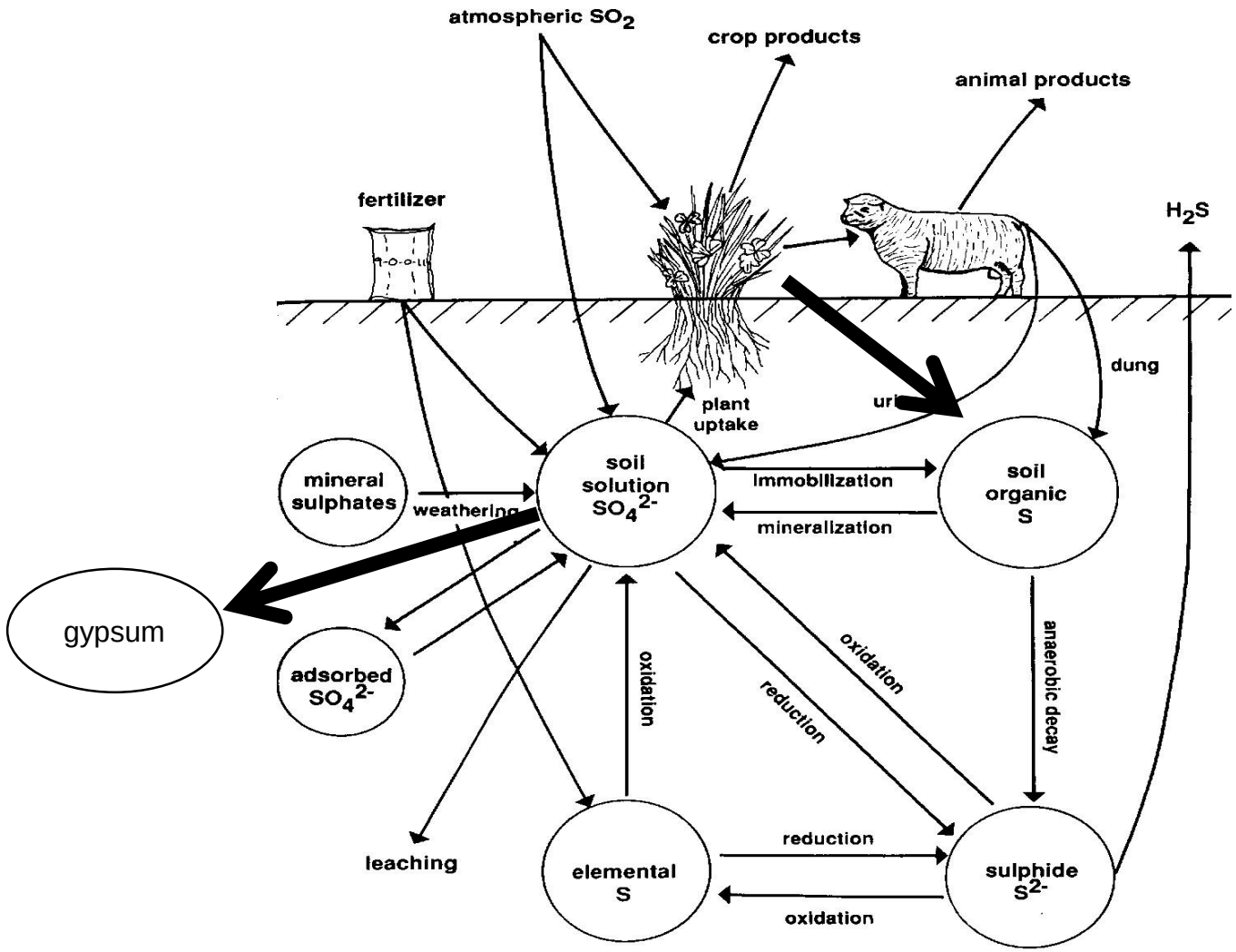
# Sulfur management: Product and placement

- Ass. Prof. Chris Guppy (UNE)



