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UPDATES

# Impacts of a wet season on crop nutrition

*Rob Norton, IPNI Regional Director*

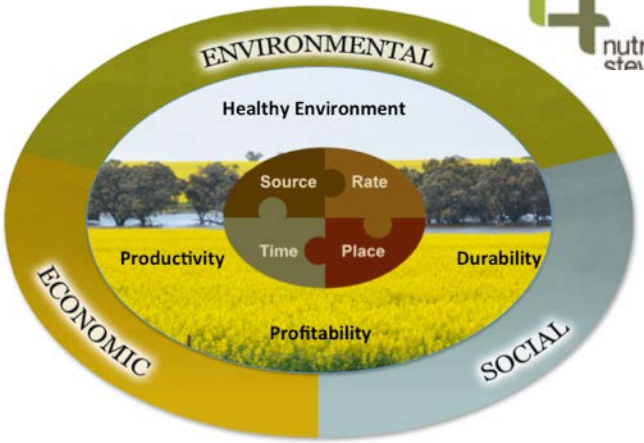
@IPNIANZ

*Tuesday 7th February, Adelaide 1100/1400; Tuesday 14th February, Wagga Wagga, 1100/1440;*
*Tuesday 21st February, Bendigo, 1100/1400; Thursday 23rd February, Rupanyup, 1130.*

***Better Crops, Better Environment … through Science***

# Observations from 2016 – *and before*

- 2015 was different to 2016 and 2017 will be different from 2016
- Nobody really knows what the season will bring
  - Forecasting is an art, not a science.


- A good nutrition program will be
  - Planned – *not reactive*
  - Flexible – in response to the season
  - Nimble – quick to respond and timely
  - Rational – have a budget and review those $.
  - ***Based on matching source, rate, time and place***

# Some observations from 2016.














https://twitter.com/AuCropNutrition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# Going out the gate……..

- Good yields
- Higher than average ***removals***
- ***Actual removals?***

| | N (kg/ha) | P (kg/ha) | K (kg/ha) | S (kg/ha) |
|---|---|---|---|---|
| **Wheat (6 t/ha,12% ptn)** | 125 | 18 | 21 | 7 |
| **Canola (3 t/ha, 23% ptn)** | 90 | 15 | 20 | 15 |
| **Barley (5 t/ha, 10% ptn)** | 90 | 15 | 23 | 6 |
| ***Stubble* baled (7.5 t/ha)*** | *56* | *6* | *109* | *9* |
| ***Stubble* burned (7.5 t/ha)*** | *46* | *3* | *44* | *6* |

* Wheat stubble

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# Replacement strategies

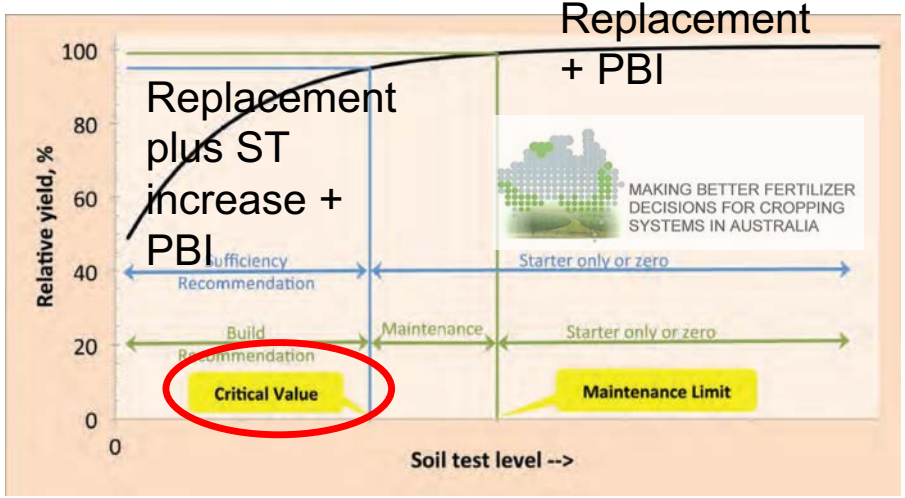
- ***You get nothing for nothing***

- Particularly P - Maintaining soil test values and soil organic matter requires replacement

- PLUS the soil demand (eg PBI) plus losses.

