Reef Rescue
Research & Development

Evaluating and improving A-Class practices to control nutrient losses from sugarcane

Peter Thorburn, Steve Attard, Jody Biggs (CSIRO)
in collaboration with:
Reef Catchments, NQ Dry Tropics, Terrain NRM, BBIFMAC, Project Catalyst and farmers

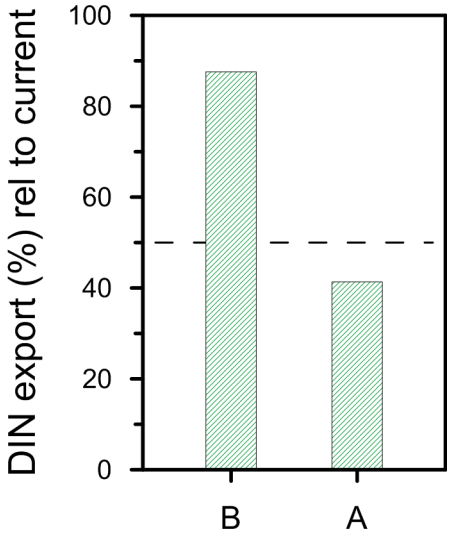
CARING FOR OUR COUNTRY

Issues and activities

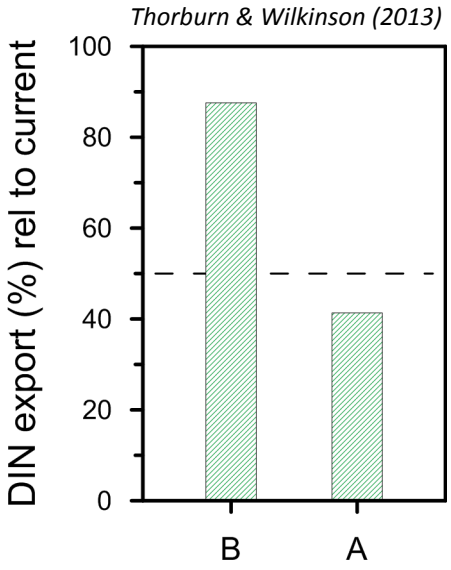
A-Class practices...

- Needed to meet water quality targets
- Being promoted and adopted
  - Project Catalyst
- Need to be represented in the P2R
- Little known about water benefits of A-Class practices

Thorburn & Wilkinson (2013)



Issues and activities



A-Class practices...

- Needed to meet water quality targets
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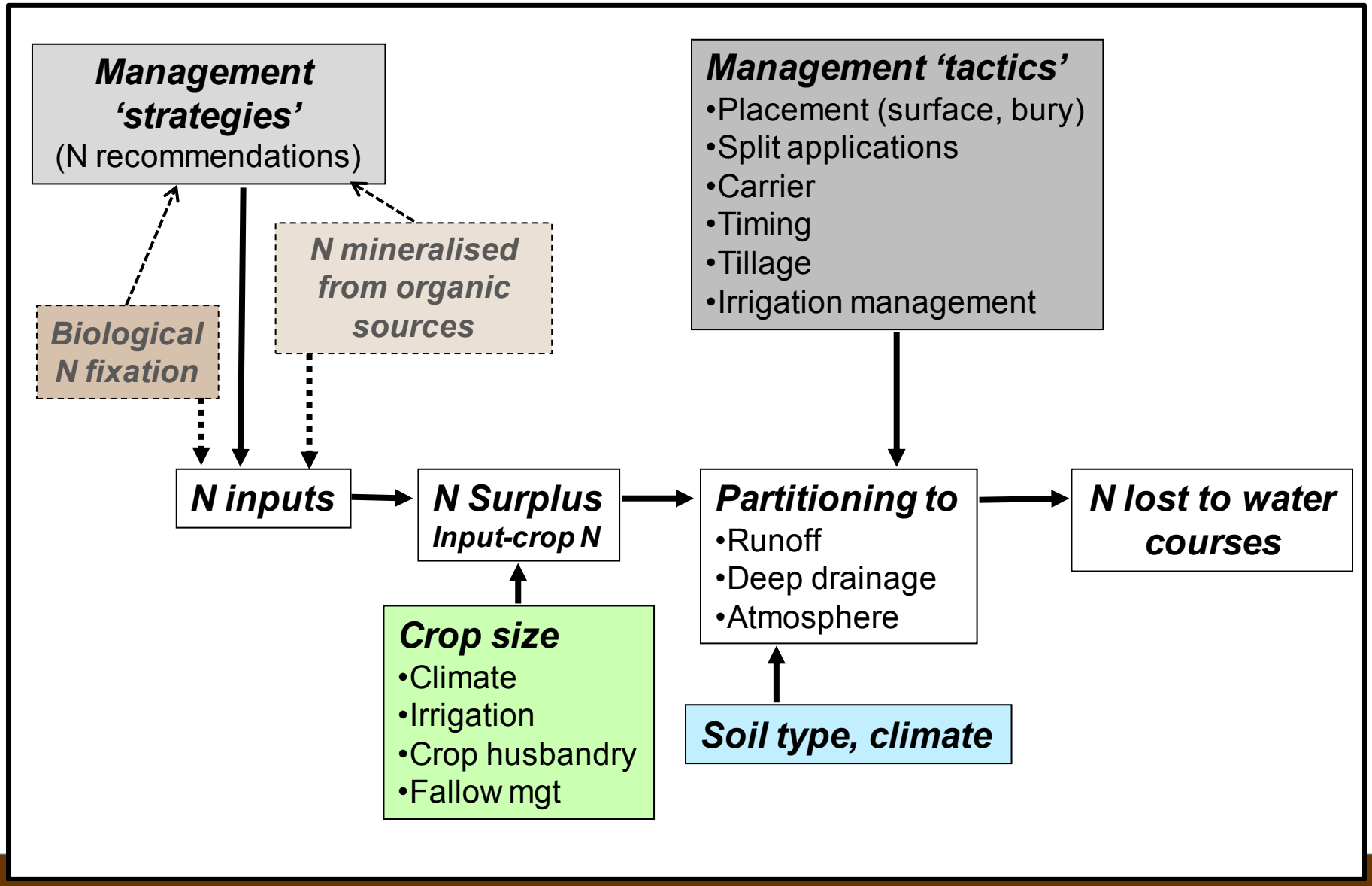
Streams of work

1. Field experiments with Project Catalyst farmers on WQ benefits
   - Three sites: Herbert & Burdekin x 2
2. Evaluate benefits of management systems
   - Simulation of experiments, and other issues
3. Identify factors behind improved water quality (hence how to improve A-Class practice systems)