# Standard sulfur cycle

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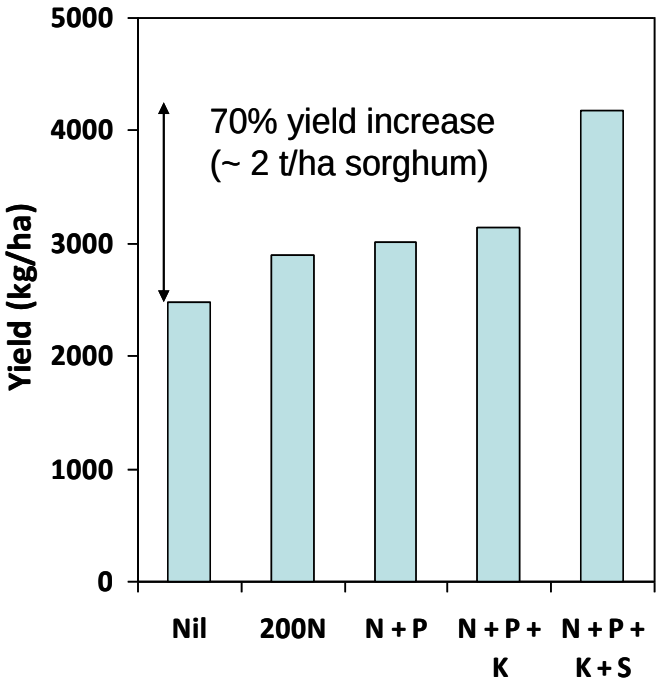
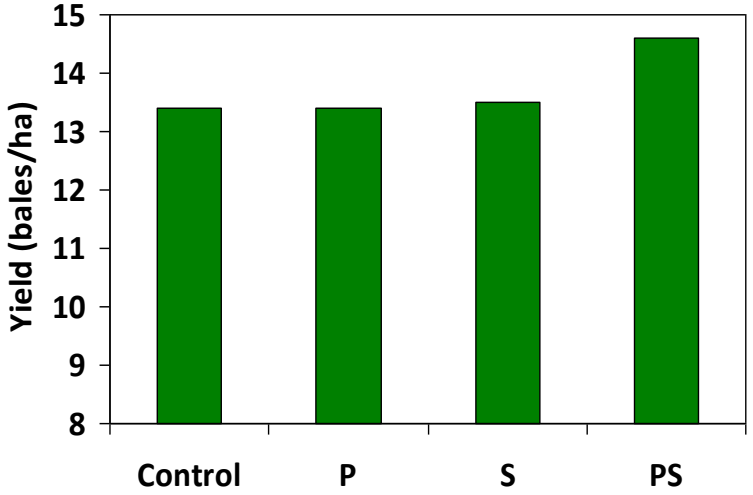
# Cropping responses

Responses rare: critical values <3 mg S/kg
subsoil S most likely buffering S requirements

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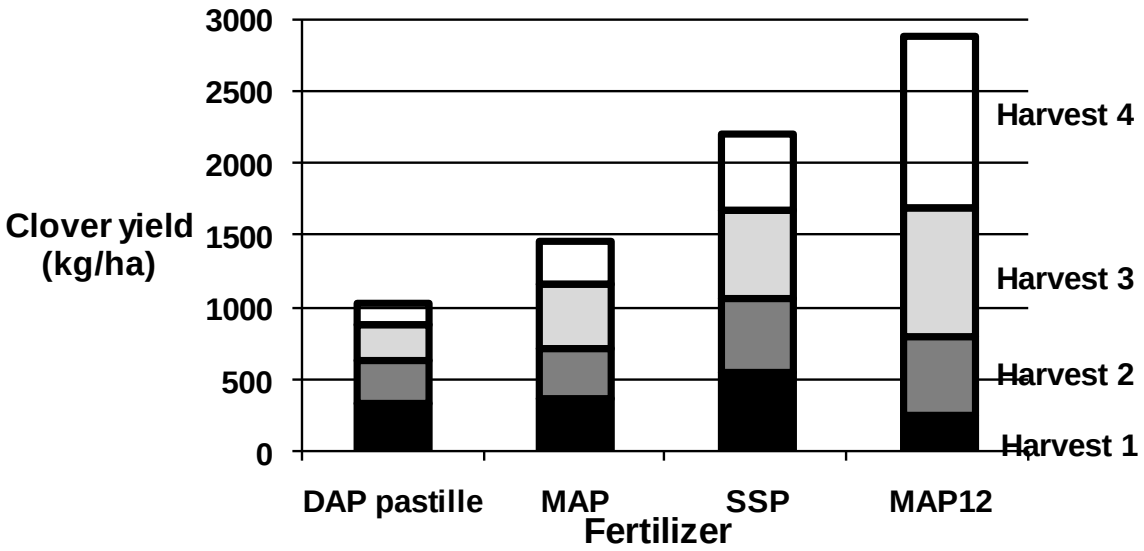
# Pasture responses

