

# eNtrench<sup>TM</sup> Nitrogen Stabiliser

Herbert Valley Grower Meetings

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**Richard Jackman – Product Development & Territory Sales**

**Greg Wells – Principal Biologist**



**Dow AgroSciences**

# Fertiliser Efficiency Enhancers

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There are 3 main types of enhanced efficiency fertilisers available for improving nitrogen use efficiency:

- Slow & Controlled release fertilisers – sulfur-coated urea (SCU) , polymer coatings, Osmocoat, ESN
  - *Physical* barrier to breakdown
- Urease inhibitors – Green Urea NV
  - *Chemical* process on the soil surface only
- Nitrification inhibitors – eNtrench, ENTEC\*
  - *Chemical* process within the soil
    - in the root zone – the most important area for crop nitrogen nutrition

# Nitrapyrin History

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- Nitrapyrin has been sold under the trade name N-Serve® nitrogen stabiliser since 1974 in the U.S. for use with anhydrous ammonia
- In 2012 eNtrench was introduced as a micro encapsulated formulation for use with liquid nitrogen and manure in the U.S., Canada and Australia
  - New formulation is stable on the soil surface for 7 to 10 days

# Instinct® Nitrogen Stabilizer Wins U.S. EPA Presidential Green Chemistry Challenge Award

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Monday, 13 June, 2016 16:00:00



Instinct® (sold as eNtrench™ in Australia) nitrogen stabilizer from Dow AgroSciences, was developed to help farmers protect their crop yields as well as the environment by helping to keep nitrogen in the root zone. Today, the company's achievement with nitrogen stabilization has won a U.S. Environmental Protection Agency (EPA) Presidential Green Chemistry Challenge Award.

Dow AgroSciences has previously won five U.S. EPA Presidential Green Chemistry Challenge Awards for agricultural technology, illustrating the company's emphasis on developing sustainable solutions and delivering breakthrough innovations in line with Dow's 2025 Sustainability Goals.

eNtrench® nitrogen stabilizer has been on the market since 2012 and can be conveniently used with commonly applied fertilizers to stabilize applied nitrogen. It has growing adoption in the cane industry.

Farmers are working to keep their farms productive for generations to come, and award-winning nitrogen management products like eNtrench can support the long-term health of their soil and water resources. Dow AgroSciences partners with farmers around the globe to achieve this vision, as the award-winning technology found in eNtrench is also currently available in a number of regions outside the U.S., including the European Union, Canada, Australia, and China under the brand names N-Lock™ and eNtrench™.



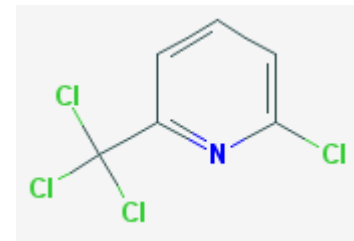
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# eNtrench - What is it and How does it Work?

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## Active Ingredient

- 200 g/L Nitrapyrin in an encapsulated suspension.
  - Part of the Dow AgroSciences Pyridine chemistry



