SESSION 4: PART 1

Fertiliser Solutions for the Future

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Incitec Pivot Fertilisers

Outline

- Incitec Pivot Fertilisers

- Fertiliser solutions for the future
  - Nitrogen Inhibitors – reducing emissions, maintain yield
  - Bio Ferts – recycling nutrients from waste streams
  - Green solutions of the future

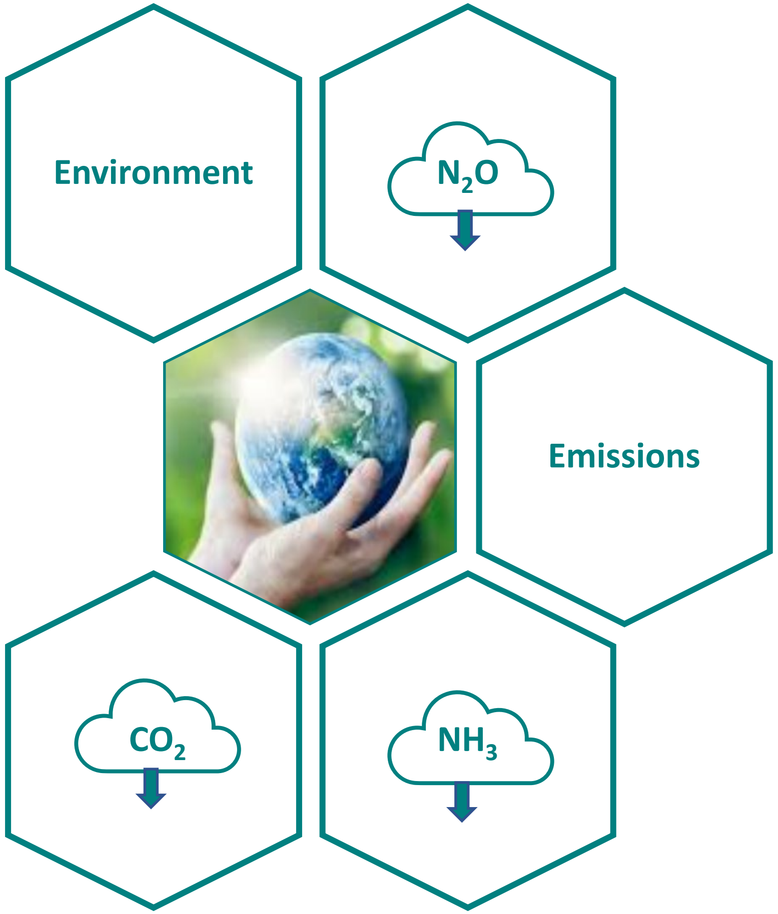
Incitec Pivot Fertilisers

IPF is Australia's largest distributor of fertilisers

3 Manufacturing facilities[2]	17 Primary distribution centres (PDC)	2 Soil and plant testing Lab	9 Export regions	>800kt Fertiliser Storage	>1mt Produced	>2mt Distributed

Enhanced Efficiency Fertilisers Nitrogen Inhibitors

Minimise nutrient losses and GHG emissions – maximise yield



eNpower® 18:20

- ✓ Nitrification Inhibitor
- ✓ Reduces N_2O emissions –**by up to 90%**
- ✓ Slows conversion of ammonium to nitrate
- ✓ Increased Yield
- ✓ Reduced fertiliser rate for same yield