More common: Critical range 6-8 mg S/kg

## 15 months legume yield in high rainfall environment

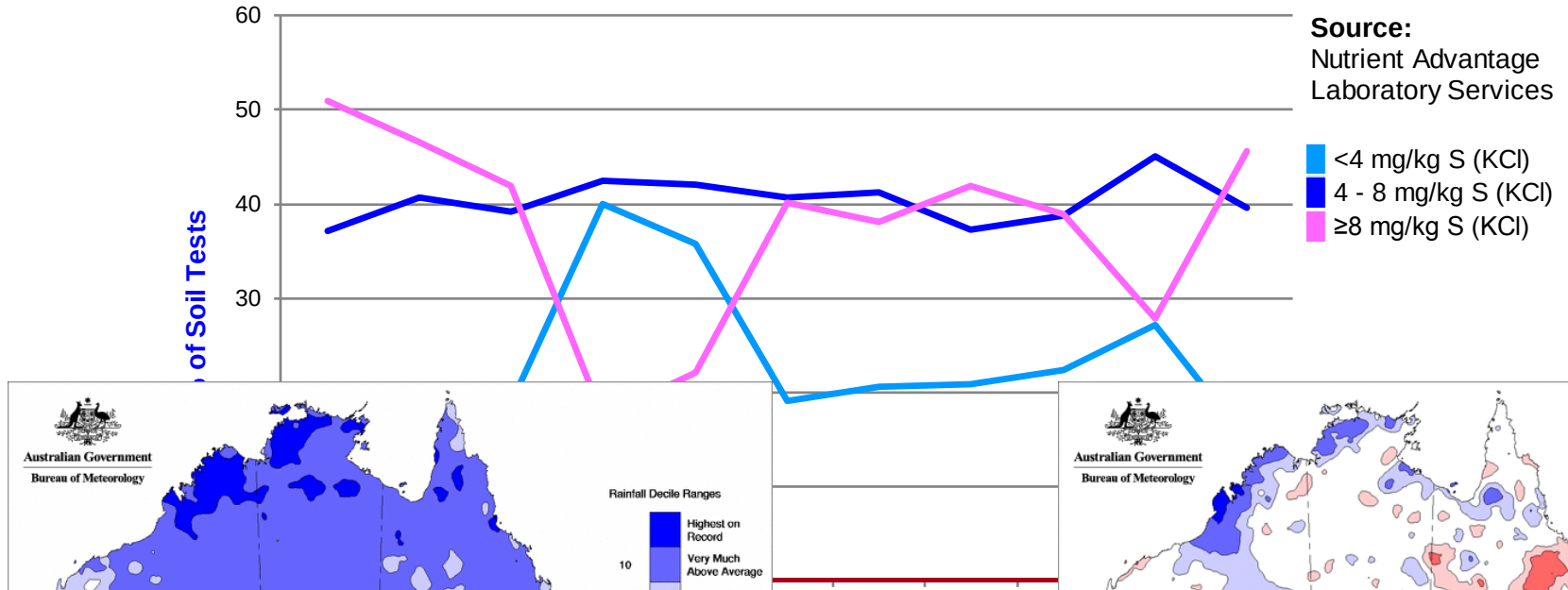


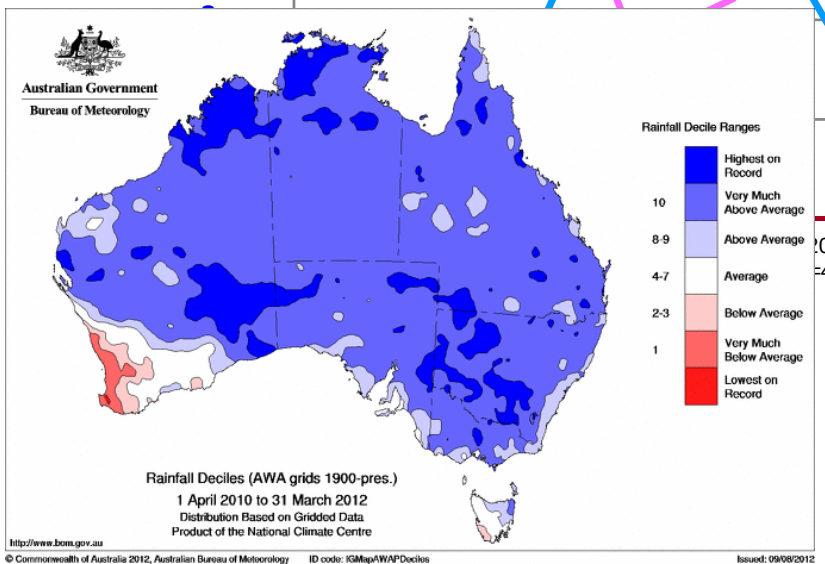
# Recent soil sulfur levels across NSW in cropping regions