## How Does eNtrench Work?

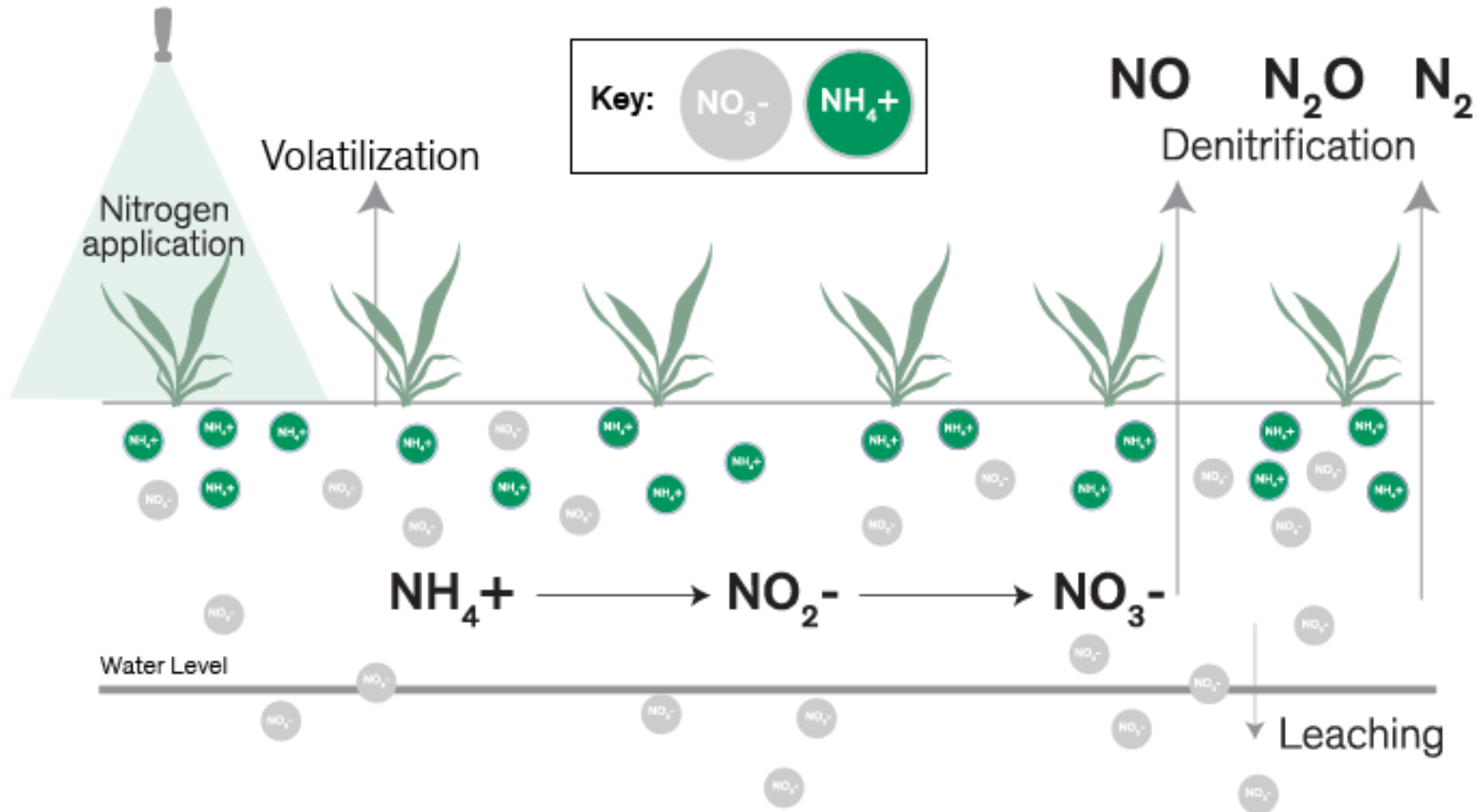
- Nitrapyrin inhibits the metabolism of *Nitrosomonas* bacteria
  - Interferes with Cu containing enzymes by competition for bonding sites
  - Inhibits transport of ammonium N across cell wall by Cu containing enzyme
- Nitrapyrin does not kill *Nitrosomonas* in field sites, but inhibits their ability to consume ammonium and produce energy required for cell growth
- Slows the conversion of ammonium to nitrate
  - A process known as oxidisation/nitrification

## Benefits from Using eNtrench

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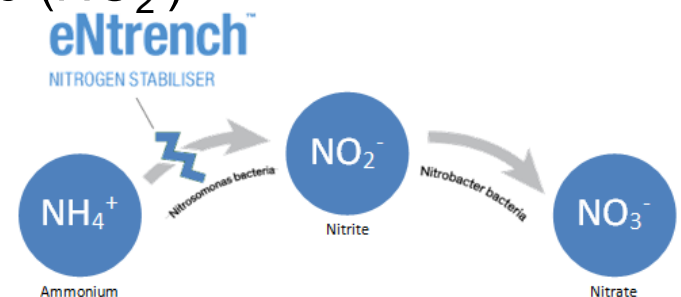
1. **Stabilises** ammonia nitrogen
2. **Minimises** loss of nitrogen
  - Protects nitrogen from losses due to nitrate leaching and/or denitrification
3. **Maximises** crop yield potential
  - Keeps more usable Nitrogen in the root zone of crops

