Unlocking the true value of organic soil amendments

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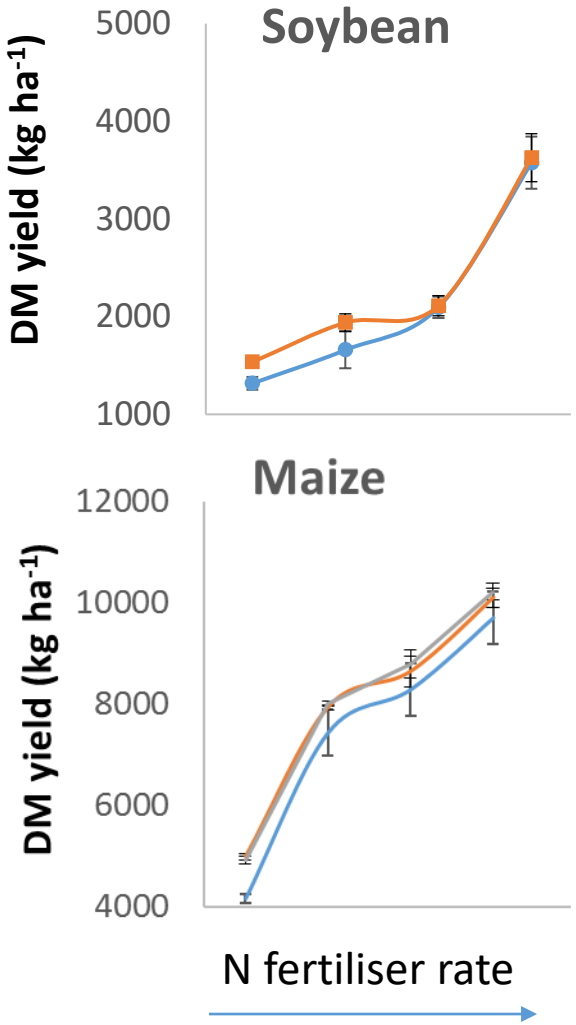
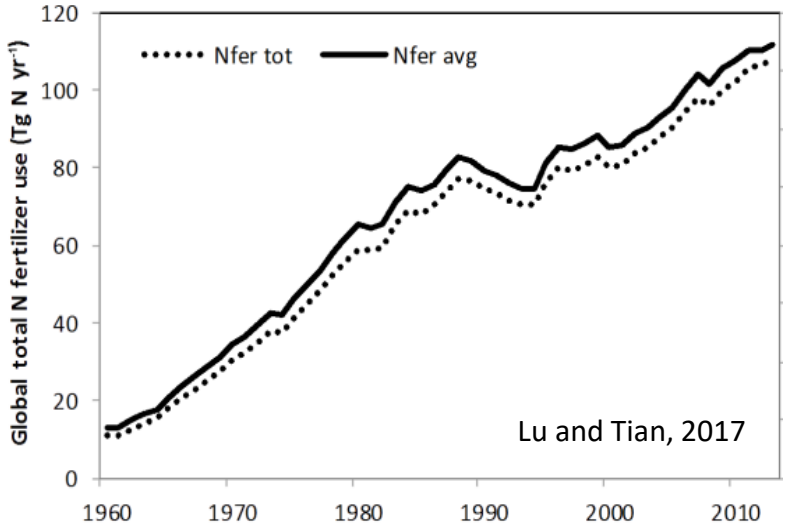
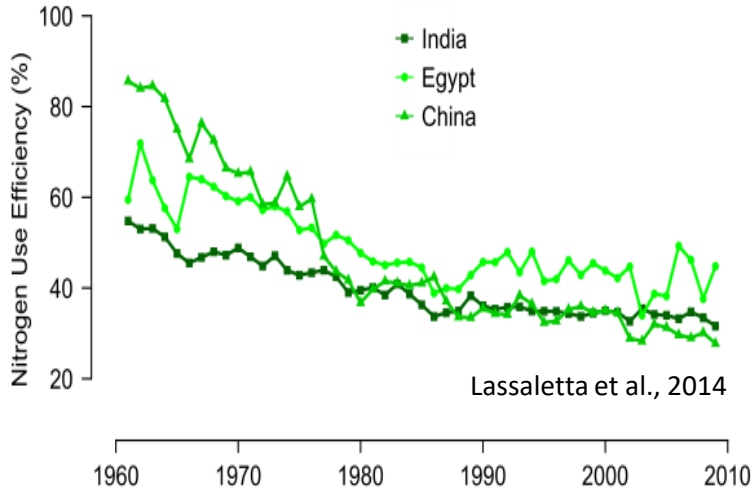
The Nitrogen dilemma - A very ~~leaky~~ important element