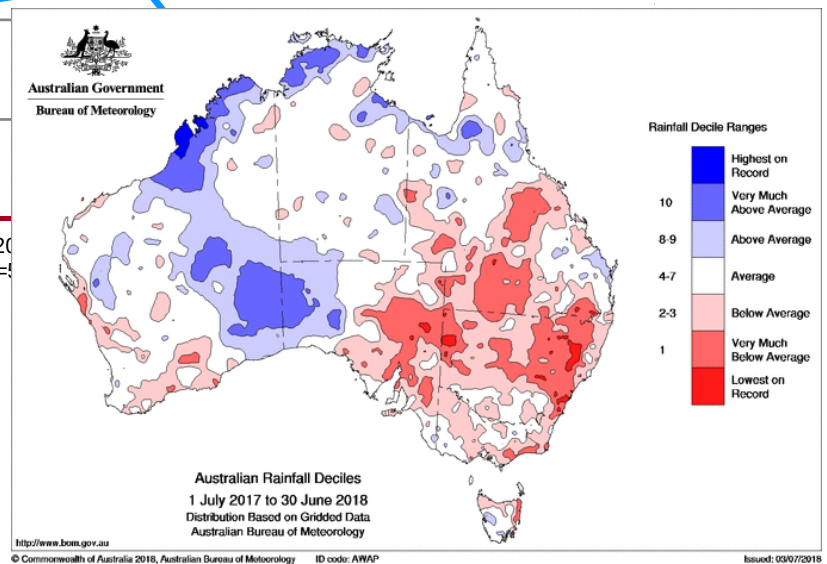
**Cropping Top-Soil S (KCl)**

**with sample depth ranges ≤10cm. 54493 Samples**

**Includes soil test results from NSW**

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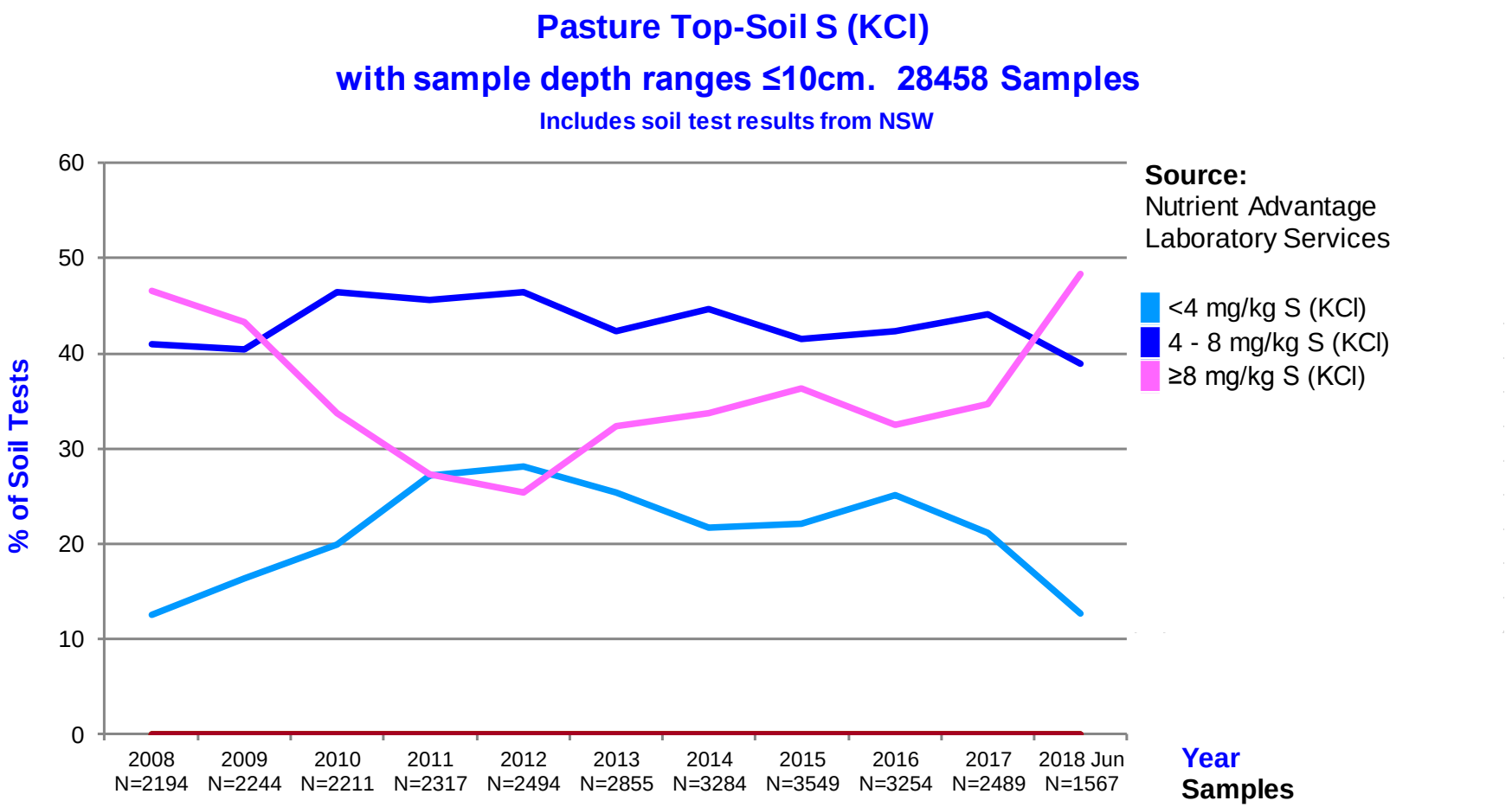
# Recent soil sulfur levels across NSW in grazing regions




Courtesy: Jim Laycock (Incitec Pivot)

# Products available

GRANULOCK® SS
PRECISION STARTS HERE.

| Product | Nitrogen (%) | Phosphorus (%) | Sulfate-S (%) | Elemental S (%) |
|---|---|---|---|---|
| Granulock SS | 10 | 17.5 | 4 | 8 |
| SuPerfect | 0 | 8.8 | 11 | 0 |
| Pasture King | 0 | 15.7 | 4.6 | 0 |
| SuStain | 0 | 0 | 0 | 90 |
| GoldPhos | 11 | 17.5 | 5 | 7 |
| Gypsum | 0 | 0 | ~17 | 0 |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THE BALANCED PHOSPHORUS & SULFUR PACKAGE