- Replacement largely depends on where the soil test value sits.
  - DRAWDOWN TENDS TO BE FASTER THAN BUILD UP

- Grain testing to complement soil testing




| Nutrient | Trigger Value |
|---|---|
| N | <1.6% (9% Ptn) |
| P | <0.2% |
| S | <0.2% |
| Cu | <2 mg/kg |
| Zn | <20 mg/kg |

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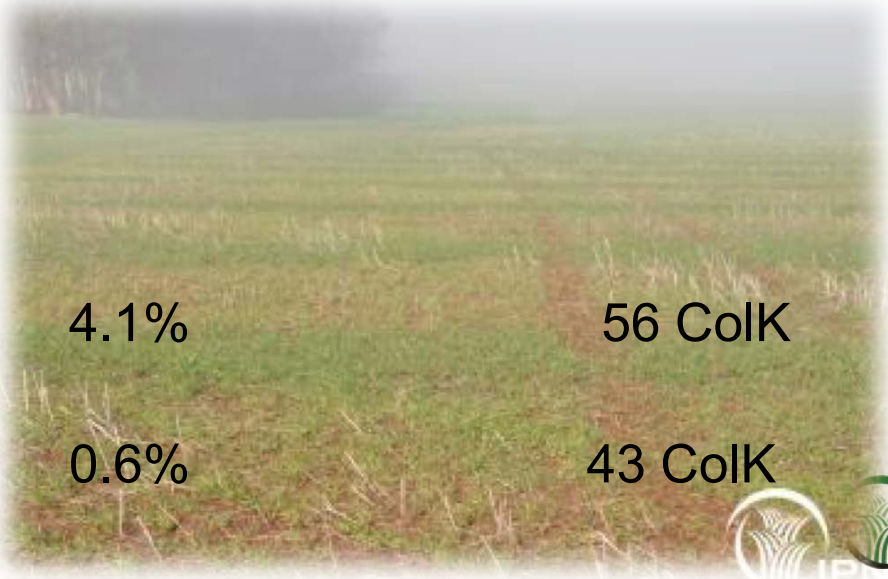
# Taking this forward to 2017……..

- Soil test – using the right test
- Consider balancing P removal from 2016 *at least*.
- Consider K on lighter, acid soils, check prior windrows

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# Some observations from the field

- 7.3 t/ha La Trobe barley crop
  - 12.5% protein
- Applied N = 120 kg/ha
- Presowing N = 50 kg/ha
- Removal = 160 kg N/ha (7.3*20)
- GRAIN NUE = 160/170 = **94%**
- **Expect N demand ~ 300 kg N/ha**


10 * Protein / 6.25 = kg N/t – wheat factor is 5.7

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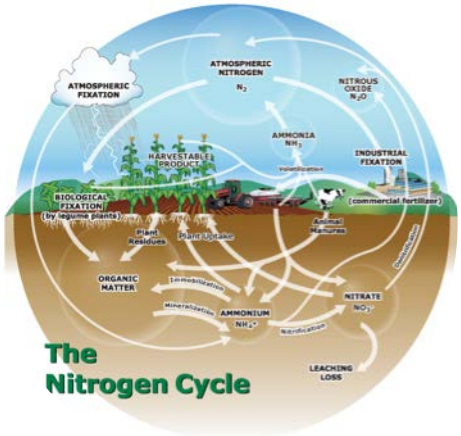
# High NUE values seen – *really?*


- So where did the N come from?
- Grain Removal = 160 kg N/ha (7.3*20)
- *Stubble = 70 kg N/ha (10*7)*
  - *230 kg N "recovered"*
- Applied N = 120 kg/ha – *very high efficiency*
- Presowing N = 50 kg/ha – *maybe deeper N supplied*
  - 170 kg N "supplied" – 120 kg to be found




- Mineralisation – is this enough to close "the gap" and account for the losses likely to occur?