GREEN UREA NV®

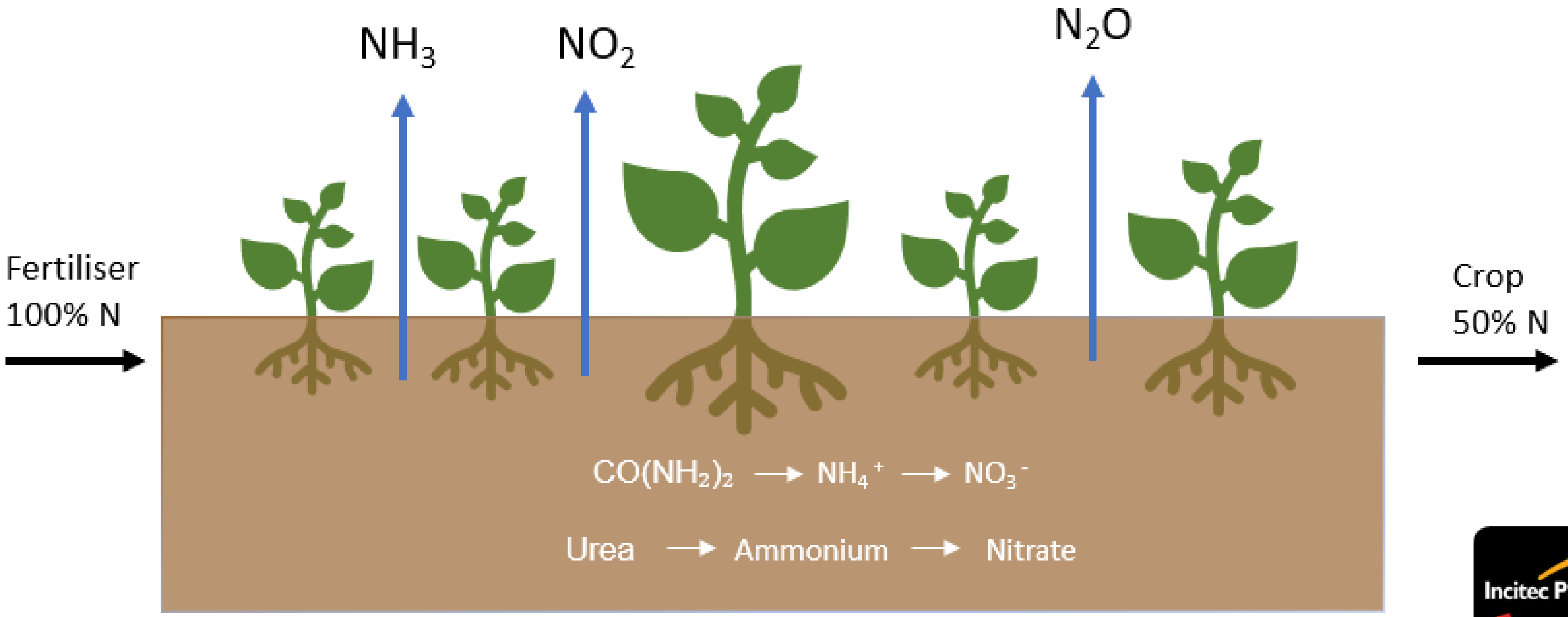
- ✓ Urease Inhibitor
- ✓ Reduces NH_3 emissions
- ✓ Slows conversion of urease to ammonium
- ✓ Increased Yield
- ✓ Reduced fertiliser rate for same yield

Incitec Pivot Fertilisers

Nitrogen Cycle & loss pathways

Air Pollution
& Lost Nitrogen

- N_2O is a GHG, with GWP of ~273 times more than CO_2.
- N_2O is cause of Ozone layer depletion
- Accounts for 5-7 % of GHG emissions in Australia
- 80 % of IT from agricultural practices.



Nitrogen Cycle

CSIRO PUBLISHING
Soil Research, 2018, **56**, 752–763
https://doi.org/10.1071/SR18114

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Mitigation of nitrous oxide emissions from furrow-irrigated Vertosols by 3,4-dimethyl pyrazole tetra-methylene sulfone, an alternative nitrification inhibitor to nitrapyrin for direct injection with anhydrous ammonia

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Table 1. Measured plant properties from pre-desiccation sampling at the two experimental sites
T1, AA; T2, AA + DMPS; T3, AA + nitrapyrin; significant N treatment differences ($P < 0.05$) are indicated by different letters following treatment means

Measure	Emerald			Gunnedah		
	T1	T2	T3	T1	T2	T3
Population (plants/ha)	52 200a	77 800b	63 300a	132 500	135 200	131 100
Boll number (bolls/plant)	26b	17a	20a	9	9	9
Dry matter* (kg/ha)	8847	9127	8690	7170	6950	7162
Lint yield (kg/ha)	3401	3631	3072	2470	2472	2180
Seed yield (kg/ha)	2757	2815	2372	2328	2330	2077
Dry matter* N (kg N/ha)	136	144	146	124	122	128
Lint N (kg N/ha)	9.2a	11.7b	9.0a	4.7	5.2	4.7
Seed N (kg N/ha)	122	123	105	104	102	94

*All aboveground plant material excluding lint and seed.

