

Long Term Trials how are their findings applied in the real world??

Brooke White
Cropfacts Pty Ltd
Victoria



Scope

- Broadacre long term trials across Australia but specifically SE Australia
 - Longerenong (rotation)
 - SCRIME (rotation & tillage)
 - Walpeup (rotation & tillage)
 - Waite (rotation)
 - Wagga (tillage)
- Effects on phosphorus, nitrogen, organic carbon

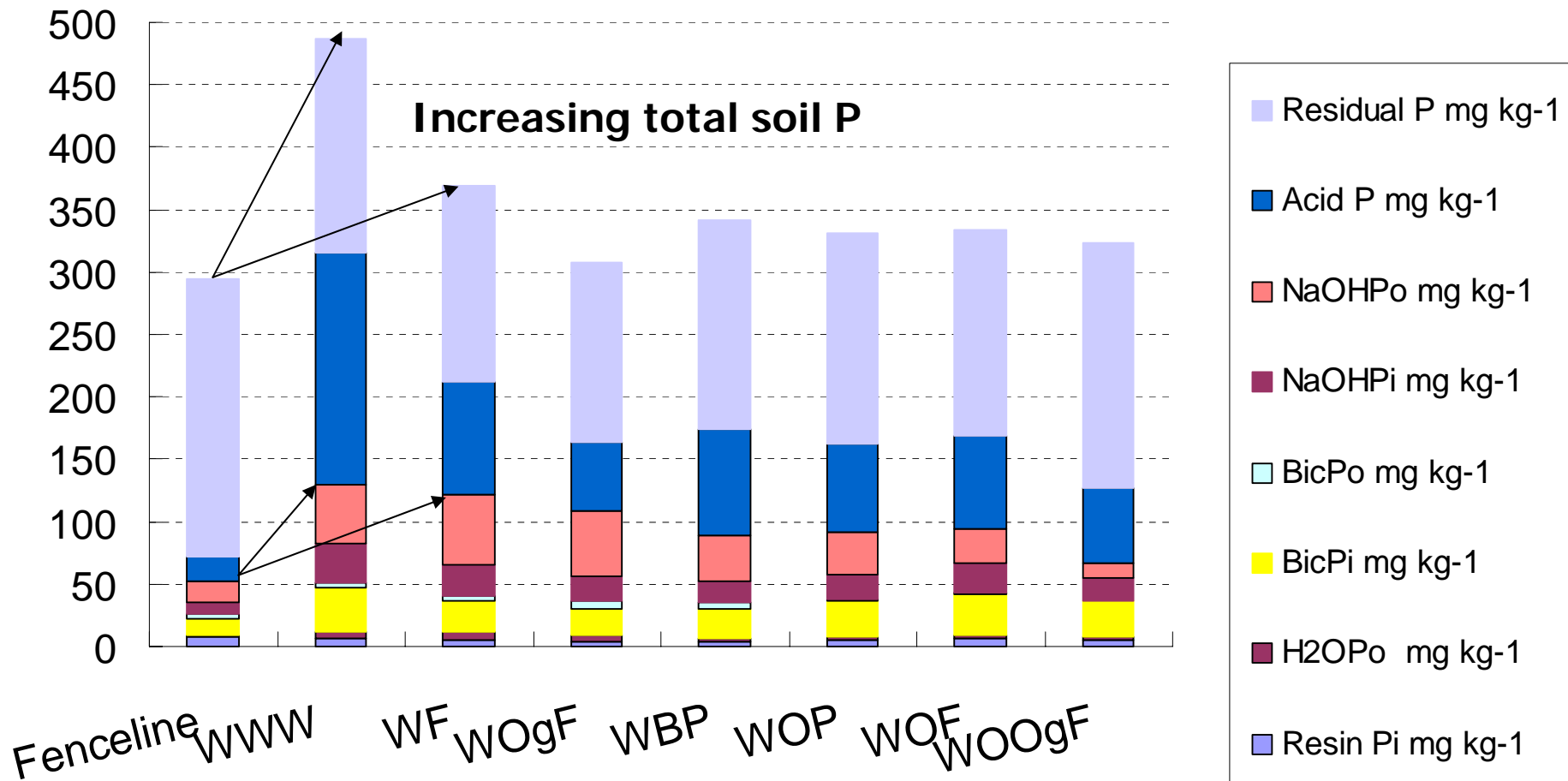


1. Phosphorus

- P levels are not declining under fertilised cropping systems
- P balance sheets are generally positive under cropping
- Total soil P is increasing under cropping
- Large amounts are unavailable



Longerenong Rotation Trial



- Available soil P also increases in proportion to the amount of fertiliser P applied each year.
- Still responsive to P fertiliser despite Colwell P 40-69mg/kg

Solutions???