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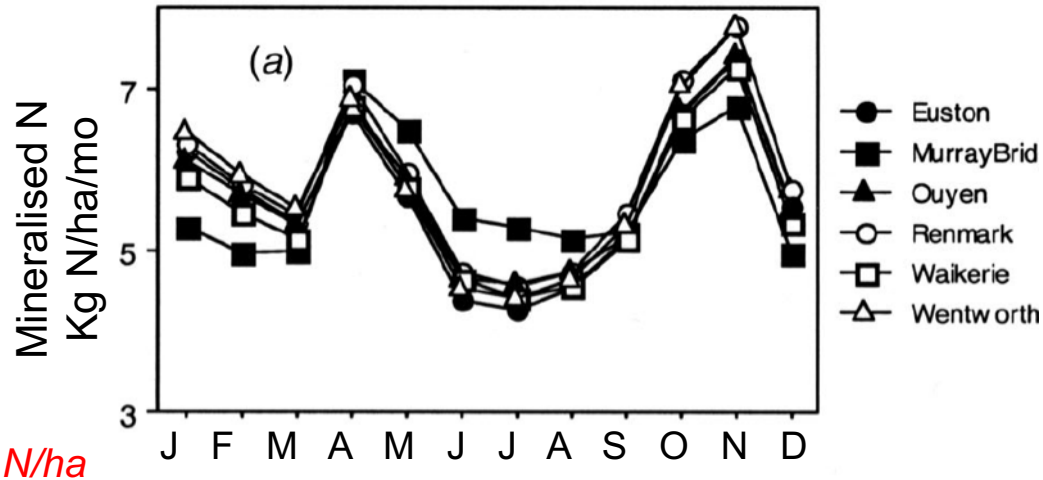
# Drivers of Nitrification – moves ammonium to nitrate

- Nitrification
  - Temperature – rapid between 15 and 25°C
  - Water - <60 to 80% water filled pore space
    - Actually oxygen limits
- Nitrification continues where
  - Early break
  - Warm winters
  - Extended spring
- If ”normal” is 50 kg N/ha
  - 2016 may have delivered 15-30 kg N
  - *Total mineralised reasonably 100 kg N/ha*
  - *At the expense of Organic Matter!*

Total N ~ 60 kg N/ha
Winter ~ 0.1 kg N/ha/d
Autumn/Spring ~ 0.2 kg N/ha/d




Sadras & Baldock, 2003 AJAR 54, 353-361

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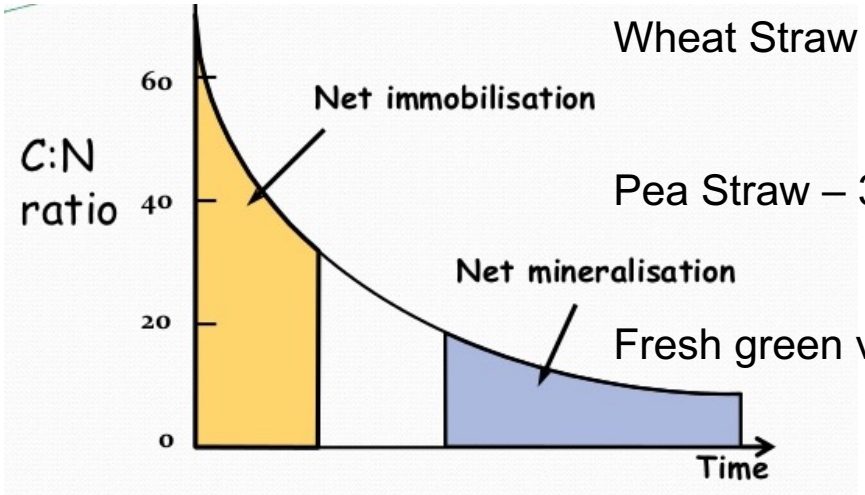
# Mineralised N
# Importance of C:N ratio of organic matter

- The amount of N mineralized or immobilized depends on the quality and quantity of the organic matter