# Nitrogen Cycle - What Happens to Nitrogen



# Nitrogen Cycle - Explained

- Plants use nitrogen in two forms;
  - ammonium form ( $\text{NH}_4^+$ )
  - nitrate form ( $\text{NO}_3^-$ ).
- $\text{NH}_4^+$  is bound to soil and organic matter, relatively immobile (i.e. it remains stable in the soil)
- $\text{NO}_2^-$  and  $\text{NO}_3^-$  are loosely bound and very mobile
- Nitrification by *Nitrosomonas* bacteria converts  $\text{NH}_4^+$  to Nitrite ( $\text{NO}_2^-$ ).
- Nitrobacter* bacteria converts  $\text{NO}_2^-$  to Nitrate ( $\text{NO}_3^-$ ).
- The process of converting all available ammonium to nitrate can take as little as two to four weeks under the right conditions.
  - Aeration, moisture and warm soils are the primary factors.
- eNtrench blocks  $\text{NH}_4^+$  conversion to Nitrite ( $\text{NO}_2^-$ ).





# Nitrogen cycle

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- Factors affecting nitrification
  - **Supply of ammonium ions** – Ammonium nitrogen and decomposing organic matter are the starting source.
  - **Population of nitrifying bacteria** – Ever present but population strongly dependent on soil moisture and temperature
  - **Soil temperature** – Above 25° nitrification occurs more rapidly
  - **Moisture** – Nitrification slows down in dry soils (wilting point), speeds up in warm, moist soils
  - **Soil pH** – Nitrification occurs over a pH range from pH 4.5 to pH 10.0
  - **Soil aeration** – Nitrification occurs faster in aerated soils as *Nitrosomonas* bacteria need oxygen to live

# How to apply eNtrench

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## Use Rates

- Apply at 2.5 - 5L/ha per application.
  - No more than 5 L/ha should be applied in any one season.

## Application Methods

1. Broadcast application to the soil surface and incorporated with tillage or rained in by at least 12.5mm.
2. In-furrow injection i.e. Stool splitter (50-200L water per hectare)
3. Stream nozzle or Dribble Bar application post emergent – requires rain incorporation for best results.(400-600Lmixed solution per hectare)
4. Applied onto fertiliser

## Compatibility

- eNtrench is compatible with a range of liquid fertilisers, herbicides and insecticides

# Application Methods

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Streaming Nozzles



Stool Splitter – In Furrow Injection

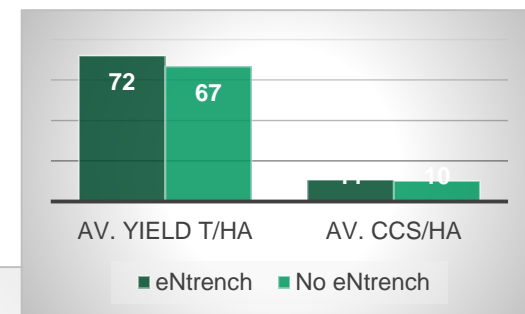


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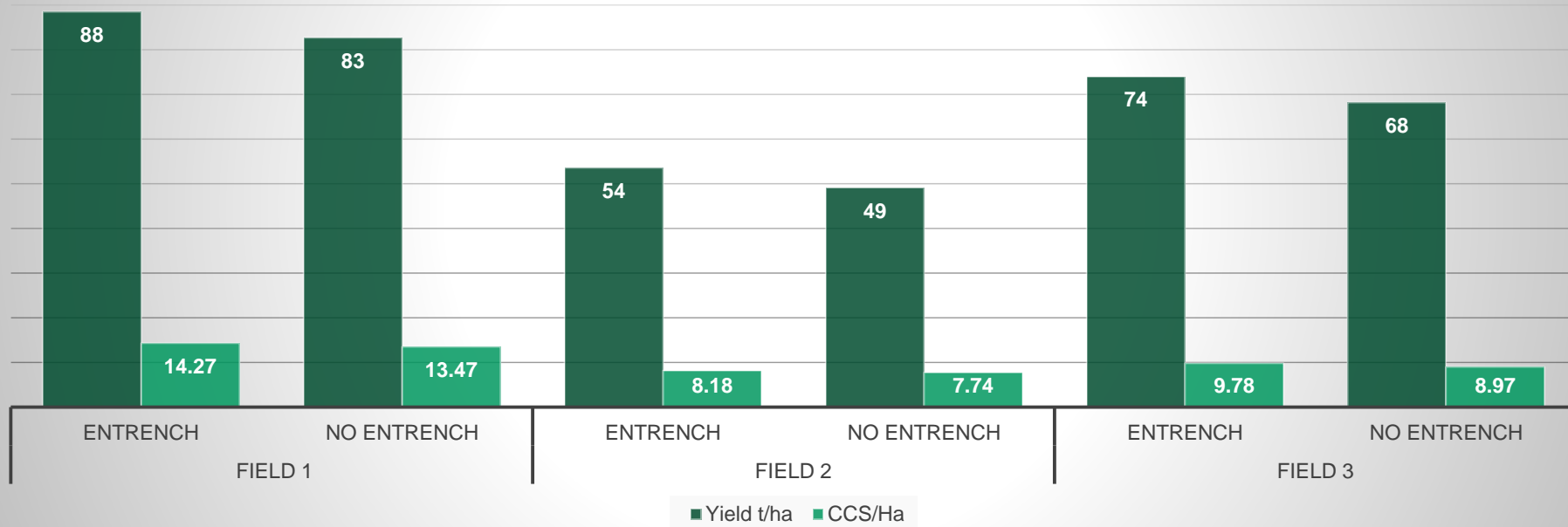
# TRIAL WORK