1. Fluid P

- Greater efficiency on Eyre Peninsula, SA
- No conclusive demonstration of response in Wimmera & Mallee despite positive glasshouse trials
- Costly compared to granular P

2. Fertiliser placement

3.?

- Practically decisions are made on
 - Soil test level (Colwell P 15mg/kg)
 - Fertiliser history
 - Nutrient balance sheets
 - Knowledge of likely response: soil type & paddock



P fertiliser decision making

- Long term trials apply base rates year in year out.
- On farm rates are adjusted each year - complex decision making



P decisions are complex

“I have had a good history of fertiliser in this paddock. I’ve had a look at the balance sheet and it is positive over the last 10 years. Last year I put out 50kg/ha MAP after a good year in 2005 and harvested nothing. So I know I can cut back but by how much?... I don’t want to stuff up my MAP rates because I know I can’t fix it later”

Clinton Olive, Charlton Vic. Feb 2007.



2. Organic carbon under cropping

- Decreased from native levels
- Current crop rotations maintain organic C
- Legumes help but generally crop rotation effects on organic C are low
- Long term trials show only rotations to significantly improve OC included a pasture phase



Role of pasture

- Often been referred to in cropping literature as a last resort BUT:
 - Useful tool for weed management – especially herbicide resistance
 - Well managed pastures contribute soil N
 - Diversity & risk management
 - Income continuity even through droughts
 - negative margins on cropping and modest profit on livestock



3. Tillage

- J Kirkegaard review: wheat yield trends in conservation cropping (AJEA 1995):
1. Cultivation has *little* overall influence on wheat yield at most locations.
 2. Improvements in yield over time under no till were rare (3/33 trials) – despite improved soil structure
 3. Stubble retention reduced yield in many instances



**Technology has overcome some of the
hurdles**



What does this mean for the grower?

No till systems are adopted for many other reasons, eg:

- Less time & labour required at sowing & lower costs of paddock preparation
 - Stubble mulching \$20/ha
 - Pre-drilling and/or cultivation \$25/ha
 - Incorporation of trifluralin \$7/ha
- Timeliness of operations
- Soil erosion protection



Adoption of No-till

" In the end we couldn't see that we had any other choice.

Last year (2006) we sowed cereals on the late break not thinking that we would harvest much from them but with the aim of getting some ground-cover.

Of course, those crops failed and as early as August we were losing topsoil in wind storms "
John Ferrier, Birchip Vic, June 2007.



No-Till can't dramatically improve soil organic C %

To increase soil OC by 0.1%:

Need approx 1.5t/C ha /10cm soil

= 3t/ha organic matter

BUT $\frac{1}{2}$ to $\frac{2}{3}$ of organic inputs are lost to respiration during residue breakdown.