Wheat Straw - 80:1

Pea Straw – 30:1

Fresh green vetch ~ 12:1

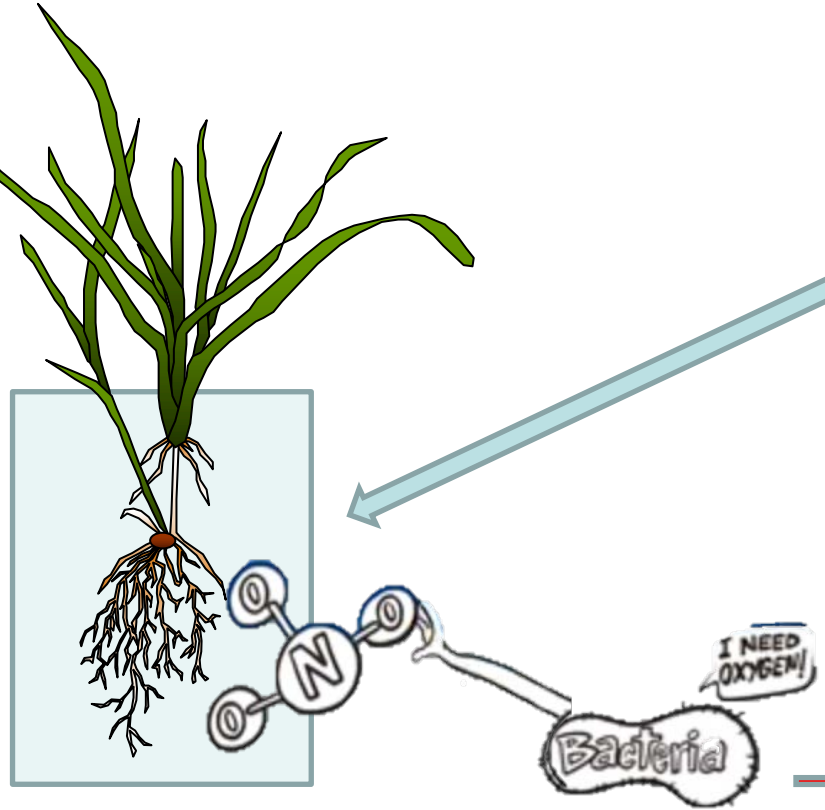
- Baldock tool – indicates 7 kg N demanded/t of cereal yield (HI, C:N ratio, % decomposed)

## Taking this forward to 2017……

- High stubble loads from 2016 crops
- 6 t/ha wheat yield ~ 8 t/ha stubble ~ 0.5% N?
- To get 8 t/ha of 80:1 to 30:1 C:N
  - Immobilize 50-70 kg N/ha
  - *Will get it back later*
- *LOWER THAN "NORMAL" N AT SEEDING*

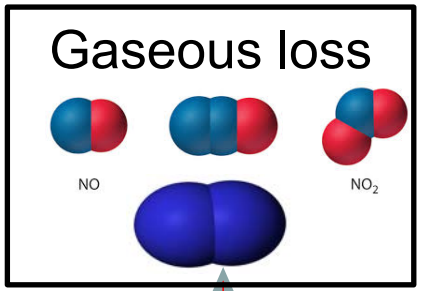
# Denitrification – major loss pathway under waterlogging

No oxygen




*Denitrification*

- *High OM*
- *Anaerobic*
- *High nitrate*
- *Warm*

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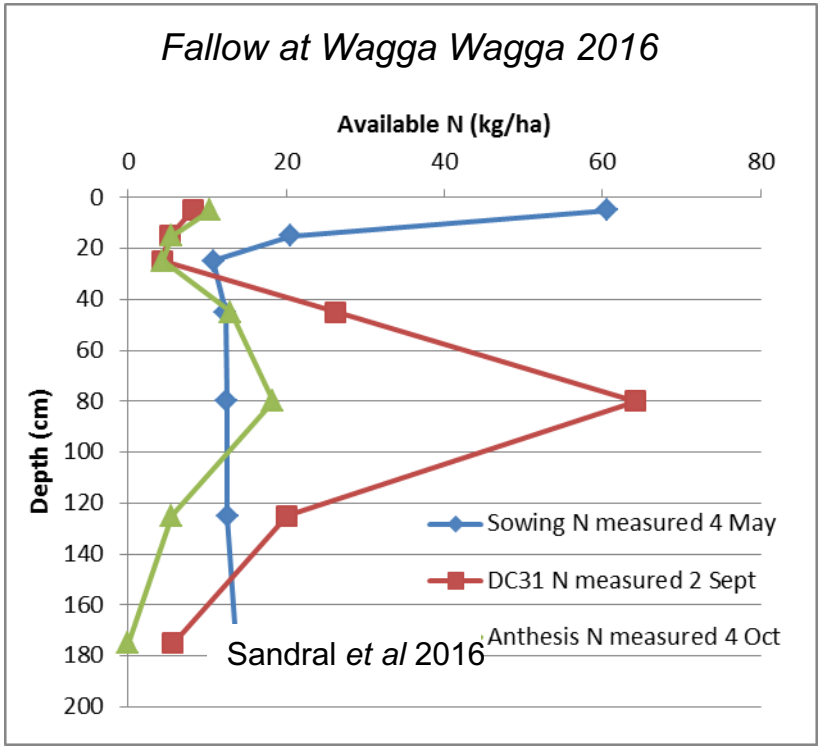
# Impacts of a wet season on crop nutrition




| May 4th | Sept 2nd | Oct 4th |
|---|---|---|
| 18 $NH_4^+$ | 13 $NH_4^+$ | 30 $NH_4^+$ |
| 124 $NO_3^-$ | 121 $NO_3^-$ | 25 $NO_3^-$ |
| 142 Total N | 134 Total N | 55 Total N |

- Total loss = 87 kg N/ha over 32 days!
- More ammonium than nitrate unusual!