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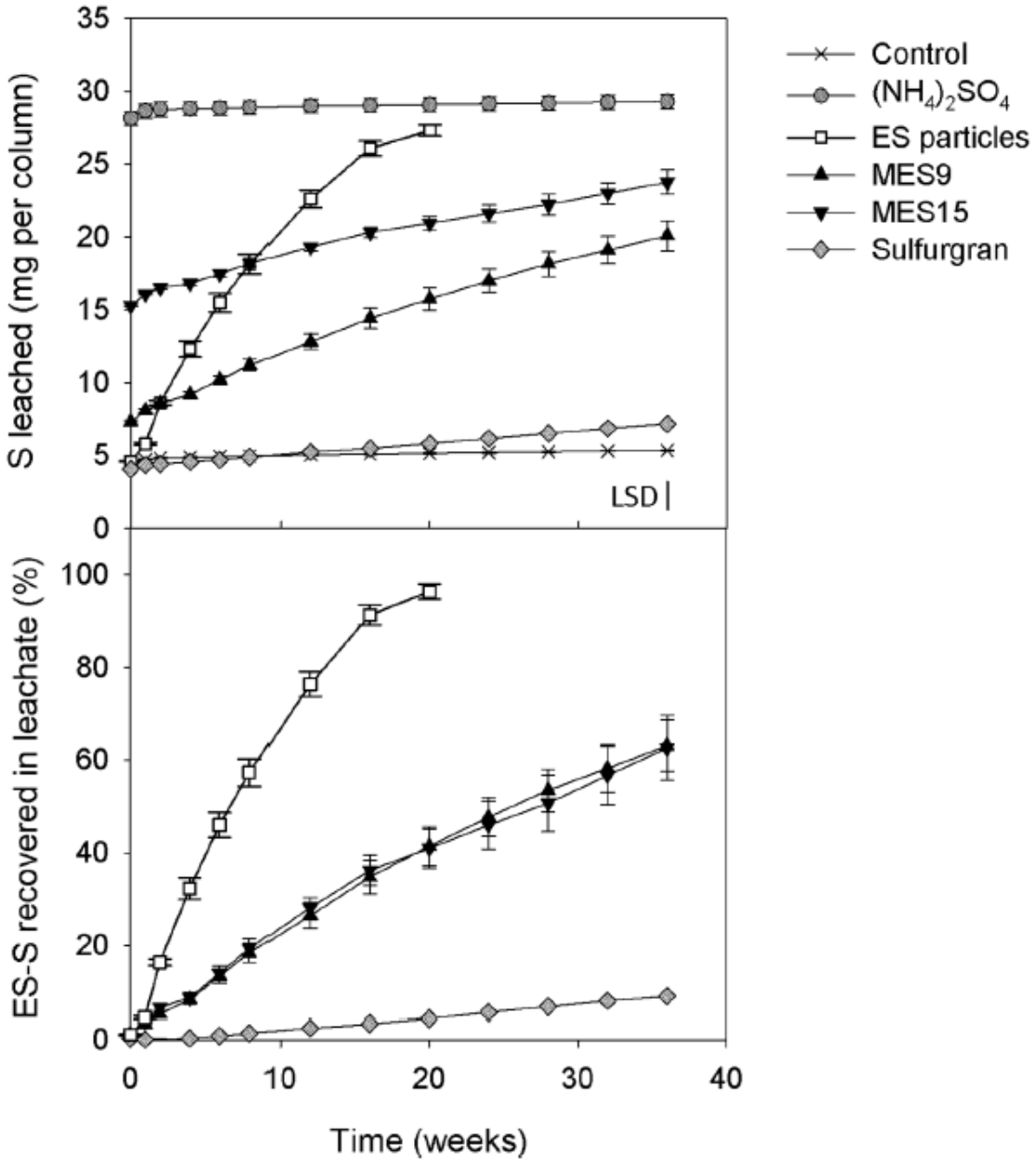
# Products available – oxidation rates

- Oxidation of elemental S is affected by soil pH, moisture and temperature
- Rates are highest in moist, warm and neutral soil
- Oxidation is proportional to size of elemental S (the smaller the micron, the faster the oxidation)
- AND proportional to contact of elemental S with soil (co-granulation reduces contact, and decreases oxidation rates)
- Half-life for pure ES (35 d); mixed granular ES (140 d) and pastilles (>3 years)




**Oxidation of elemental S from a range of fertiliser products over 40 weeks**

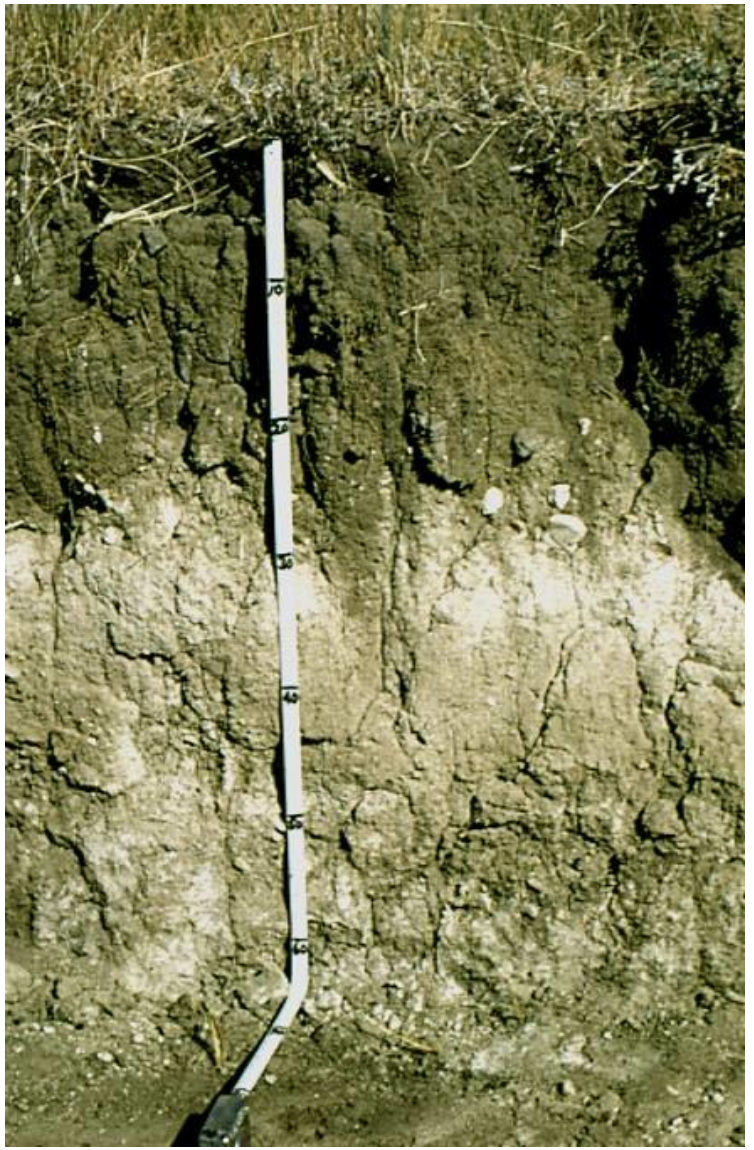
**Source**: Degryse et al. (2016) Oxidation of elemental sulfur in granular fertilisers depends on the soil-exposed surface area. SSSAJ 80:294-305