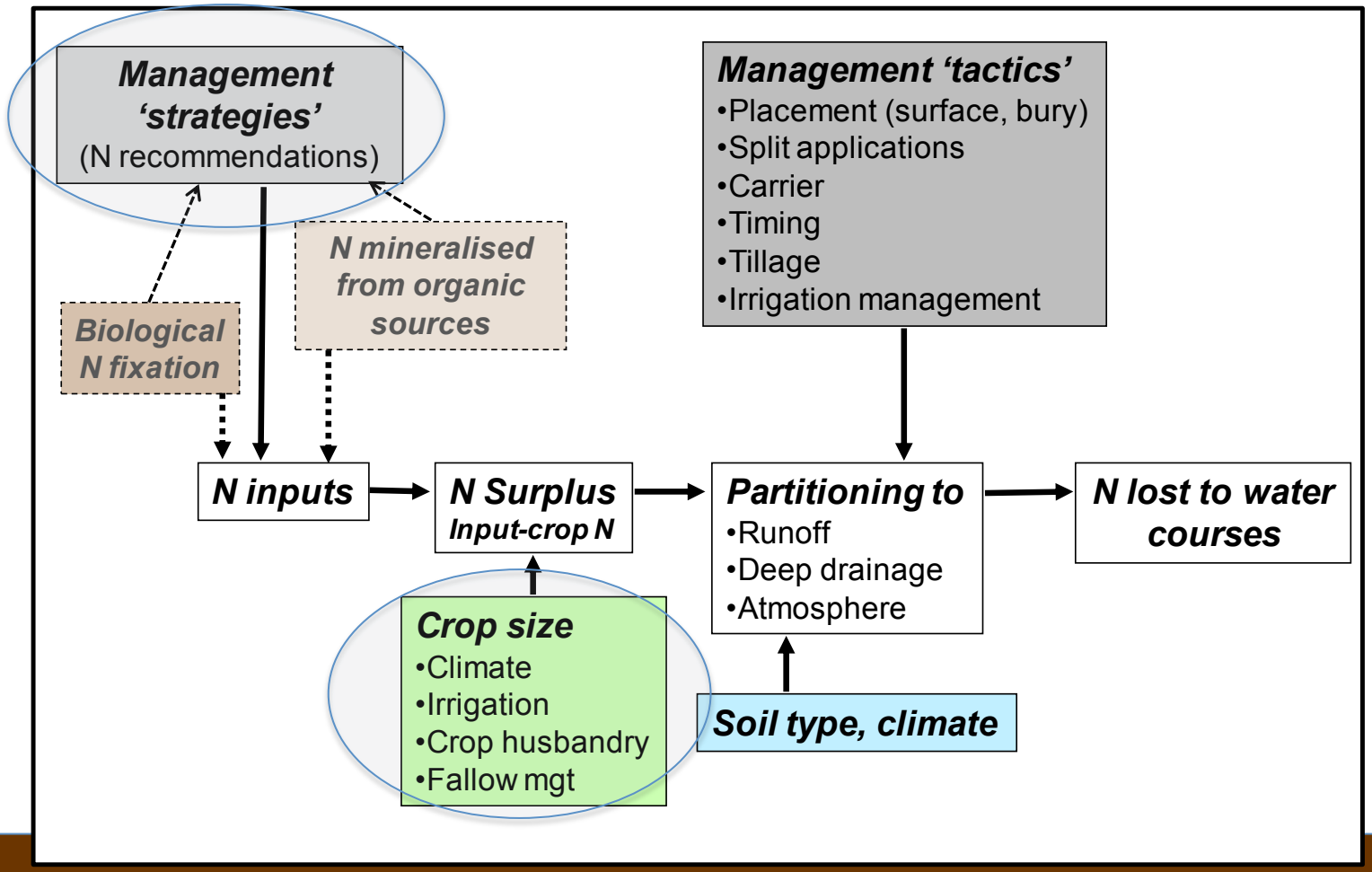
Framework

Thorburn & Wilkinson 2013



Field experiments on A-Class nutrient & soil mgt on Project Catalyst farmers' farms

- 'Precision management' = lower avg N application on block
- Good soil management = greater potential crop growth

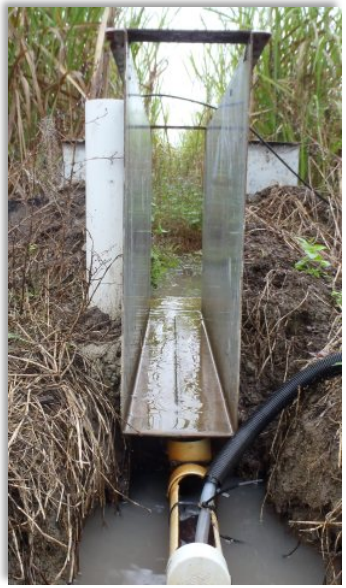


Field experiments on A-Class nutrient & soil mgt

- Herbert – precision mgt (spatial nutrient) v conventional
  - Avg N rate: Prec = 121 kg/ha. Conv = 149 kg/ha
  - No yield differences (60 TCH)
- Burdekin furrow, plant cane following cow pea
  - Nutrient rates, high v low
  - Avg N rate: High = 134 kg/ha. Low = 38 kg/ha
- Burdekin new trickle, plant cane following soybeans
  - Nutrient rates, high v low
  - Avg N rate: High = 180 kg/ha. Low = 140 kg/ha

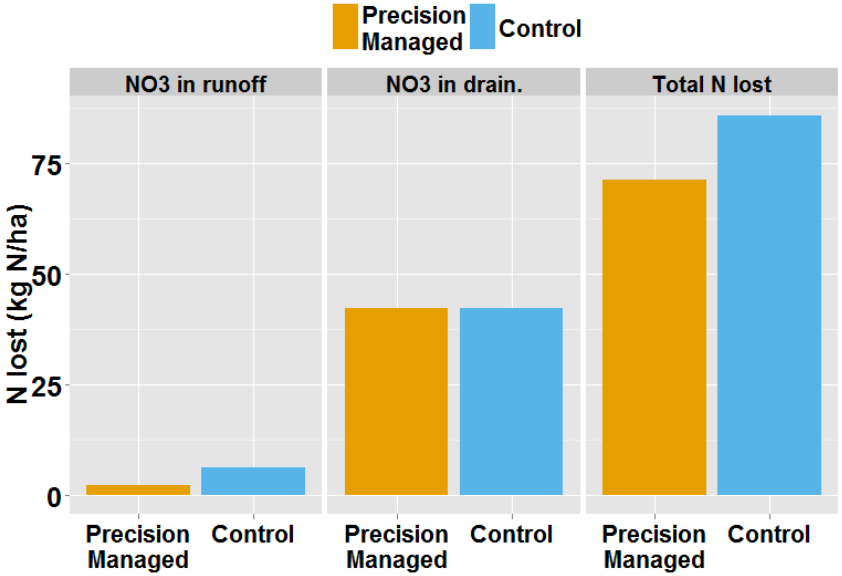
Field experiments on A-Class nutrient & soil mgt

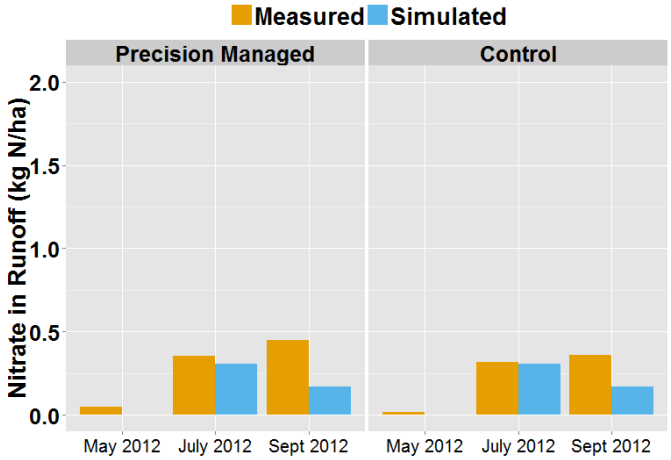
- Measurement and modelling approach
- Example results...