A great resource: Organic Amendments (OA) in Australia

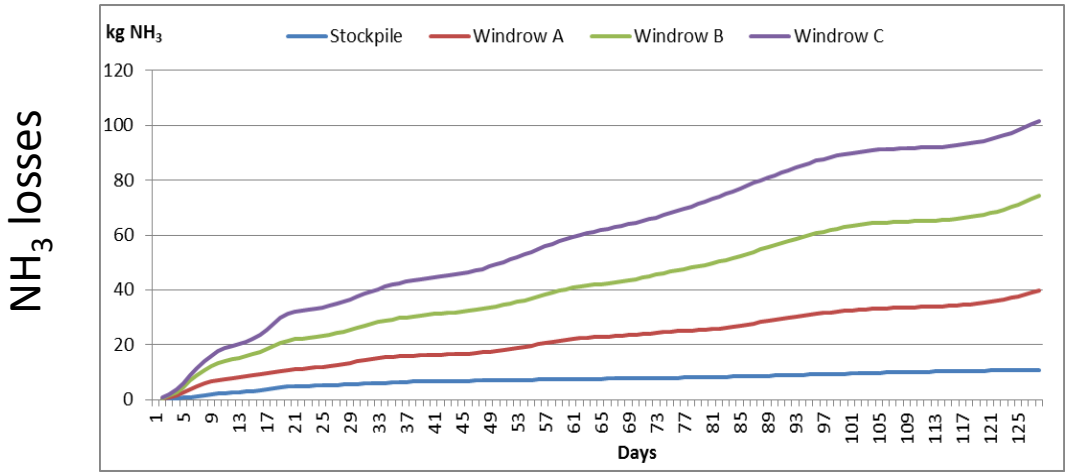
- Intensive animal industries in Australia produce >3 million t/yr
- Contains 246,000 t of N, 88,000 t P & 359,000 t of K
  - Valued at $1.9 billion/yr
- Few operations but large, centralised operations (e.g. >25 000 head of cattle)
  - Majority as poultry and beef feedlot
- Transport is major cost for use > 150 km economical?
- Wide price range – $12/t raw feedlot → >$85/t composts
- Nutrient and liming value up to $160/t
  - Co-benefits?
- Storage and processing largely unregulated
  - Little incentive to minimise losses
  - None for application

So what's the issue?

1. The product: How manure product is handled, stored, blended

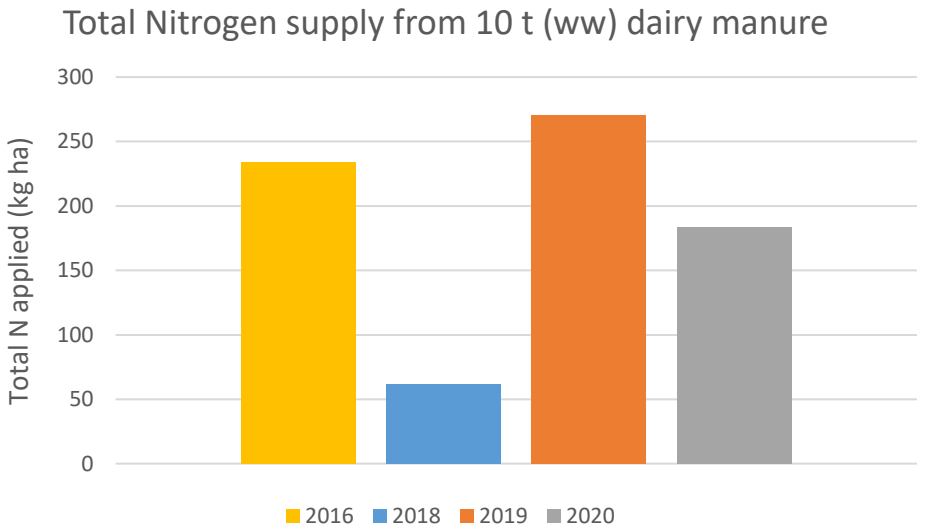
- Age
- Weather/exposure
- Stockpiled, composted, turned, blended with carbon sources
  - Large potential nutrient losses – particularly nitrogen
  - Estimated \$700k yr^{-1} of N lost from this single composting operation

→ **highly variable end product**: what are you paying for?



NH_3 losses

Composting period →



So what's the issue?