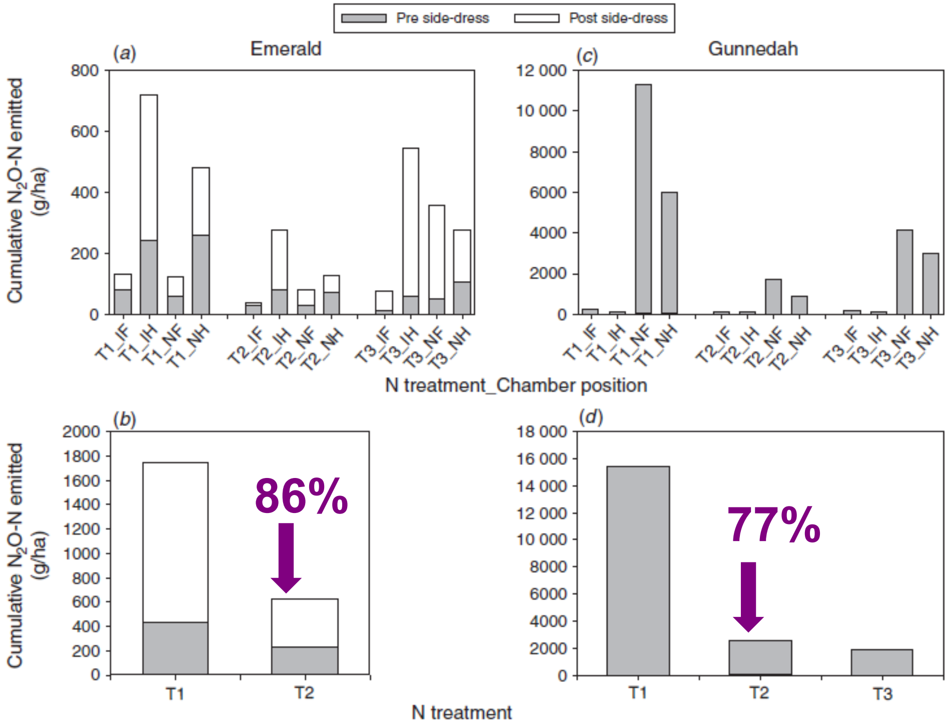


Fig. 3. Cumulative N_2O flux measured with manual chambers at (*a*) Emerald, and (*c*) Gunnedah, and semi-auto chambers at (*b*) Emerald and (*d*) Gunnedah. Data are back-transformed means from each chamber position within each N treatment. Significant treatment differences are described in the text. T1, AA; T2, AA + DMPS; T3, AA + nitrapyrin; IF, irrigated furrow; NF, non-irrigated furrow; IH, irrigated side of the plant bed; NH, non-irrigated side of the plant bed.

T1 = Anhydrous ammonia (AA), T2 = AA + eNpower &
T3 = AA + Nitrapyrin (alternative technology)

Equivalent yields

N_2O

86% at Gunnedah and 77% at Emerald
Reduction emissions are superior performance to alternative (Nitrapyrin) inhibitor

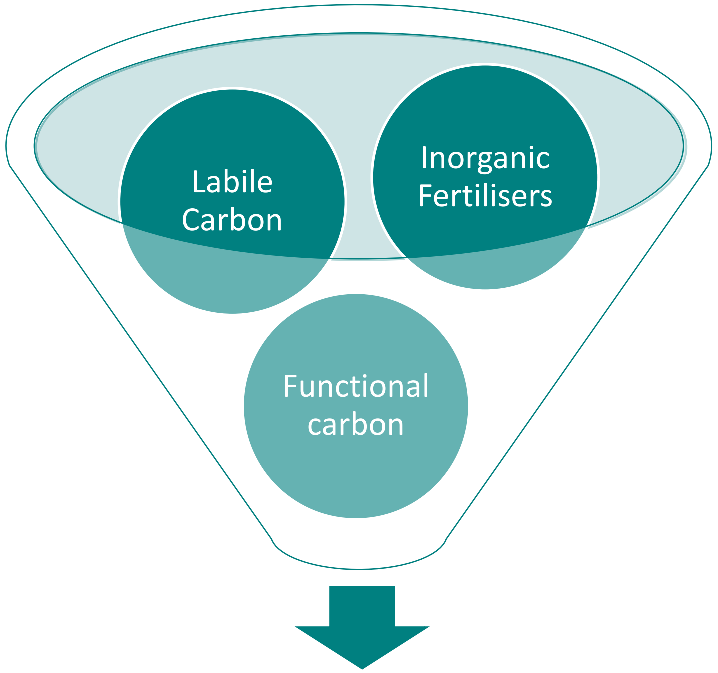
Incitec Pivot Fertilisers

Bio fert

Recycling nutrients from waste streams into fertilisers

AUSTRALIAN BIO FERT

Australia Bio Fert is made from heat-treated, sterilised organic material mixed with balanced mineral nutrients and functional carbon. The mixture is granulated into high quality and easy to apply granules.