Whole of crop N losses in runoff, deep drainage & total

Burdekin Site 1

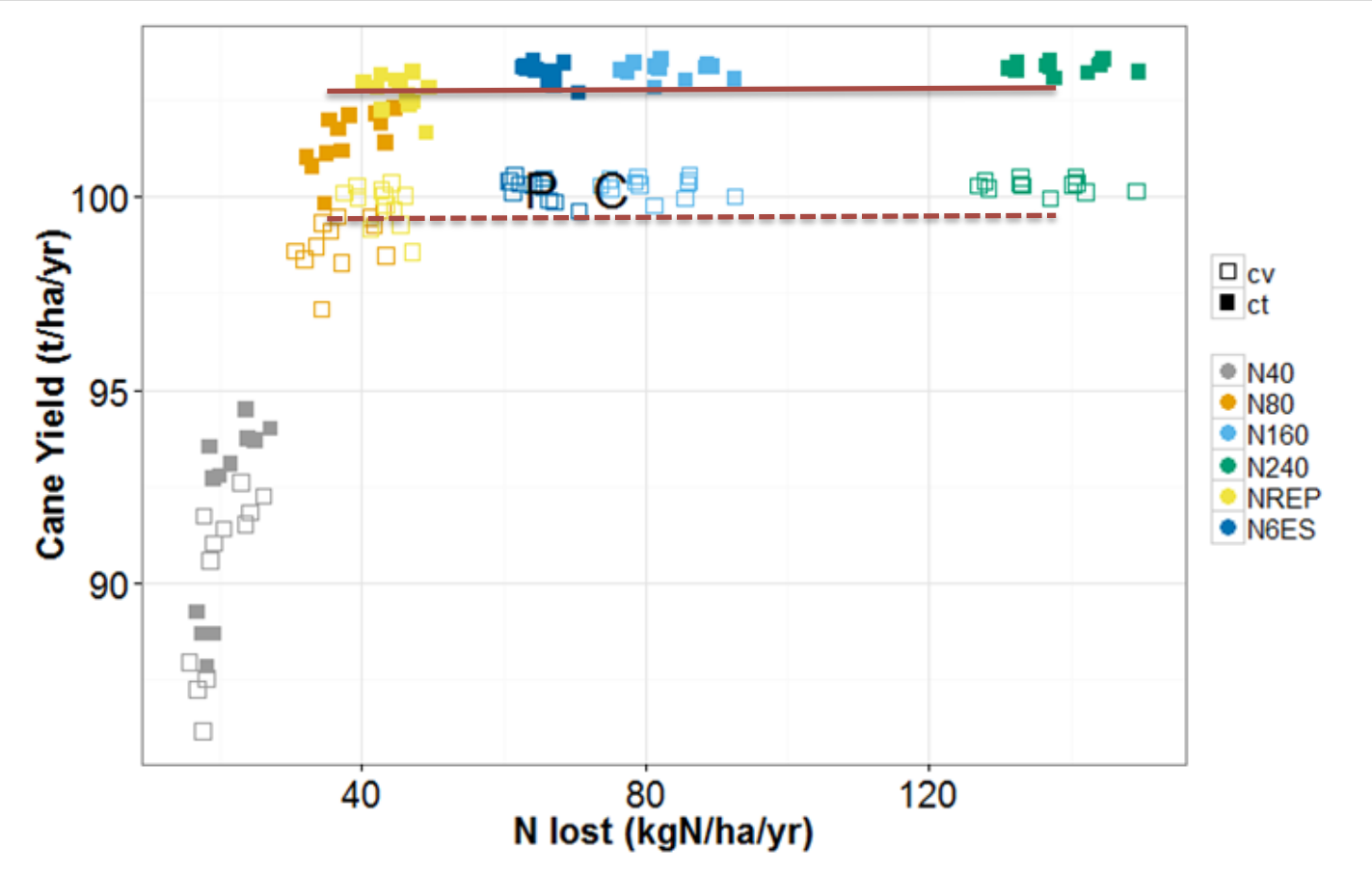




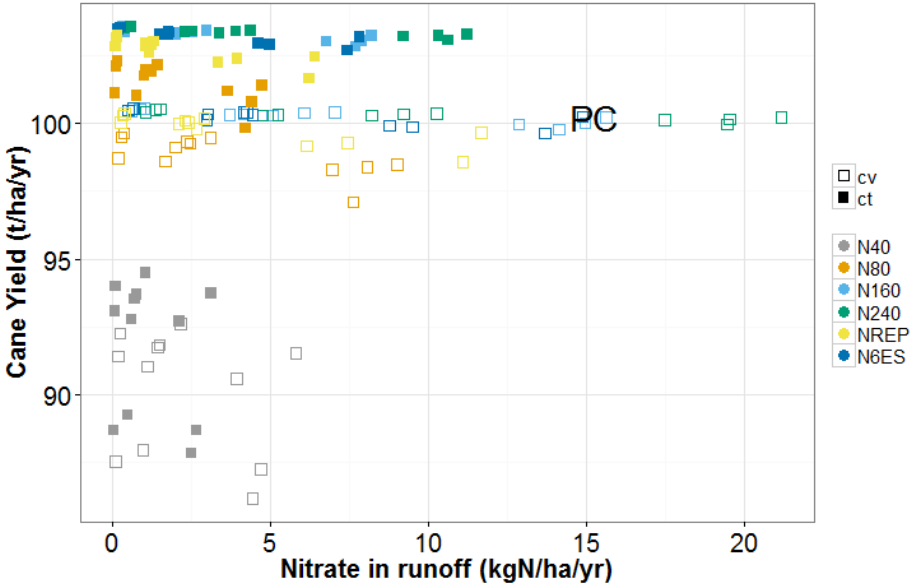
Field experiments on A-Class nutrient & soil mgt: Site HR-02

