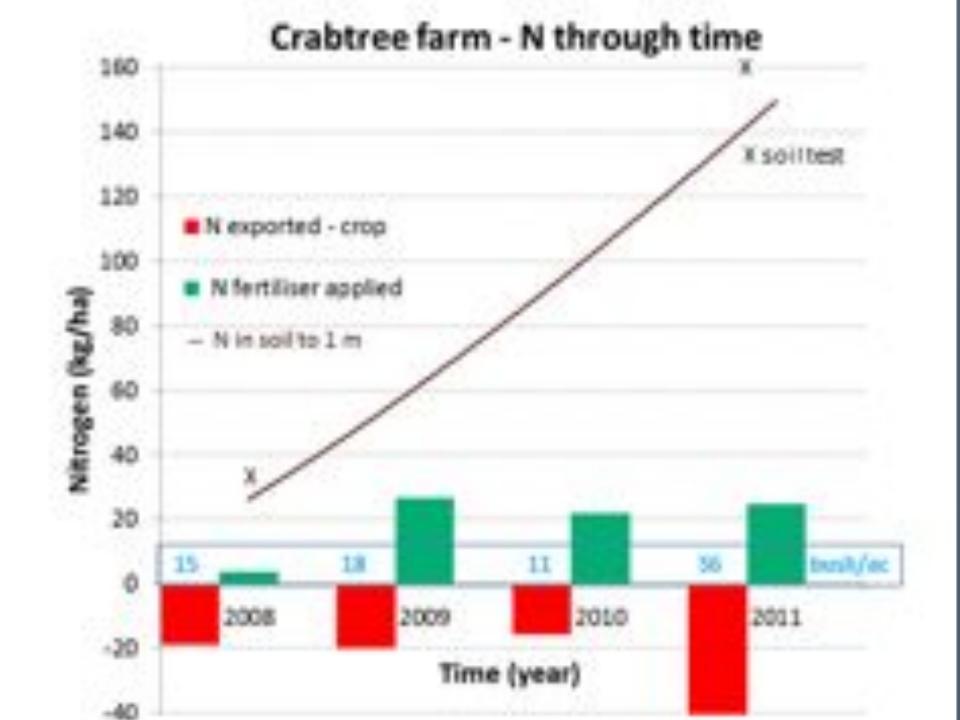




#### After 3 years continuous wheat [08/09/10]







#### Let's do the numbers?

- Over 4 years I have applied 77 kgN/ha
- Have exported 96 kgN/ha in crop N
- Wheat crop yields have averaged 20 b/ac/yr
- Protein averaged 11.2%.
- The extra N gained has been 120 + 96 77
- = 139 kgN/ha/4 years
- Which is 35 kgN/ha/yr
- Worth \$42/ha/year or \$114,260 annually
- I am just a beginner no-tiller in practice



## What about practical implications?

- Will likely not work with soya
- Consider non-legumes if it makes sense 4 U
- Measure it yourself to be sure
- Band fertiliser N
- Get the N away from residue
- Feed crop, starve weeds and force N fixation
- Listen to and observe the crop
- Do deep soil N, do tissue tests
- Observe



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