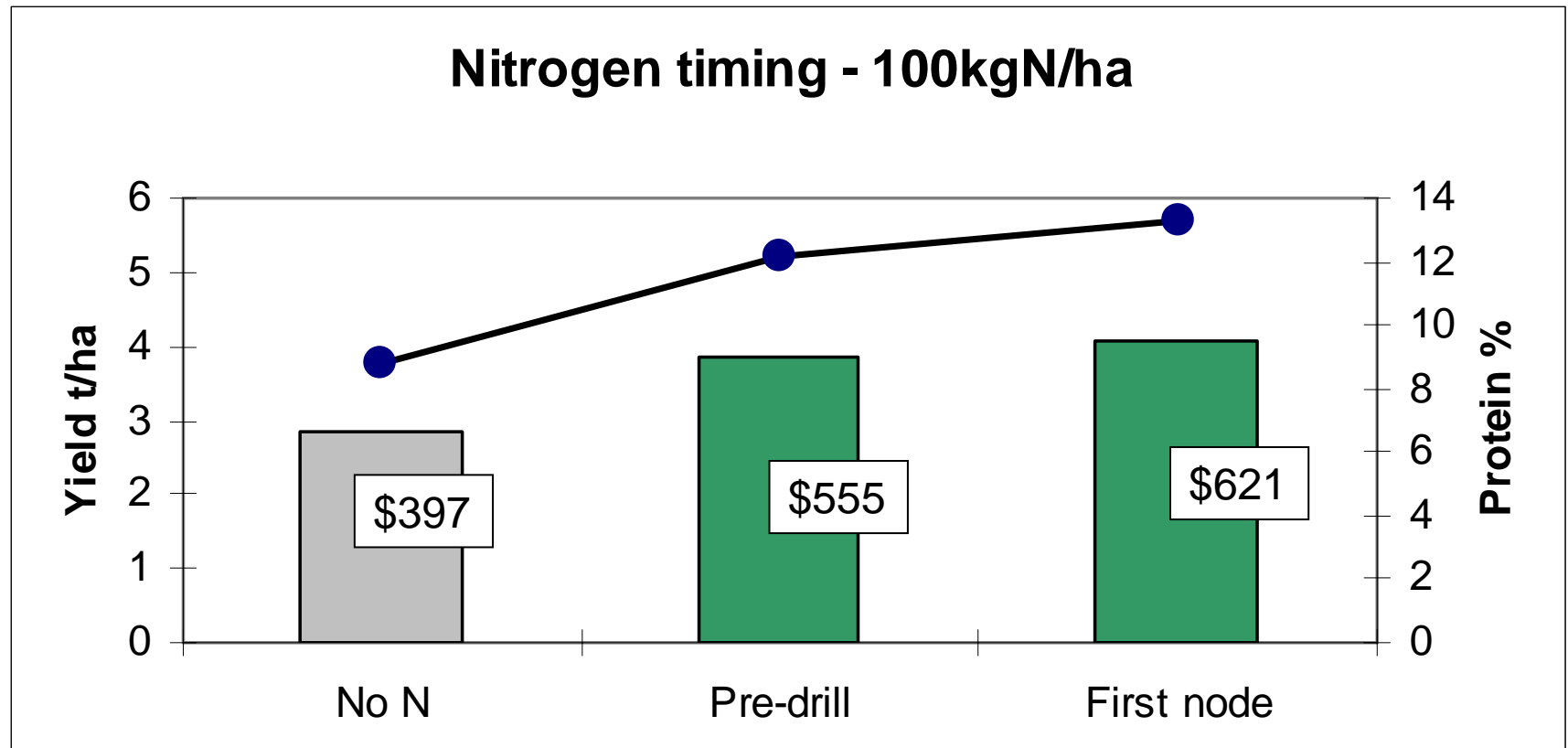
SO need 6-9t/ha EXTRA organic matter to improve soil OC% by 0.1%

4. Nitrogen

- Negative N balance under continuous cropping
 - Long term trials often under-fertilised for N eg LR1 totally reliant on mineralisation
 - Rotations that include grain legumes have the best N balance
- LTE's say continuous cropping needs N
SO what is the best way to do it?