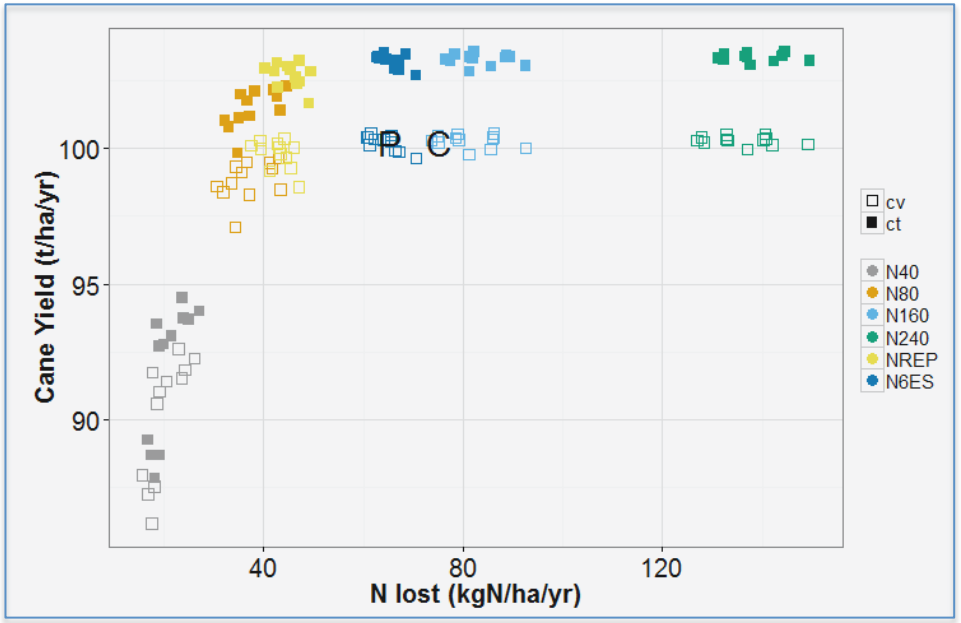
Simulating trade-off between cane yield and N losses across managements

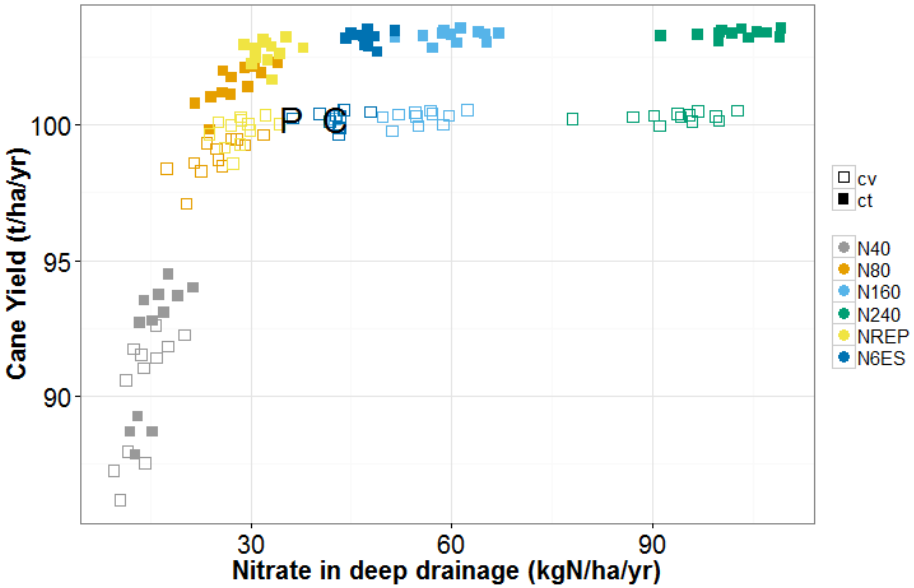
- Put farmers' 'treatments' into perspective
- Predict 'limits' of the system