2. How much OA to apply?

	Target nutrient input	Urban-derived compost	Feedlot manure	Composted chicken manure
Application rate - Wet weight (tonne ha^{-1})	-	29	16.5	6
Application rate - Dry weight (tonne ha^{-1})	-	21.3	13.3	4.6
Total P (kg ha^{-1})	**70**	70	70	70
Total N (kg ha^{-1})	300	336	158	199
Total K (kg ha^{-1})	180	216	227	118

What about available (mineral) N?

→ **How do we avoid excess nutrients**

Manure needed to apply 35 kg N ha^{-1} of available N upfront

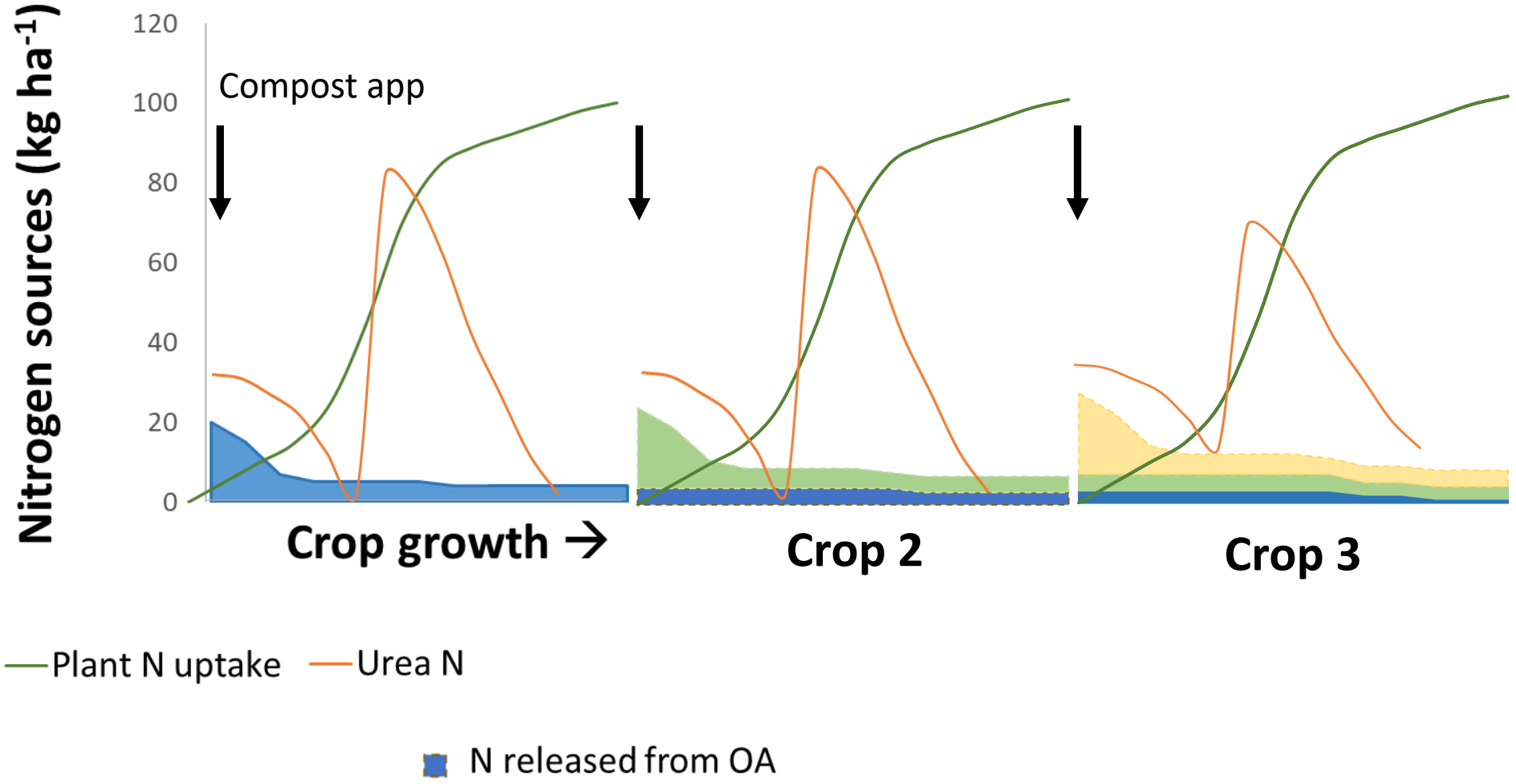
Stockpiled/Raw CM: 3.5 t/ha
Composted CM: 19.0 t/ha

Stockpiled/Raw FM: 2.5 t/ha
Composted FM: 34.0 t/ha

So what's the issue?

