Enhancing N and P use efficiency in cotton

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Update on research activities since last MPfN Forum (Sept 2019)
2019–20 Research Activities

- Core site trials (3 paddocks) at ACRI, Narrabri
  - N x P x I
  - N rate x Pix
  - N timing, N budget, late-N
  - optimising water-run N
  - P response x N treatment (water-run, N rate, N timing)
  - Residual P from 2017–18 vs ‘new’ P
  - cover-crop P / cotton-crop P x P-banded / P dispersed

- On-farm trials at Narromine
  - Pre-plant N x P (Toobaroo West)
  - Late N application for boll retention (Central Farm)

- Glasshouse $^{15}$N study (UM)

- In-field root proliferation study in P/cover-crop trial at ACRI (UNE)

- Soil N mineralisation lab incubation (4 N rates x 2 deficits)

- Polymer-coated urea N release in the field
Pre-plant N and P fertilisers applied with new NSW DPI variable-rate fertiliser applicator.
2019-20: our “biggest” season
Four cotton-cropping seasons of rainfall at ACRI

Dec 2018 hail!
Water-run urea being applied plot-wise
Runoff water sampling: manual (time-averaged) and automatic (flow-averaged) sampling
2019-20 was a ‘big’ season
2019–20 Core-site Early Observations

N x P x I (all fertiliser pre-plant)
- 60 mm deficit (14 ML/ha) vs 90 mm (8.4 ML/ha)
- 60 mm: plants 13% taller and 21% greater biomass, but same number of bolls.
- No +N or +P effect on height or biomass

N rate x Pix (growth regulator)
- Increasing N rate increased plant height
- Maybe an impact on biomass with nil < standard = high N
- No difference on boll numbers

Optimising water-run N x P (30:70 pre-plant : in-crop)
- No effect of optimisation on biomass
- +P decreased biomass by 7%

Variety x I
- Biomass greater in 60 mm, but more bolls in 90 mm
- Variety 748 was 10% taller than 746
N-timing effects on biomass

2018-19

Dry matter (kg/ha)

Day degrees

2019-20

Dry matter (kg/ha)

Day degrees
Importance of the plant line

**2017-2018**

- **Total N mineralised**
  - 60mm = 63 kg/ha
  - 90mm = 25 kg/ha

**2018-2019**

- **Total N mineralised**
  - 60mm = 96 kg/ha
  - 90mm = 27 kg/ha
Plant N

No difference
- N uptake
- Yield
  - 60 mm 1842 kg
  - 90 mm 1816 kg

- Synchronisation with mineralised N 60 mm
- Plant accessing N deep in the profile
Potentially large losses of, or redistribution of mineralized soil N
Engagement and extension efforts (past 7 months only)

Australian Cotton Research Conference (GN, JB, GS, CM)
CottonInfo e-newsletter (JB)
MPfN results forums for growers in Moree, Gunnedah and Narromine (GN, JB, GS, BM)
Two abstracts accepted for International Nitrogen Initiative Conference (postponed)
Extension and Publication Plans

• Industry magazine articles (several planned for 2020)
• Scientific journal articles (several in progress for submission before project end)
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