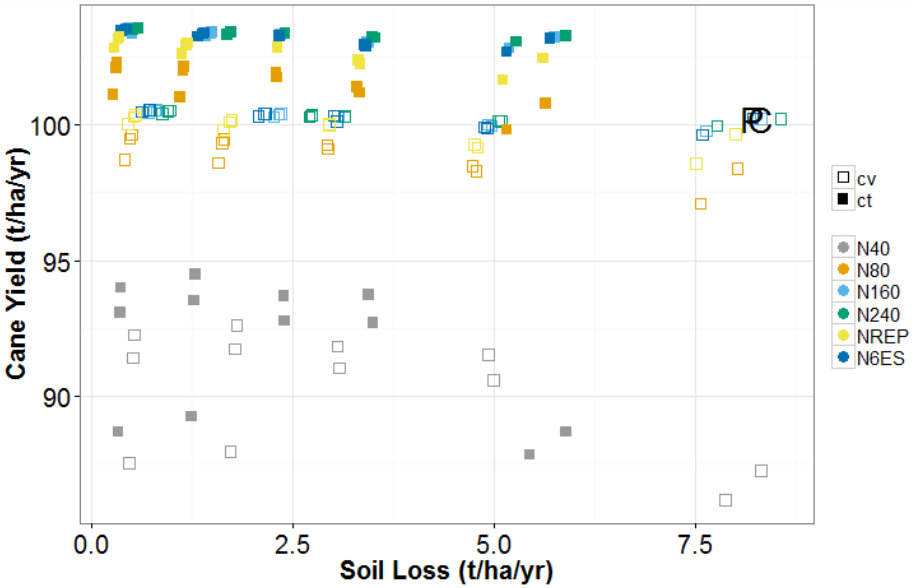


Field experiments on A-Class nutrient & soil mgt: Site HR-02

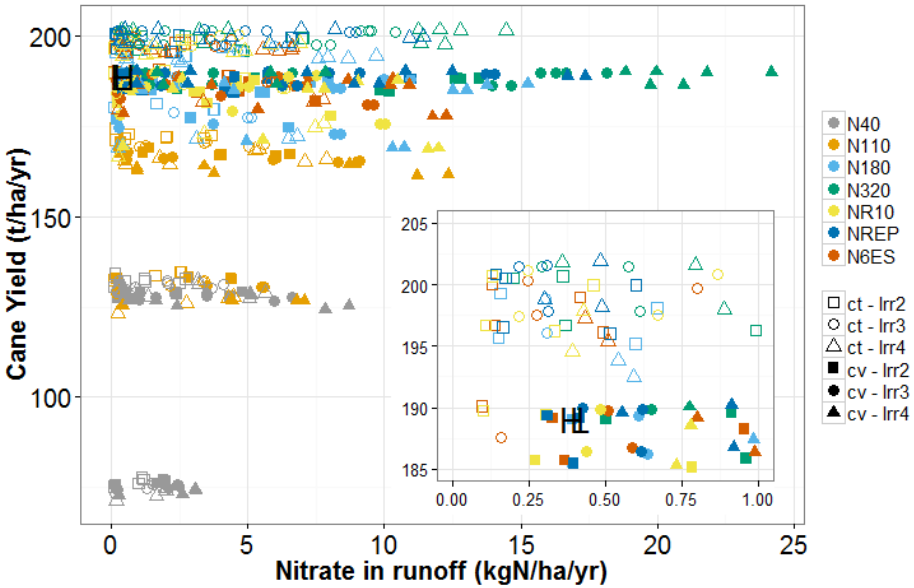


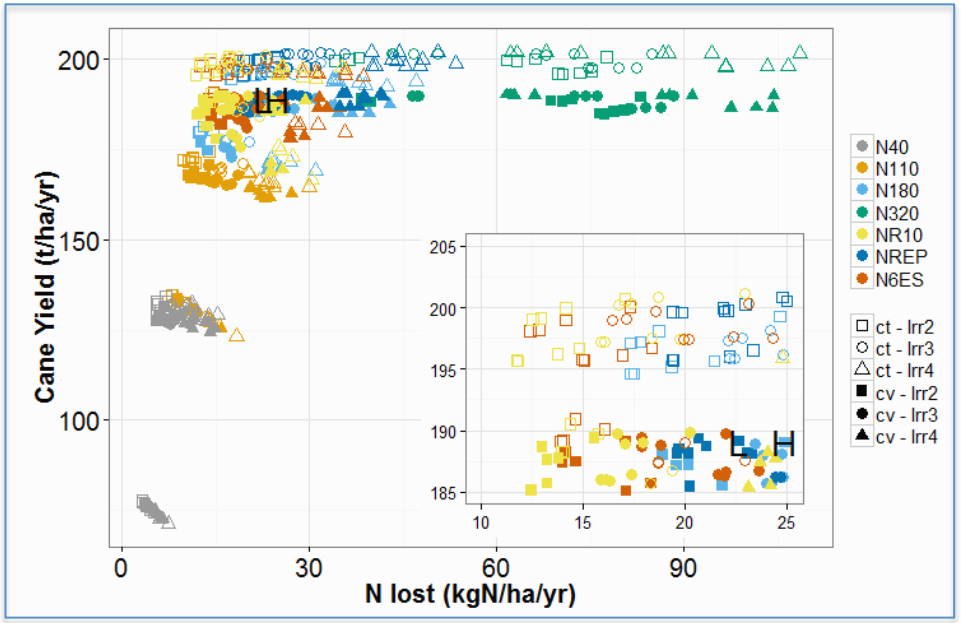


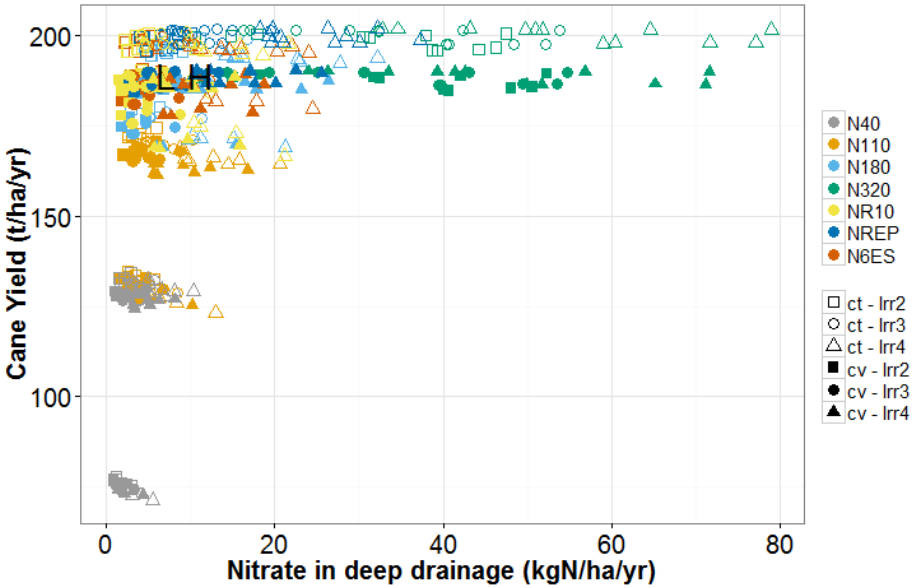


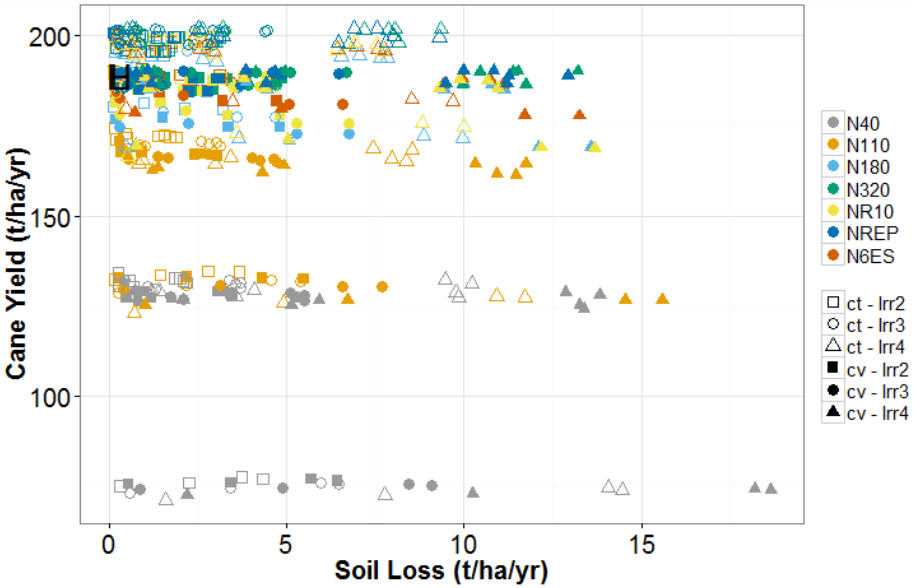


Field experiments on A-Class nutrient & soil mgt: Site BK-05