# Sulfur placement and responses

Sulfur placement is less critical

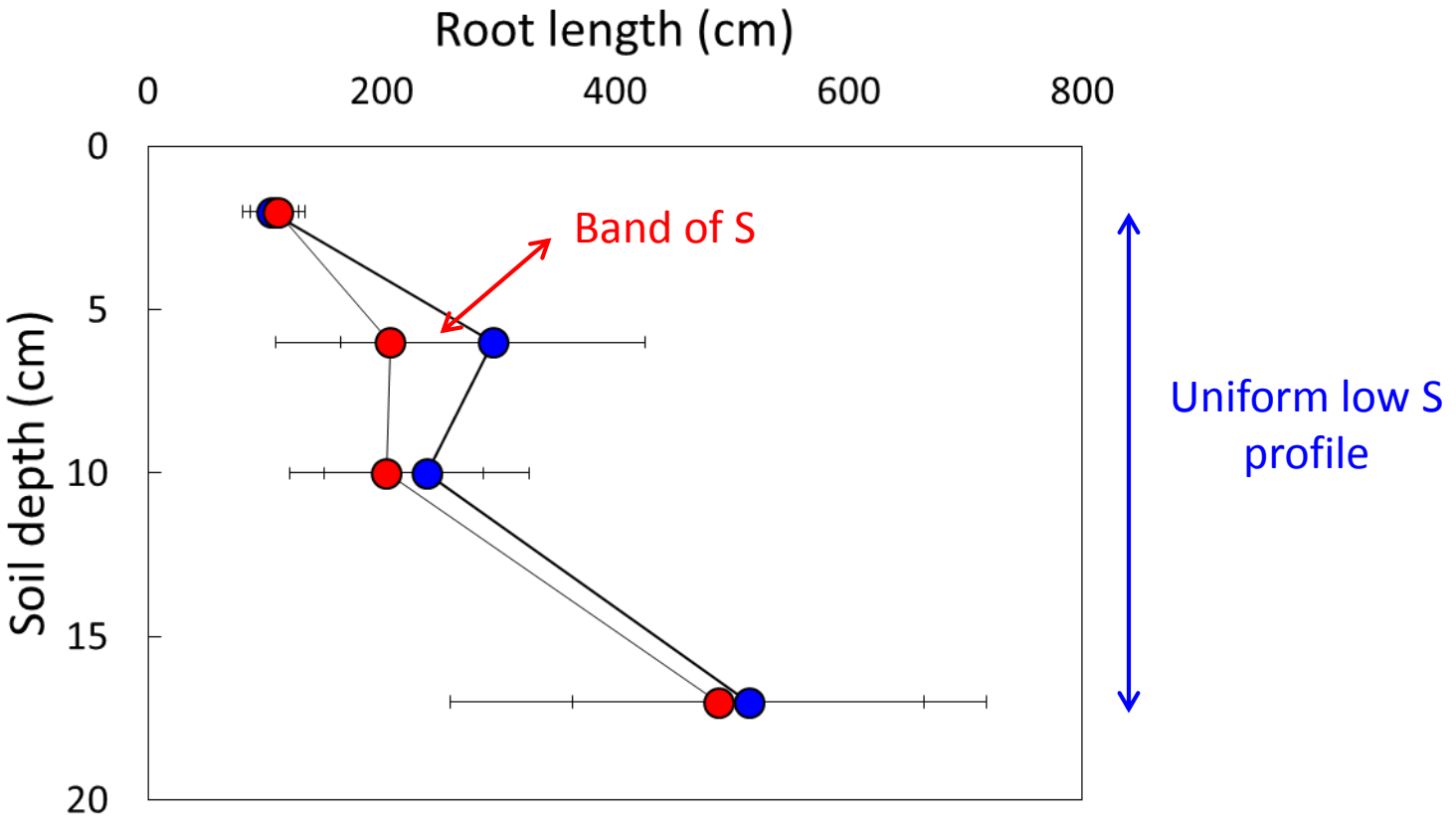
Sulfur is mobile in soils

Subsoils often contain root accessible S



# Sulfur placement and co-location

- No evidence for root proliferation in response to S
- Increasing S recovery is associated with increasing root exploration and length