3. When is that nitrogen available (nutrient release curves) and matching plant demand

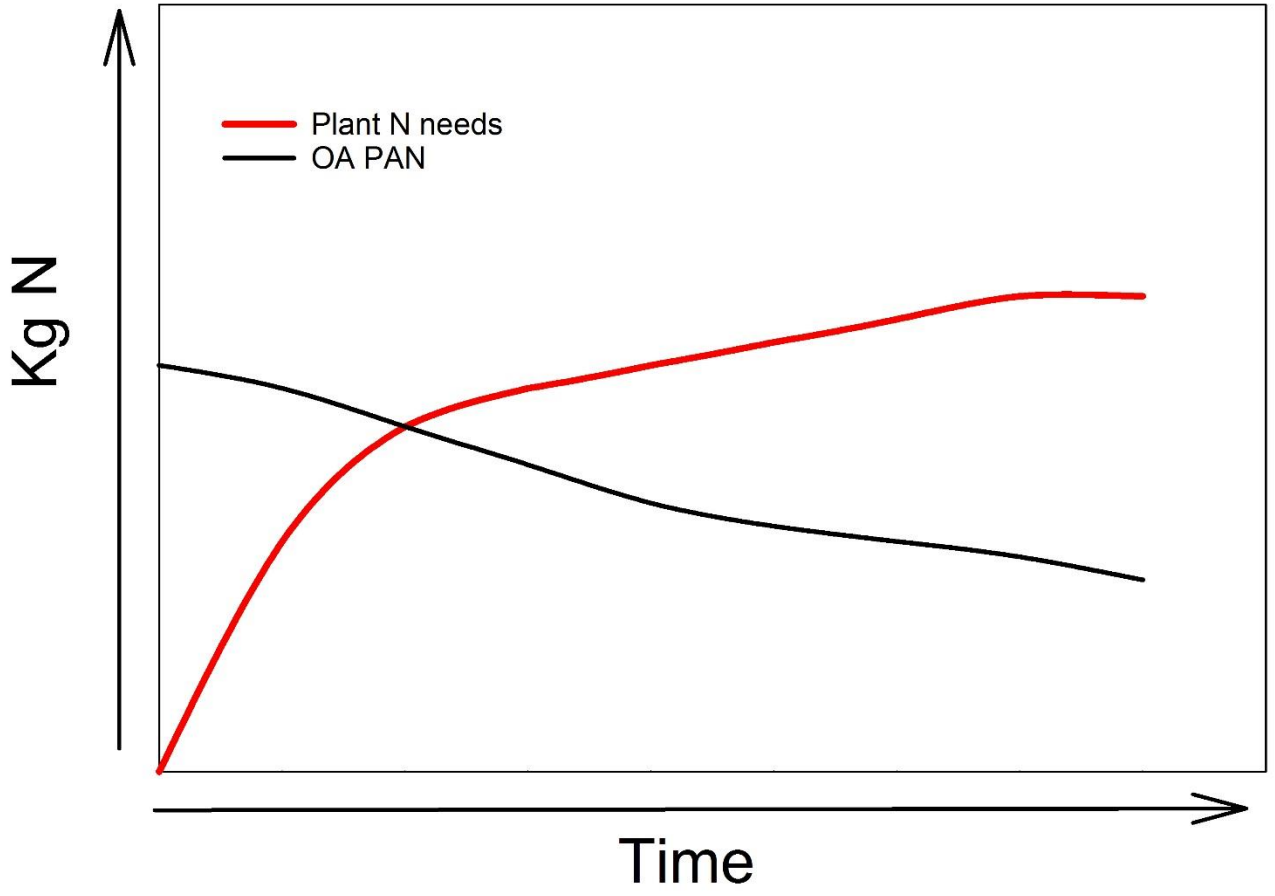
→ Multiple applications