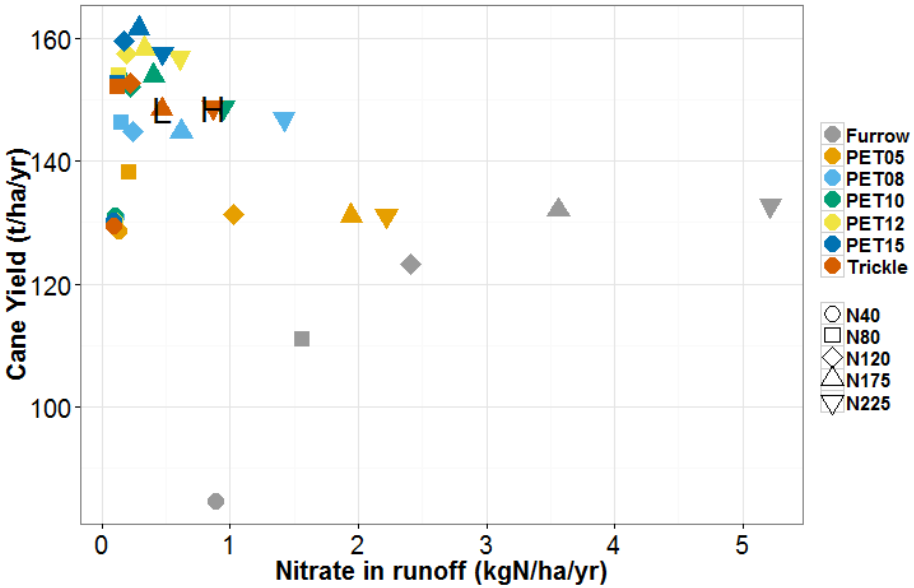


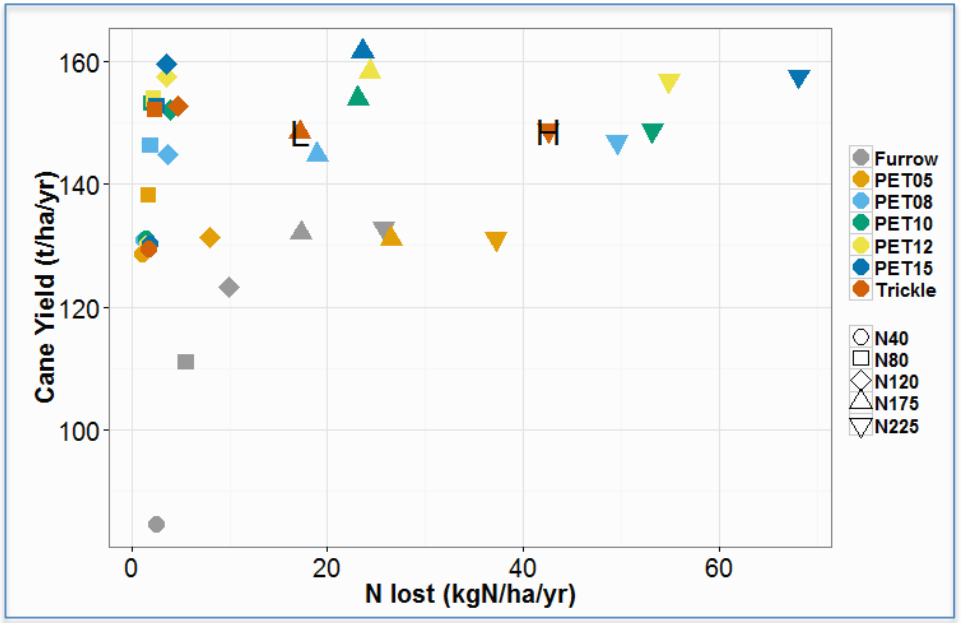


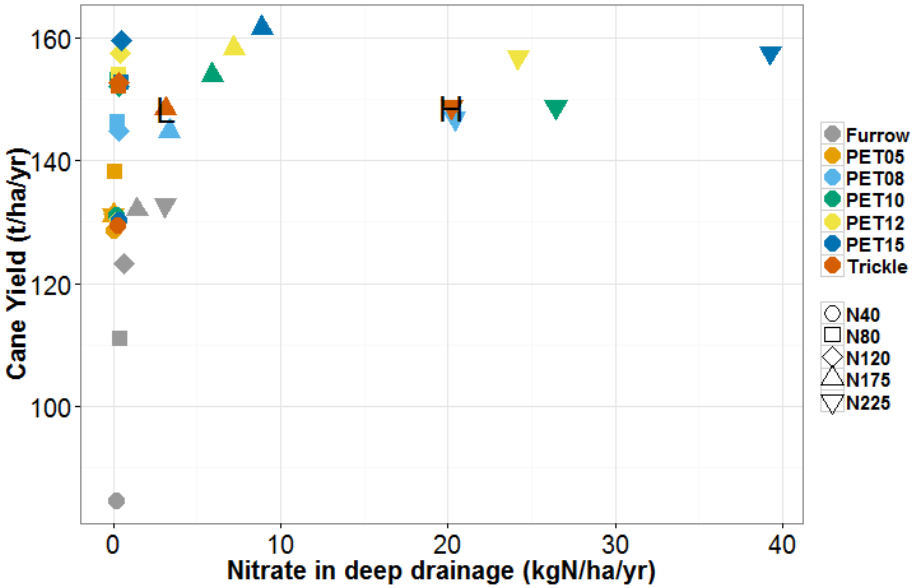


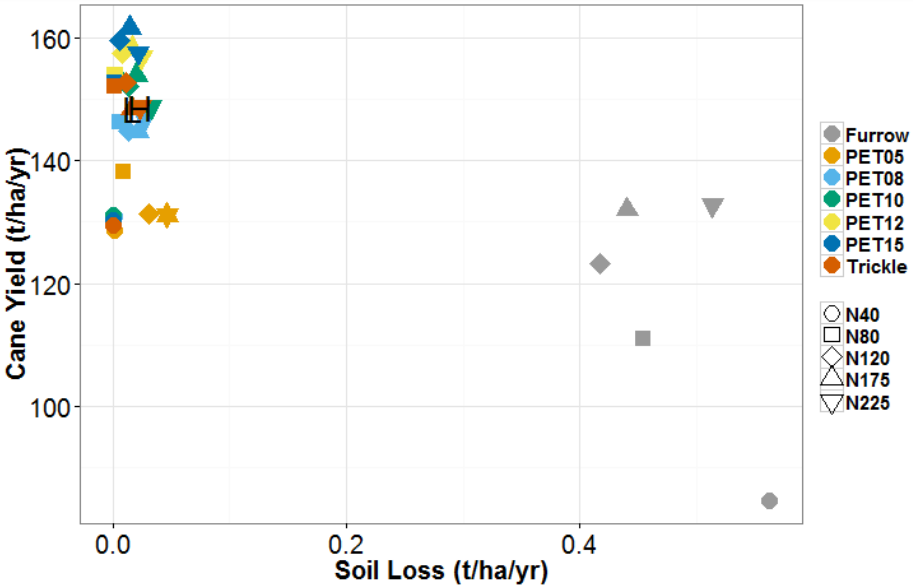


Field experiments on A-Class nutrient & soil mgt: Site BH-04



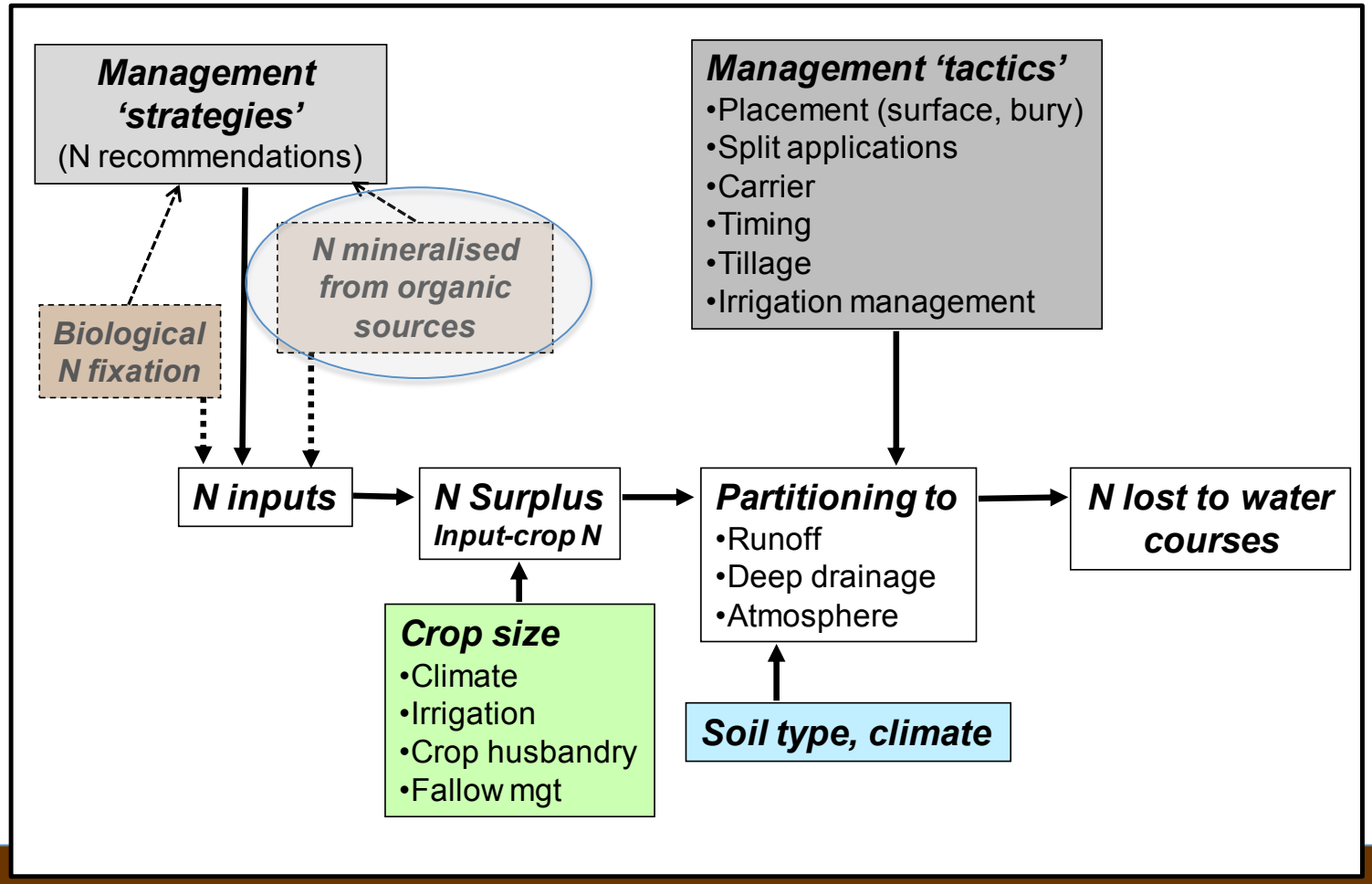






Simulation studies on management systems

