



# TwinN - for increasing yield and profitability in rice



Mapleton Agri Biotec Pty Ltd



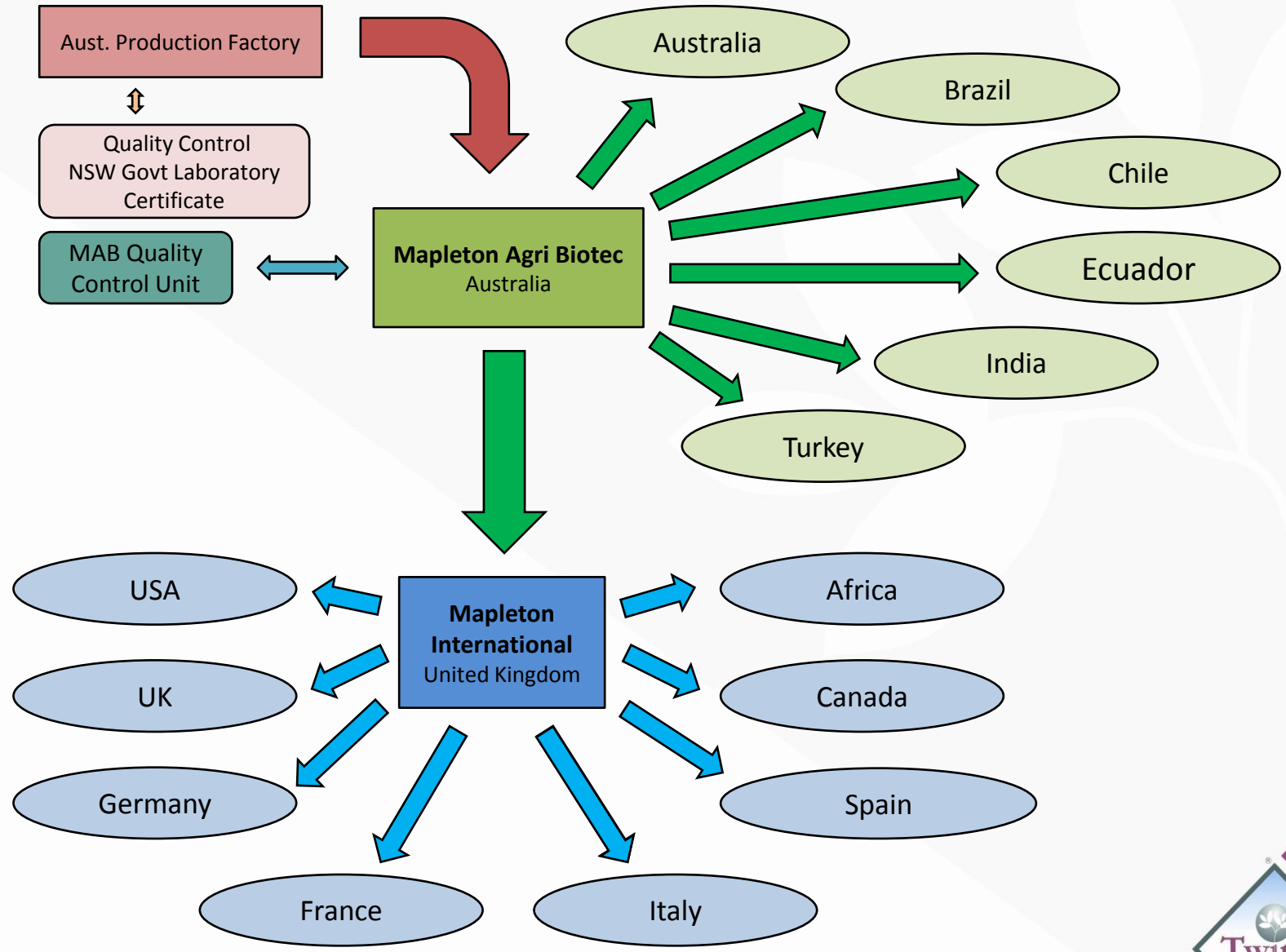
# What is TwinN?

TwinN is a breakthrough product that reduces the amount of N fertiliser needed for high yields in rice

- Freeze-dried microbial product – *Diazotrophs*
- Produced in **modern, sterile fermentation facility**
- Every batch tested and **certified by Australian Govt** laboratory
  - $> 10^{11}$  cfu/ha - very high concentration
- Reliable shelf life 12 mo – cool (4°C) storage
- Available in 1, 5, 10 and 100 ha packs







Schematic of supply and distribution of TwinN

# Why use TwinN in rice?

- Use of nitrogen fertiliser has underpinned increases in crop yields worldwide for the last 40 years