Organo-Mineral Bio Fert

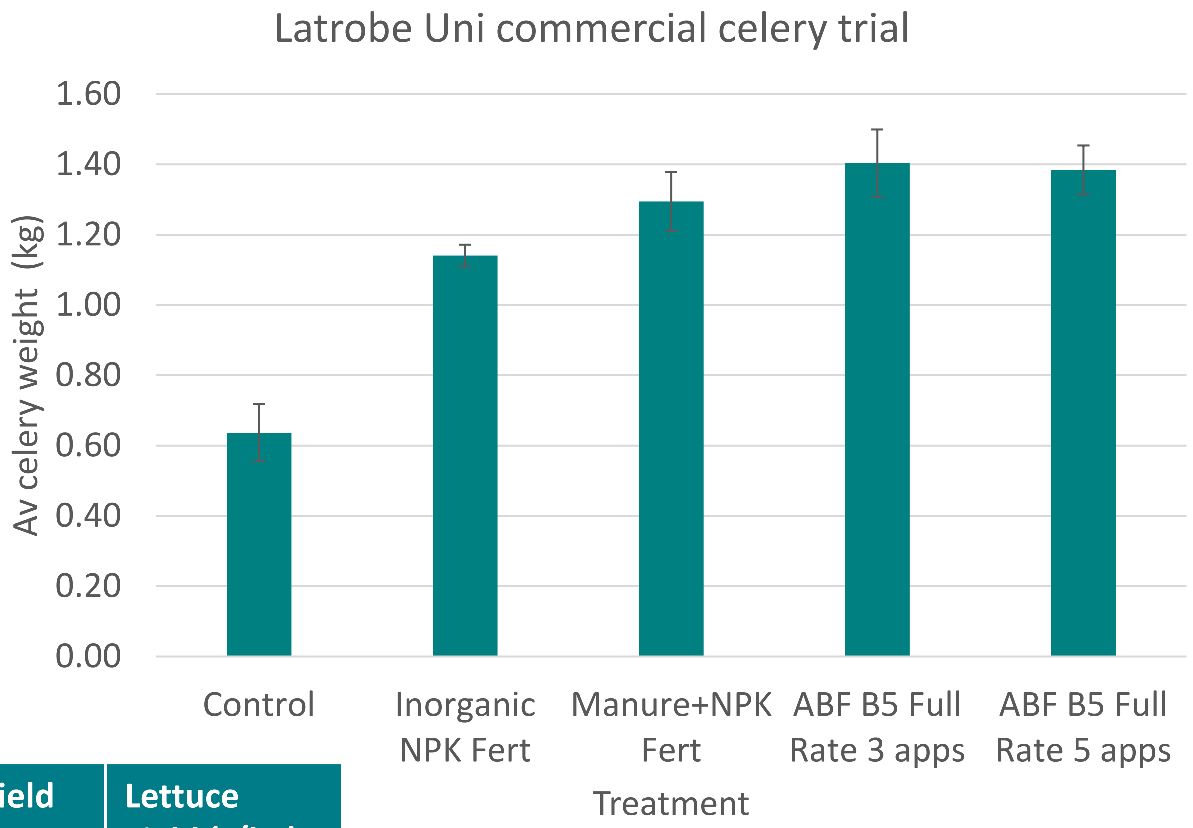
A2	Organic horticulture and pasture	C19 N2 P4 K9 S4
B5	Horticulture and Dairy	C14 N29 P9 K10 S1
B7	Horticulture	C14 N10 P4 K10 S5
C1	All	C32 N4 P2 K2 S1
D1	All	C13 N29 P1 K1 S1
D5	All	C13 N20 P1 K1 S1 NI
E1	Grains	C11 N8 P14 K1 S6 Zn 0.6