Accounting for Nitrogen

Accounting for the Plant available N (PAN) release from OA

Right balance between OAs and chemical fertilizer



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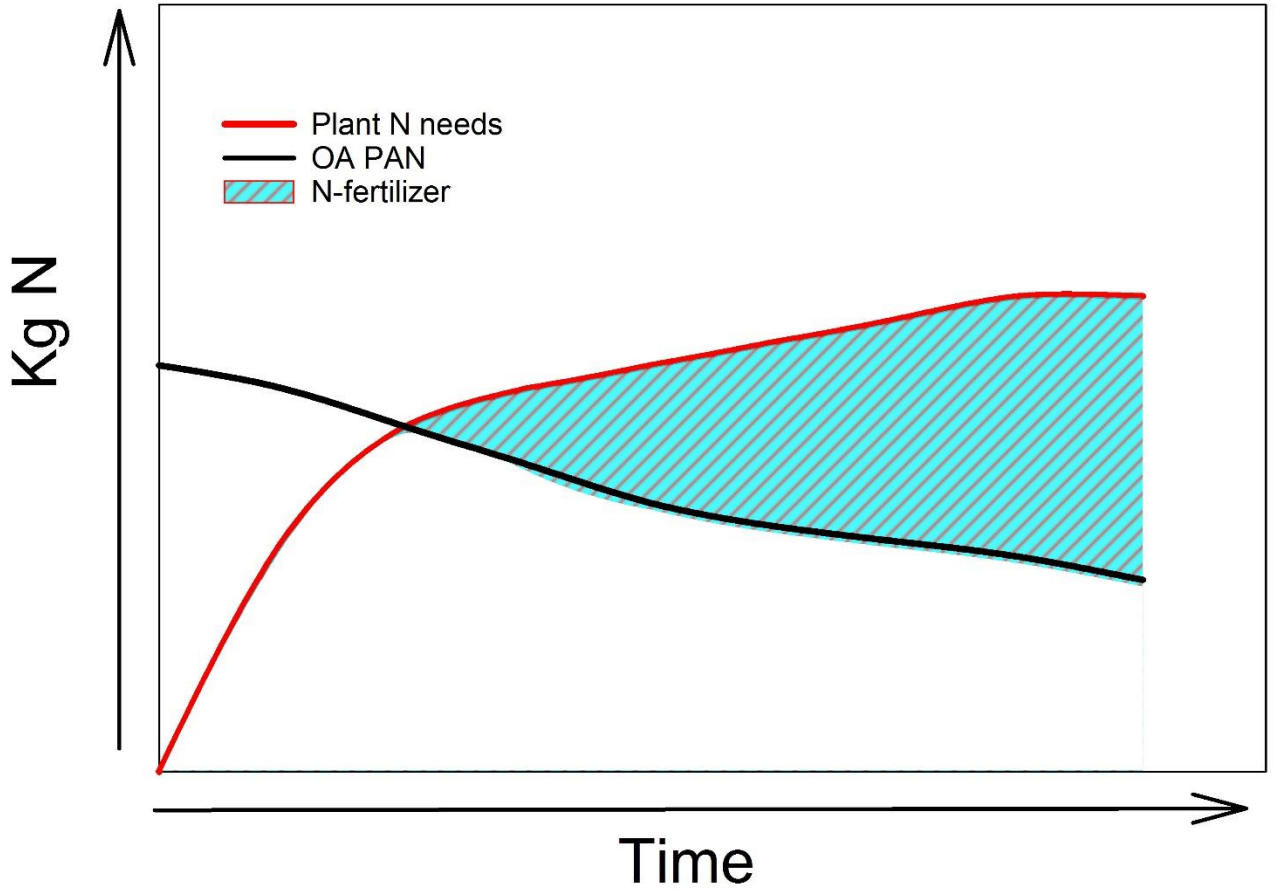
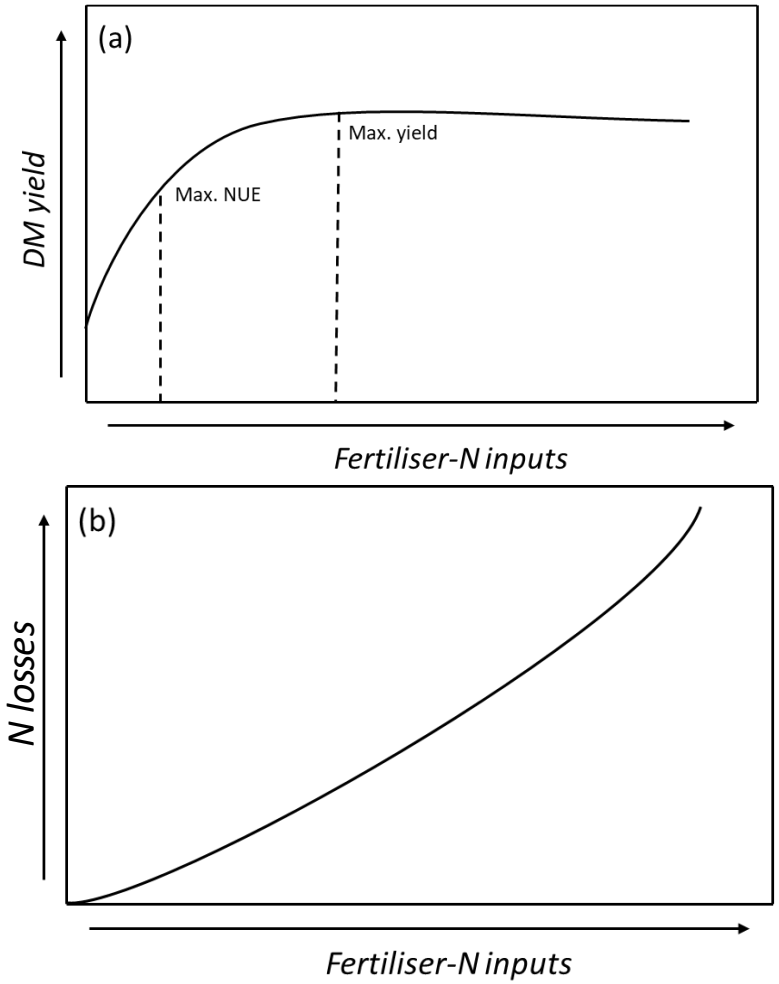
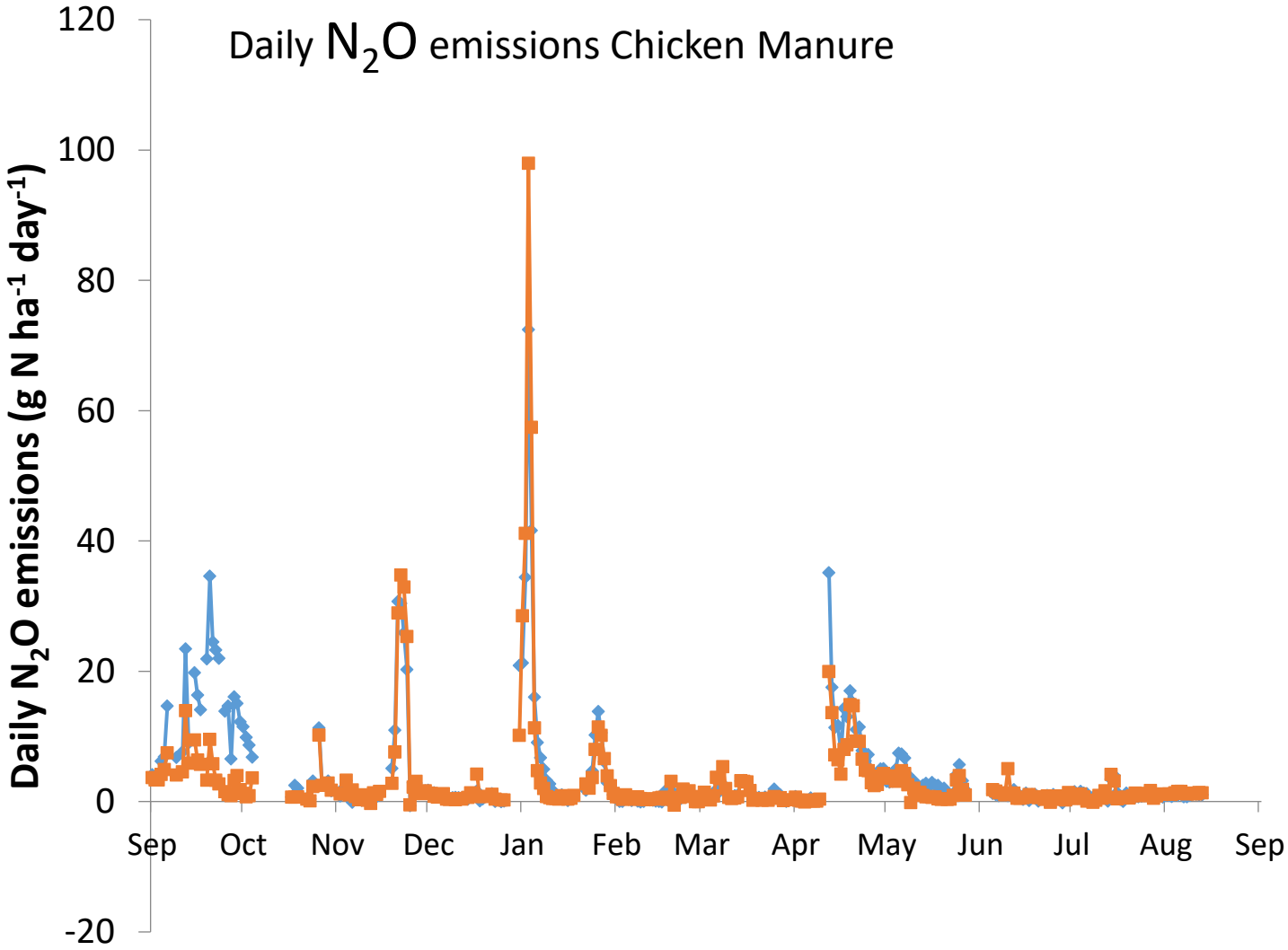