## 2013/14 Trial - Increased Yield & SC

The grower banked  
between \$202-\$375/Ha



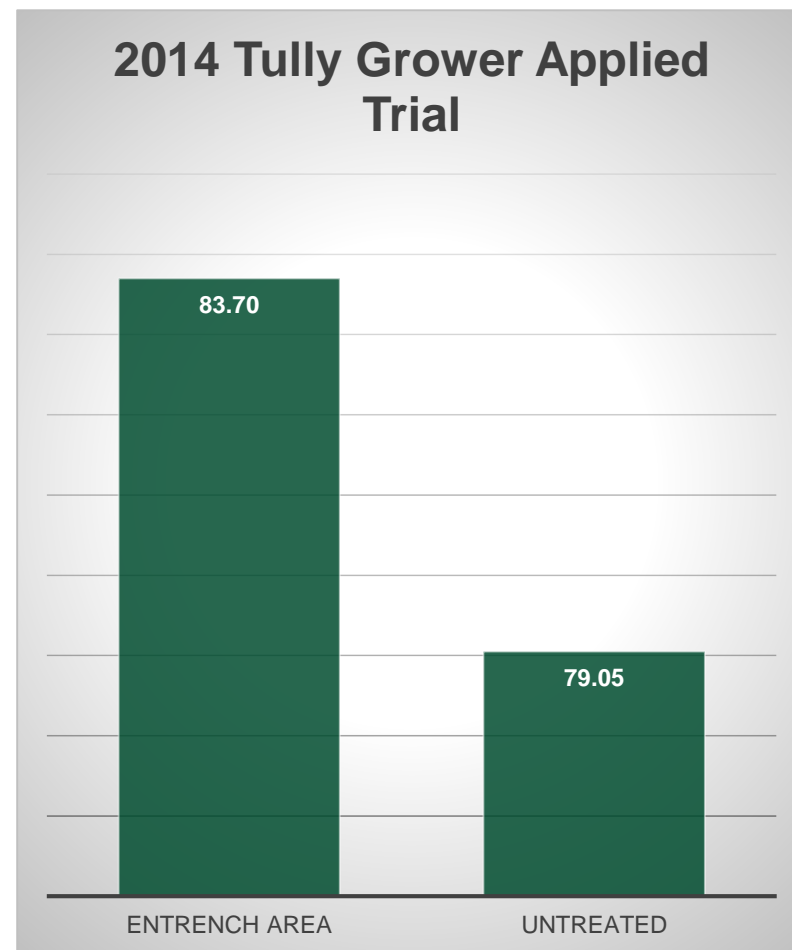
### 2013/14 Herbert Valley Cane Trial



## Tully Grower Trial – 2014 season

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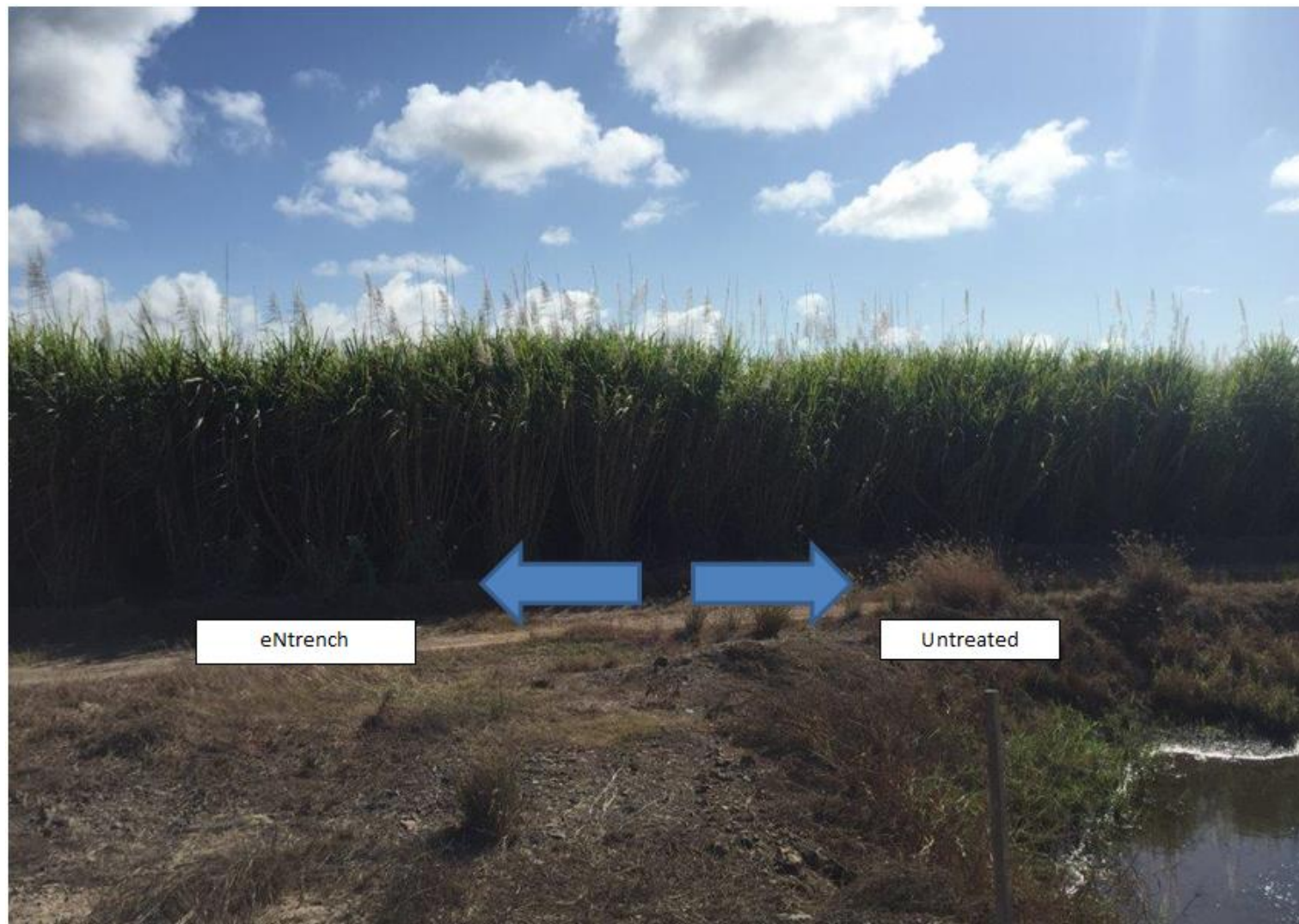
- 2015 harvested crop
- Grower applied strip trial
- eNtrench yielded 84t/ha vs. 79t/ha
- Grower made and additional \$145/ha from extra yield where eNtrench was used





# 2014/15 Burdekin Trial

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# eNtrench summary

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- eNtrench
  - ***Always*** works at inhibiting *Nitrosomonas* bacteria in moist soils
  - Always stabilises applied Nitrogen by inhibiting the nitrification of soil stable ammonium nitrogen
  - Applied Nitrogen is available to the plant immediately
  - Slows the conversion of ammonium to nitrate
  - Maximises yield potential – Nitrogen is available when and where the crop needs it
  - Reduces nitrogen losses to maximise yield potential and can have an environmental impact (reduce leaching or volatilisation)
  - Maximises the return on the nitrogen investment



## In closing

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eNtrench is a new treatment that  
stabilises applied N, to help  
maximise yield potential and  
minimise loss of applied N.



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# THANKYOU FOR YOUR TIME