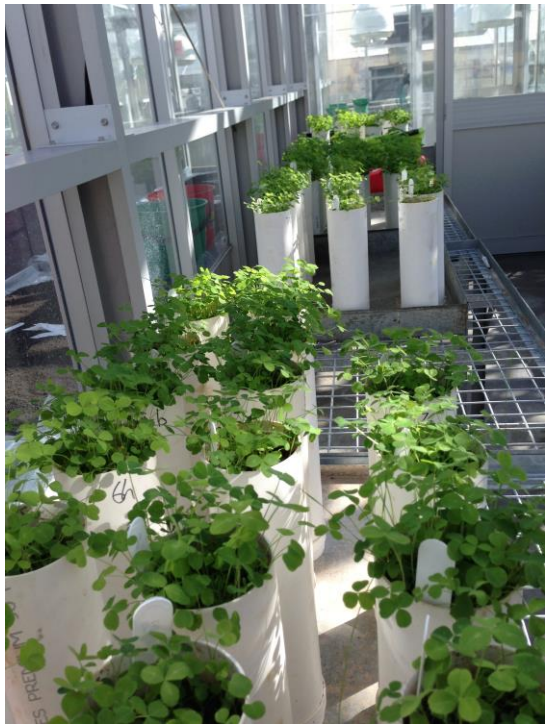


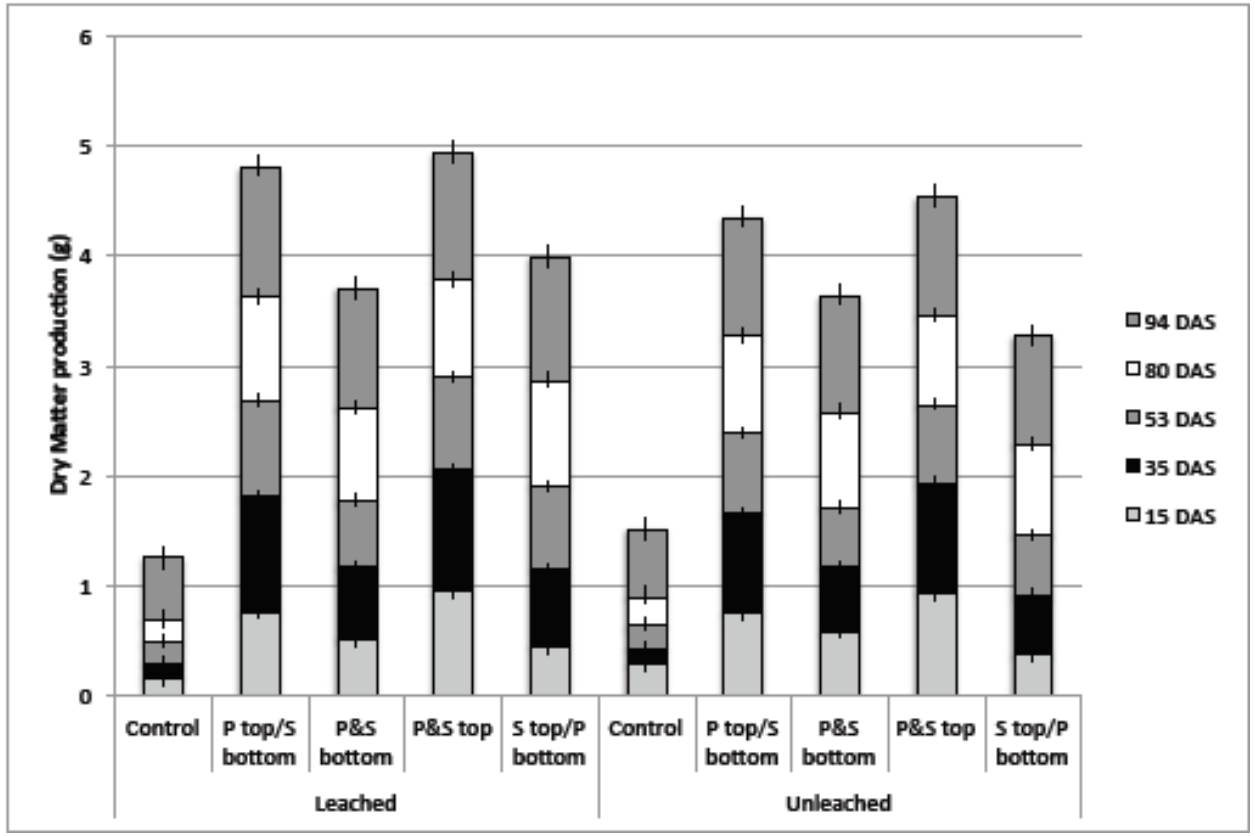

**Effect of S banding on cereal root proliferation response after 3 weeks**

# Sulfur placement and co-location

Study to investigate whether co-location of P and S important for legume pastures, particularly N fixation

Biomass and S uptake linked to P recovery not placement. Leaching had no effect – a surprising result.