- Example for mill mud
  - Defining water quality impacts
  - Possible management

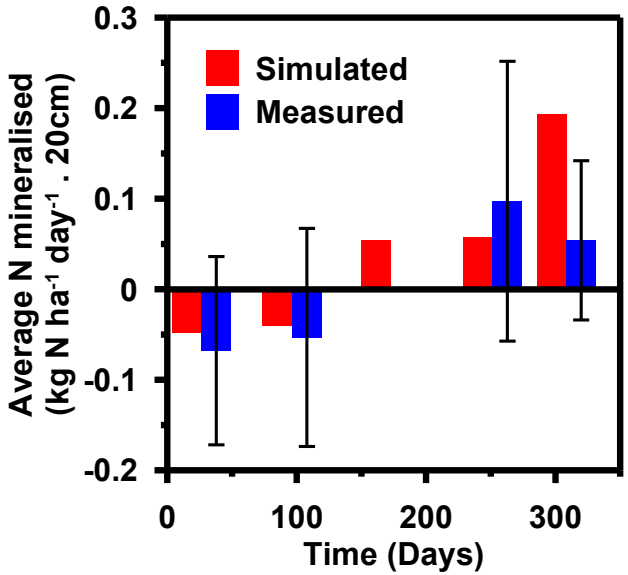


Simulation studies

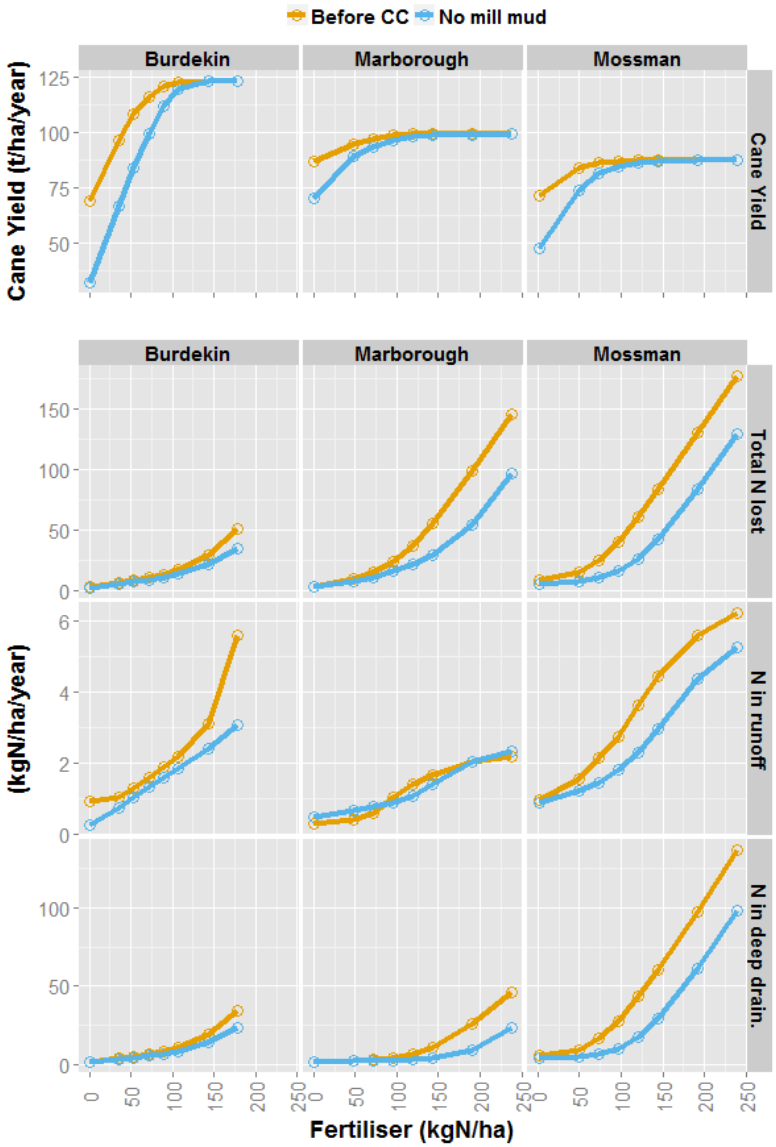
- Example for mill mud

Testing simulation of soil N cycling – N mineralisation from mill mud

Experimental data from Bloesch et al.