Incitec Pivot Fertilisers

The trials continue to validate the farmer value

ABF B7 2.61kg Control 1.74kg

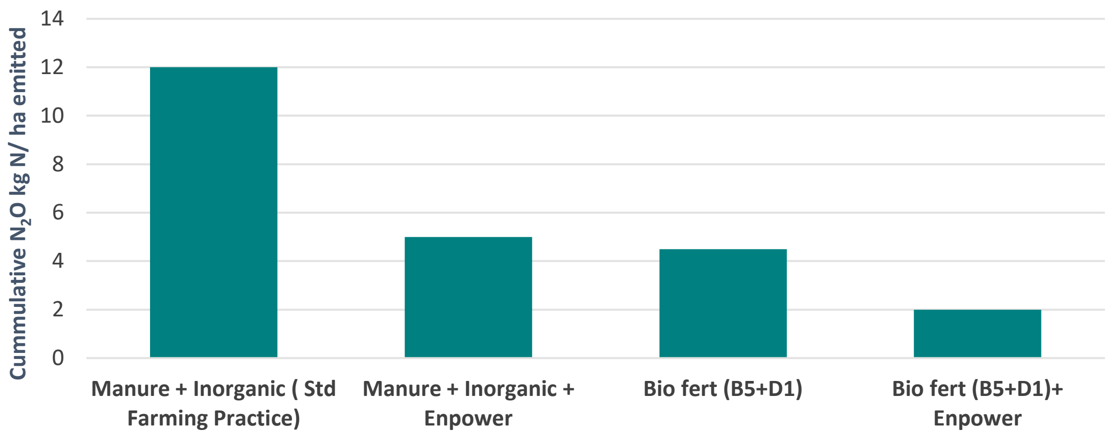
Control 1.37kg ABF B7 1.59kg



Treatment	Broccoli yield (t/ha)	Lettuce yield (t/ha)
Nil Fertiliser	8.33	48.0
Farmer Practice	15.98	51.3
ABF B7	18.87	
ABF B5		56.5

Study by La Trobe University 2022

Combining inhibitors with Bio fert technology



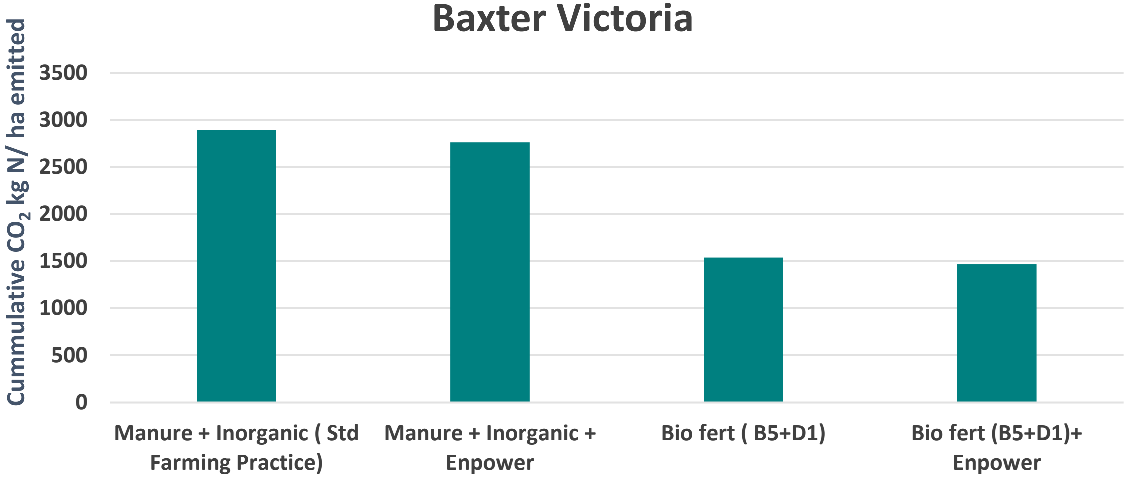


Table 3. Effect of Base (Pre-plant/planting) fertilizer application on celery yield and biomass at harvest

Base Fertilizer	Yield (g/bunch)	Biomass (FW) (g/plant)	Biomass (DW) (g/plant)
Nil	968 a	1341 a	75.7 a
B5 (45 kg N/ha)	1051 ab	1759 b	87.2 b
B7 (50 kg/N ha)	1166 bc	1922 b	98.3 c
Manure+PB	1238 c	1886 b	97.7 c
LSD (P=0.05)	150.6	216.4	10.29

Table 4. Effect of side-dress fertilizers on celery yield and biomass at harvest.

Side-Dress	Yield (g/bunch)	Biomass (FW) (g/plant)	Biomass (DW) (g/plant)
Nil	694 a	992 a	67.5 a
5x D5 (50 kg N/ha)	1308 b	2036 b	96.3 b
5x D1 (50 kg N/ha)	1315 b	2153 b	105.4 c
5x SDB (50 kg N/ha)*	1350	2343	93.7
LSD (P=0.05)	130.4	187.4	8.92

*Not in factorial analysis, included for comparison purposes only

Reduced GHG emissions, both nitrous oxide and carbon dioxide when Bio ferts and inhibitors are combined

Similar yield compared to standard farming practice

Future Fertilisers

Several key projects identified to deliver future sustainable fertilisers