**Effect of P and S placement depth and co-location on growth and S recovery of clover grown for 13 weeks**

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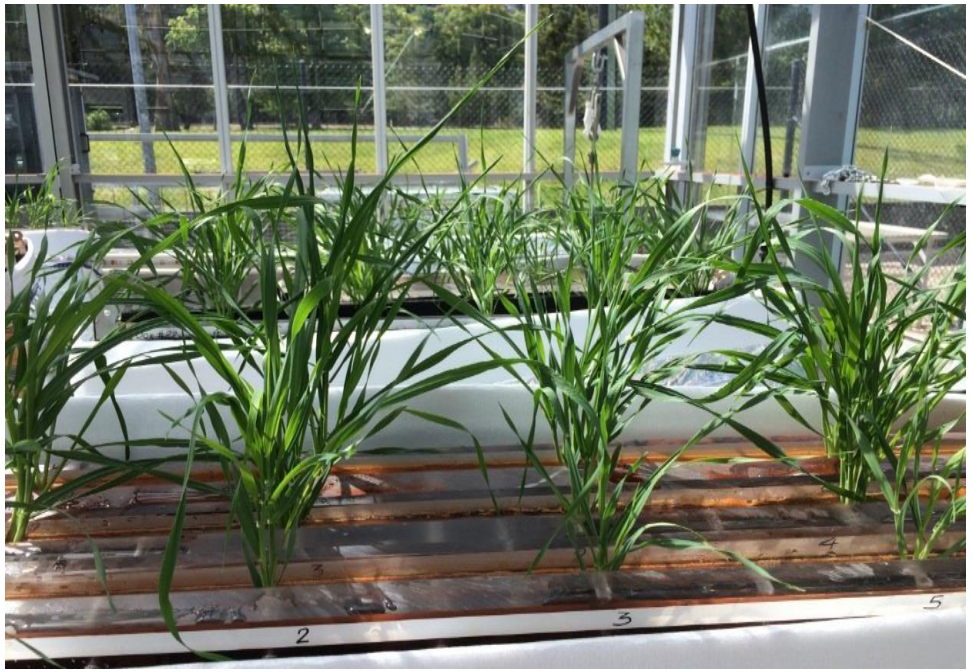
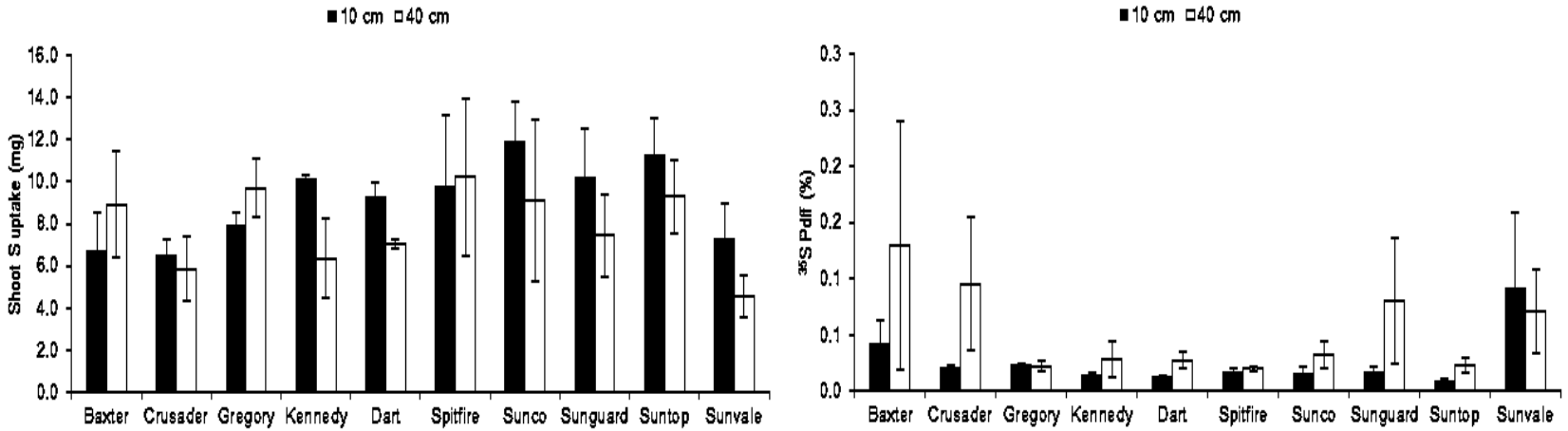
# Sulfur placement and co-location

Study to investigate cereal recovery of S from depth in multiple wheat varieties

No significant difference in S recovery from 10 or 40 cm suggesting roots at all depths are able to recover S (i.e age is not critical)






**Effect of P and S placement depth on root recovery by wheat using isotopes following 6 weeks growth**

# Gaps in S knowledge

- Critical S values
- Sampling depths that match response
- Depletion of labile organic S reserves
- Residue management to optimise S cycling

# Recap

- S deficiency not yet widespread in cropping regions, but critical in grazing regions
- Products with elemental S important under leaching conditions
- Placement less critical due to S mobility in soil