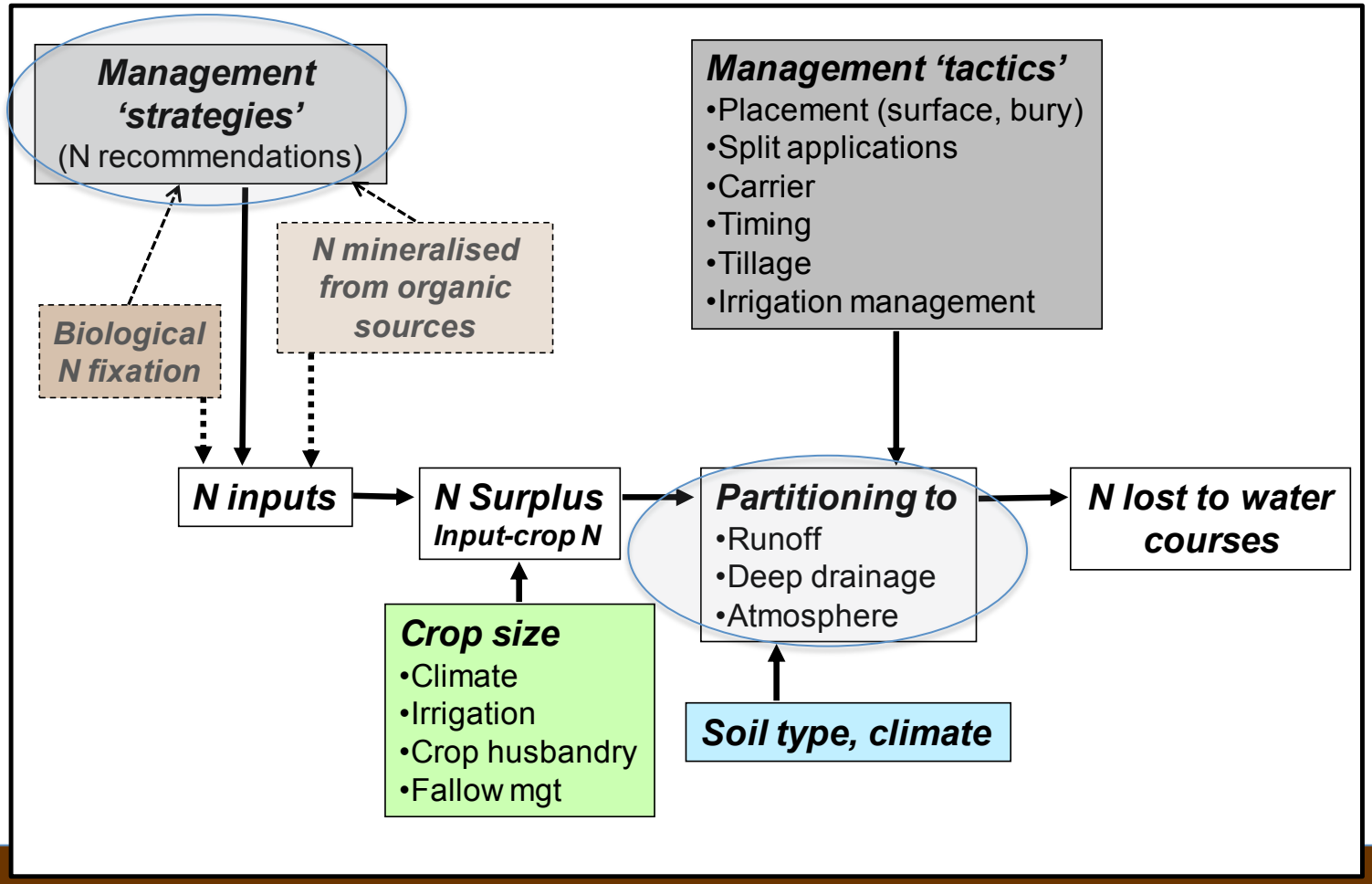


Long-term simulation of mill mud effects



Factors behind improved water quality

- What is driving N losses
- Simulation and analysis of multiple drives across soils and climates

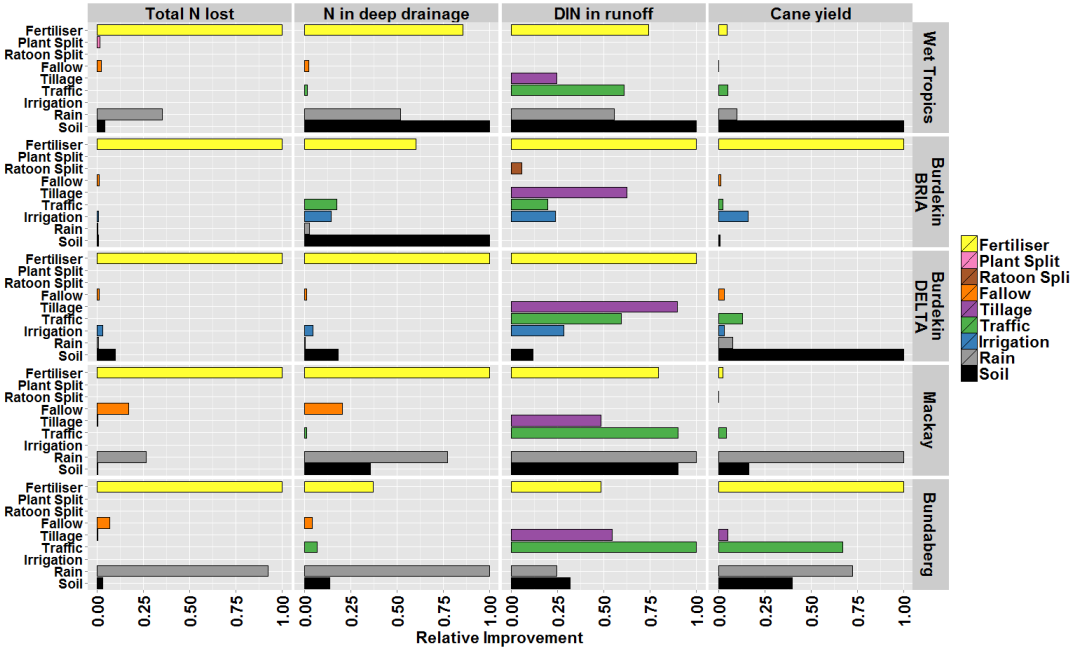


Simulation of N loss drivers

- Management factors
  - N fertiliser rates
  - Splitting applications
  - Tillage
  - Controlled traffic
  - Fallows
    - Bare
    - Ley legume
    - Grain legume
  - Irrigation
- Outputs
  - N in runoff, leaching & denitrification
  - Yields
- Analysis – data mining
  - Regression tree
  - Cluster analysis
  - Developed an influence factor

Results for N losses

- N application rate the main driver
- Rainfall important in Bundaberg
- Soil (& rainfall) partition between runoff and leaching



Implications & future

- Getting evidence that precision management reduces N losses
  - Is ‘full’ precision agric a breakthrough ?
- Understanding what causes benefits
- Showing impact of external (organic) N sources on N losses
  - Mill mud, legumes
- Understanding that irrigation can influence N losses
  - Better management of the current systems
  - Benefits of system change
- Results consistent with framework
  - N rate and crop yield determines overall losses
  - Partitioning between loss pathways affected by soil & climate
- Tool to effectively integrate experimental results, explore option

THANK YOU

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