NSW GOVERNMENT Department of Primary Industries

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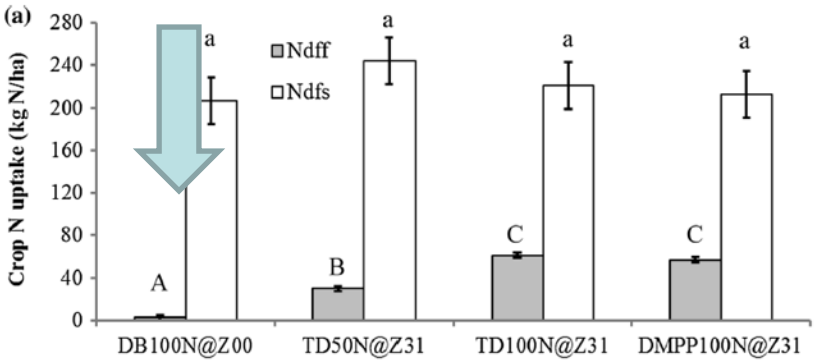
# Taking this forward to 2017……

- Paddocks are likely to be highly variable in N status in particular
- Probably lower than normal
  - Denitrifcation in wetter parts
  - High removal in drier parts
- Soil N testing (and S)
  - Consider sampling by zones
- Consider an N-Rich Strip

# N-Rich strips

"The strips give me the confidence 'Not to apply N' when the crop is N sufficient. This has saved me a lot of $$$$ over the years."
– Mark Branson, grain grower, South Australia.

# So……. Look for early N supply?




- DB = Deep banded @ sowing
  - no N from the fertilizer –
  - 15N study indicated most N denitrified
- TD = Topdressed, two rates/products
  - ~ 60 kg recovered from the fertilizer.
  - 2/3rd in grain, 1/3rd in straw.
  - No effect of DMPP

Harris et al. 2016. Hamilton Site – 227 kg N/ha 0-20 cm

*May/June – Very wet > 70% WFPS*


- Risk of loss –
  - fertilizer N exposed for the whole season to leaching, denitrification, immobilization.
- Risk of over application
  - Haying off - yes even in a wet year.
- Uncertainty of demand
  - At seeding is when least is known about the season
  - Splitting to match seasonal yield estimates
- In-furrow damage at high rates
  - Machine, crop, soil type, product.

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# Mid-row banding urea in-season 2016

Ash Wallace, DEDJTR, Horsham

- Comparing:
  - Banding above and below surface
  - Streaming nozzles
  - Conventional nozzles
  - Topdressed granular