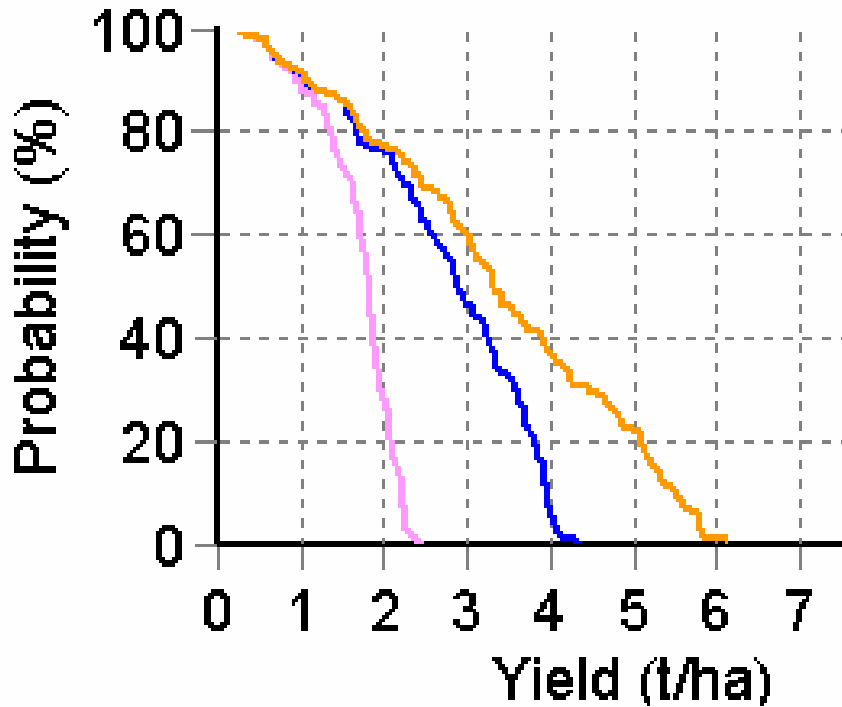
Commercial Nitrogen Practice – example 2005: soil N 61kg/ha



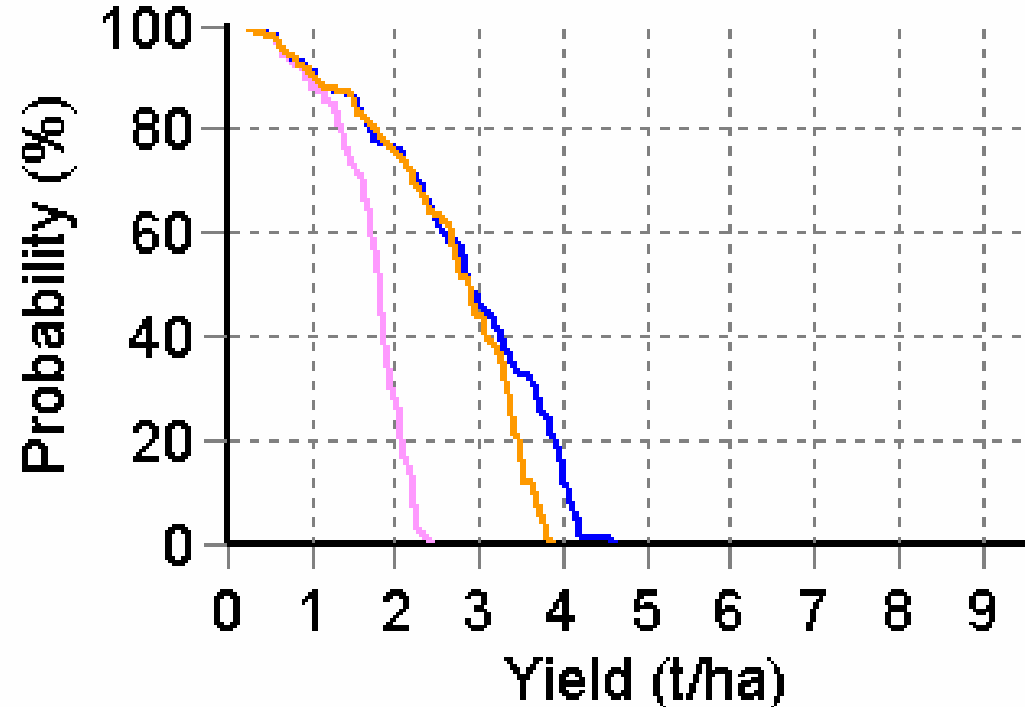
LSD – 0.20t/ha



Yield Prophet for N decision support



- 0 kg N/ha
- 50 kg N/ha
- 100 kg N/ha



- 0 kg N/ha
- 50 kg N/ha at **end of tillering**
- 50 kg N/ha at **2nd node**



Summary

- LTE's: long term cropping is possible BUT profitable cropping systems need careful attention to rotation and input management for success under variable seasons
- P decisions are difficult
- Tillage and stubble system choice is personal
 - No promises on yield increases
- N and P are crucial inputs
- Pasture must be considered for large OC changes