So what's the big issue?

What happens when we get it wrong?





Additional benefits – Soil Health

- Increased Nitrogen use efficiency
- Increased water use efficiency
- Increased infiltration/lower erosivity
- Pathogen resistance
- Soil C sequestration

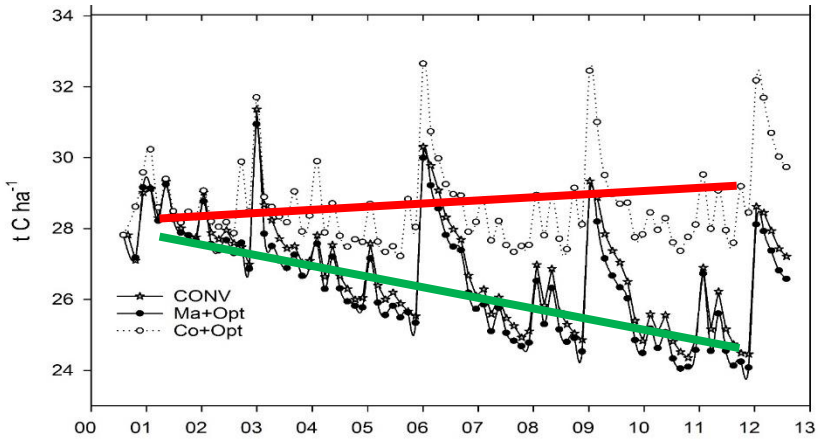
Hard to quantify

Maintaining Long-term Soil Carbon

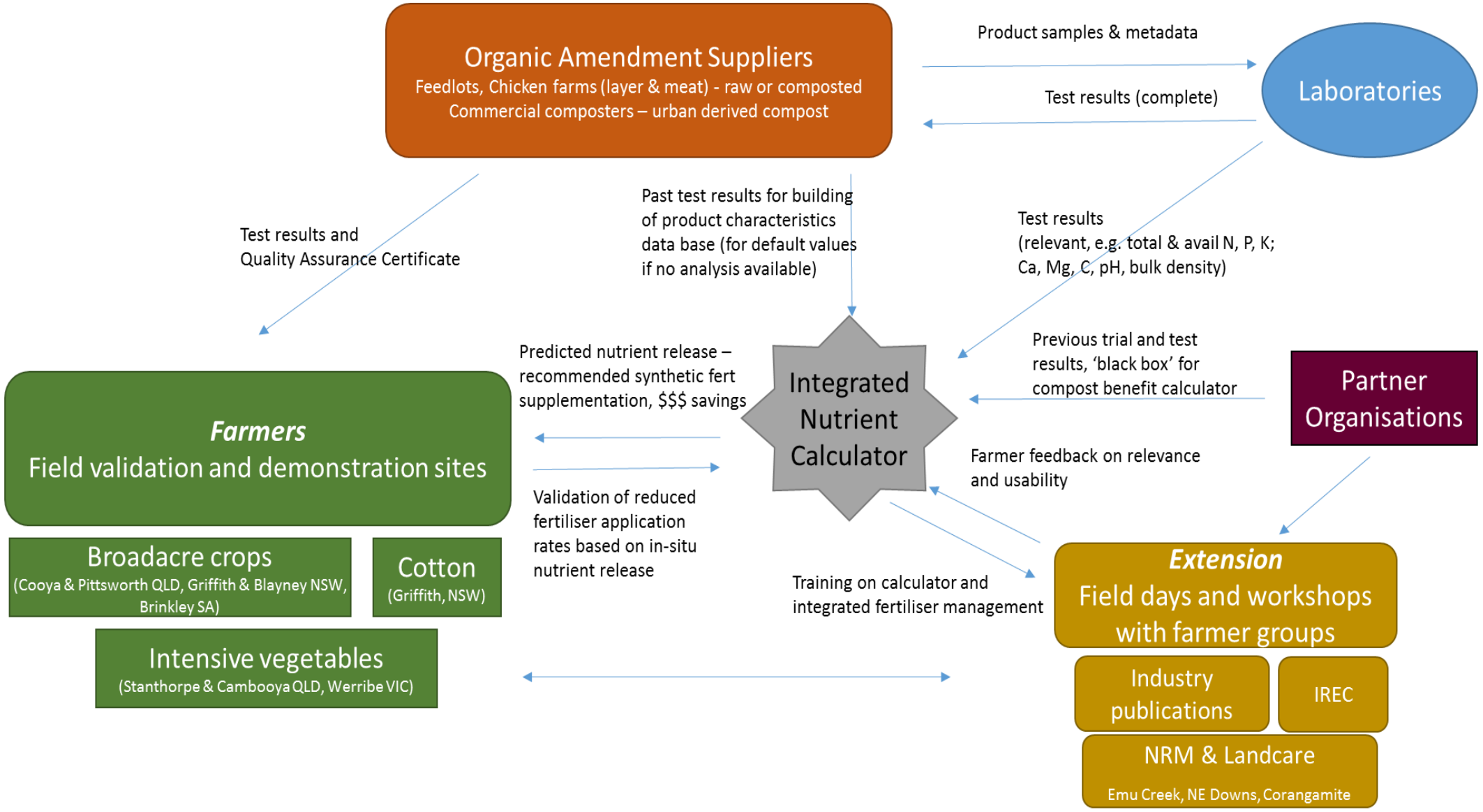
Intensive vegetables - Gatton

Treatments that received
COMPOSTED OA
Maintain or **increased SOC**

Treatments that received
RAW OA