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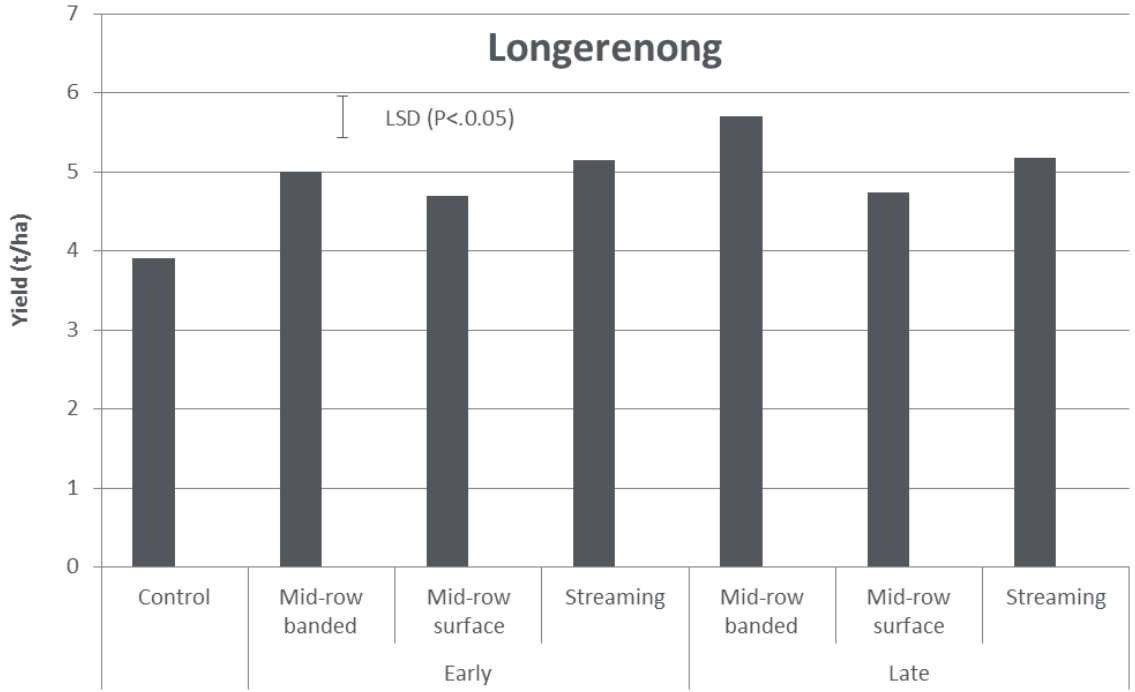
# Mid-row banding urea in-season 2016

- Protein response to MRB at Quambatook
- Responses varied with site, time of application and follow-up conditions
  - ‘Why?’ is the key
- Initial indications of higher plant uptake from mid-row banding (15N studies)
  - 60-75% of fertiliser ‘taken up’ vs. 40-65%

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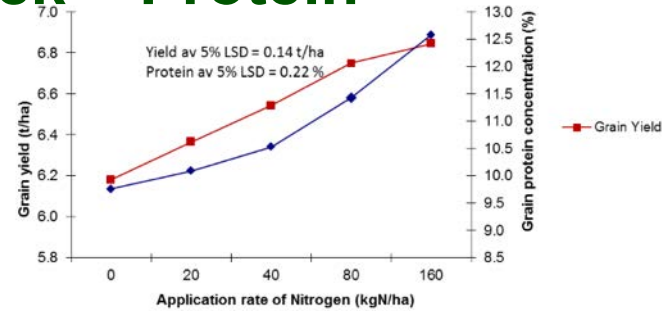
# The 2016 push for protein – late N

- Favourable post-anthesis
- Long cool finish (generally)
- Does low protein mean missed yield?
  - Maybe.
  - Maybe not.
  - *Experience from 2016 says luck played a big role.*

# Right Timing + Right Rate + Right Luck = Protein




- Does the crop need more N? *Rate*
- Can the N get into the crop? *Source*
- What will the N stimulate? (yield/protein) *Time*
- Can enough N get into the crop/grain? *Rate * Source*
  - 5 t/ha wheat increase 1% ptn with a 50% efficiency of N use (high) - is 20 kg N.
- The finish is critical – duration of starch deposition *Luck*
- Will the extra protein be worth anything?

- Most important point
  - Protein deposition and starch deposition are largely independent
  - Rate and duration of deposition important for both.