Decreased SOC (-3.4% year)



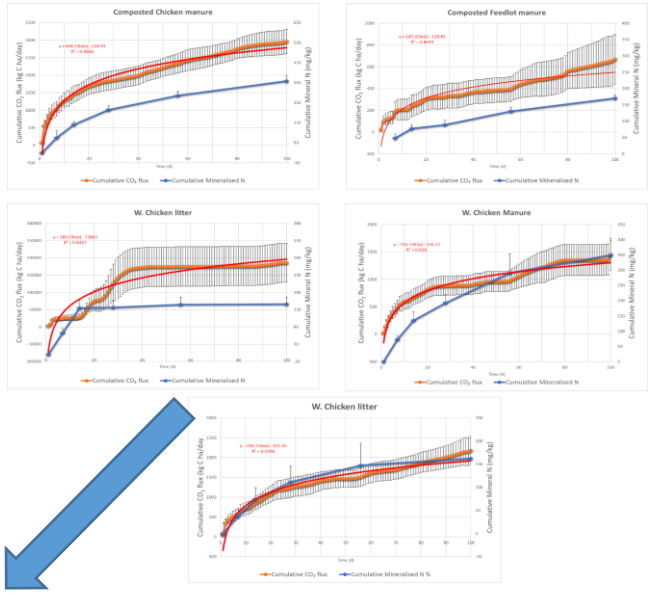
Smart Farming partnerships: From waste to fertiliser – a farmer ready tool for the effective integration of manures and composts into farm fertiliser budgets for improved environmental, soil health and economic sustainability



Predicting plant nutrients release from soil organic amendments

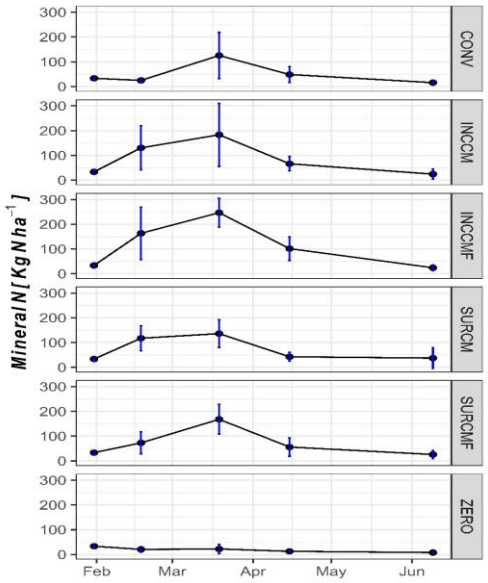
Laboratory analysis

Model parametrisation



calibration

Field validation



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