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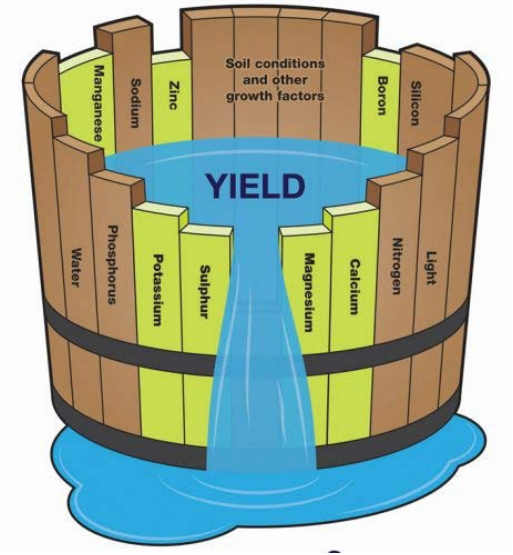
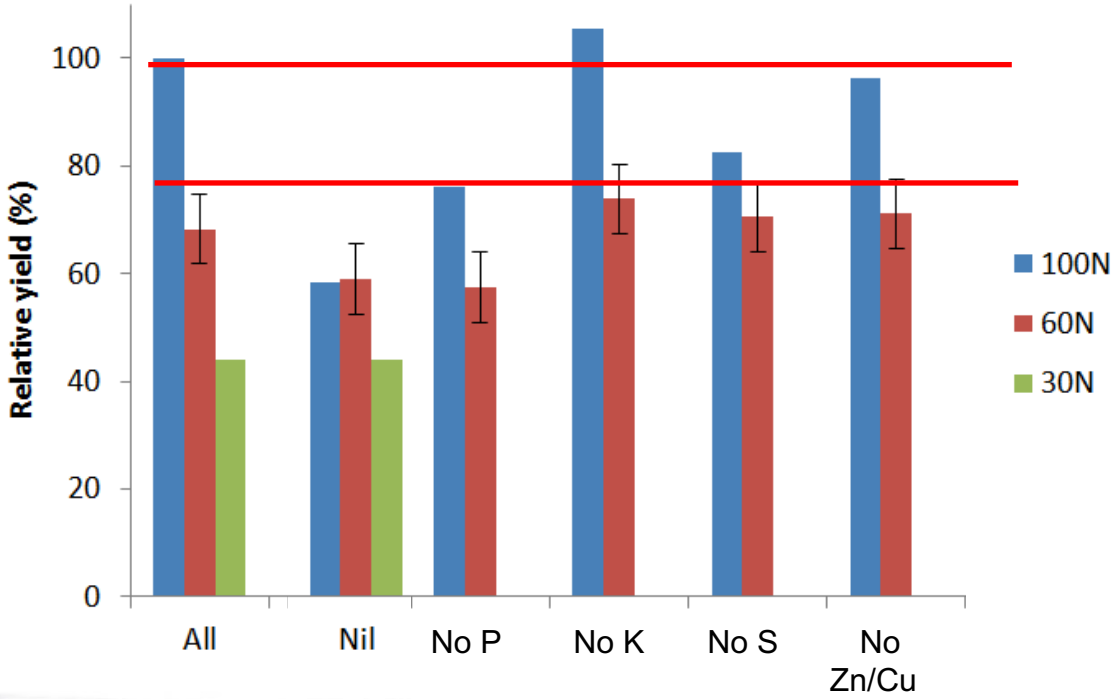
## Take this forward to 2017……

- Certainly look for protein, but yield is king.
- Balance early and later N supplies, N budget & risk.
- With low N status, N at seeding/early may be more important
  - 50 kg N to get to stem elongation.
- Yes – you can hay-off a crop even with a good finish
- Take care with seed/fertilizer placement if not dual chutes.

# It’s not all about N

- Balanced nutrition




Bool Lagoon Nutrient Omission Experiment

GRDC, DAV00141
Penny Riffkin, Malcolm McCaskill , Amanda Pearce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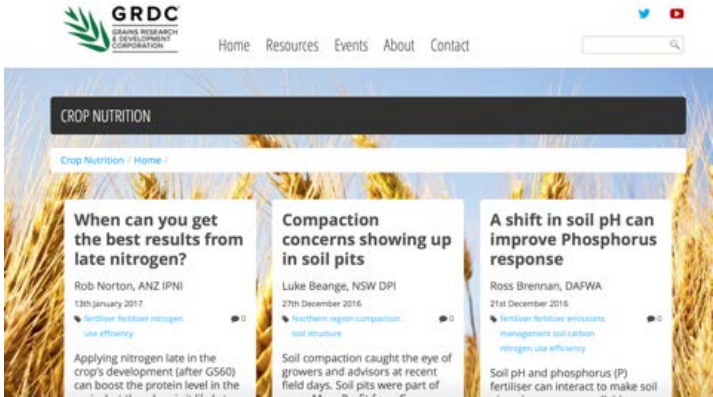
# Summary…soil test to know where you are!

- 2017 is a new year …. With a new set of challenges.
  - Remember what happened - but don't expect the same.
- Off-takes of all nutrients were high (including pulses)
  - at least balance P offtake in 2017
- Mobile nutrients (N & S & B) likely leached – deeper sampling
- N status likely low but test – more N at seeding?
- Not everything is explainable…..but most things are.
  - Get your information from reputable sources
  - Use extension hub

*"The important thing is not to stop questioning."*

*A. Einstein*



# *Thanks for your attention……*

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