## But

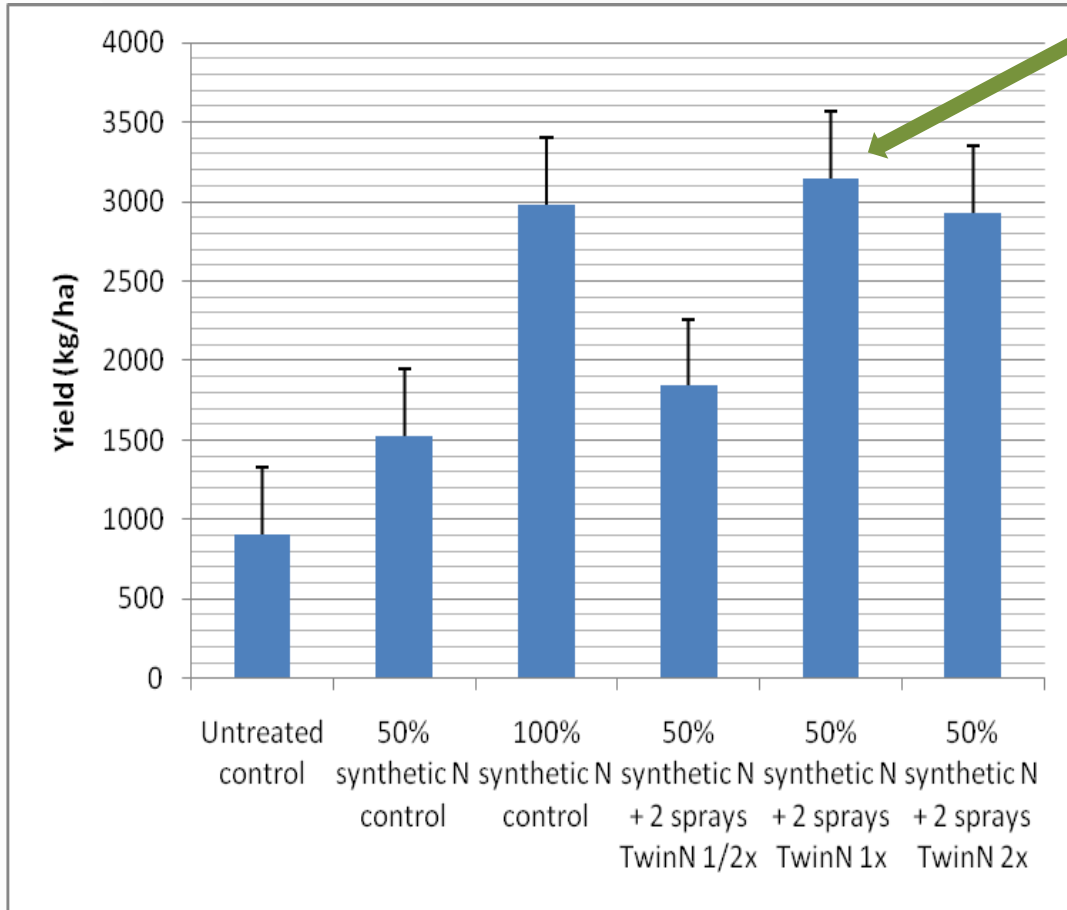
- Nitrogen fertiliser prices fluctuate – usually upwards
    - Prices doubled during 2007 – 08, have fallen and will rise again
  - Nitrogen fertiliser is bulky and transport costs are high
  - Nitrogen fertiliser has a very high carbon footprint
  - Nitrogen fertiliser is lost via leaching and volatilisation
  - Nitrogen fertiliser acidifies soil – a significant problem in some soils
- 
- TwinN provides **increased rice yields** with a **25% reduction in nitrogen fertiliser needs**
  - TwinN will assist with multiple environmental problems in rice production areas

# How does TwinN work?

TwinN microbes improves crop performance by four main mechanisms

1. Converts  $N_2$  from the air into a **steady supply of plant available N** through the entire crop season
2. Produces **larger root system** due to production of Plant Growth Factors (PGFs)
3. Microbes release organic acids **improving availability of P** and some micronutrients in some soils
4. **Improved soil health and structure** with longer term use of TwinN lowering soil disease pressure and **builds soil carbon**

## Wheat – South Africa – 2010 – Independent Registration Trial



- Full rate TwinN with 50% N gave the highest yield and was statistically equal to 100% N (standard rate 112 kgN).

- 50% N with no TwinN delivered significantly lower yield (50% of control).

- 2X rate TwinN performed no better than 1X

- Half rate TwinN did not perform and is not recommended at all.

### Conclusion

TwinN enabled a large reduction in N fertiliser with no loss of yield

Note In rice a 25% reduction in N is recommended practice



## 2<sup>nd</sup> Mechanism of Action – larger, more effective roots

TwinN microbes produce plant growth factors (PGFs) that grow **larger root systems**



- TwinN drives growth of **larger root systems** with **more root hairs to capture nutrients**
- This means much **better capture of nitrogen fertiliser** before it can be leached or volatilised – improved nitrogen use efficiency
- More effective root systems assist in **maintaining growth through short dry spells**



# How to use TwinN in rice?

- Reduce the total nitrogen fertiliser by 25%
- Preferably maintain at planting N rates and reduce later applications
- Do not reduce P, K etc rates
- Use a single application of TwinN at the 5 – 6 leaf stage or on to mid-tillering
- Later applications are also effective
- Apply by flood irrigation, boom spray onto wet soil or by air

## Where do the TwinN microbes act in rice after application?

When **applied to rice via soil/shallow water application** they colonise the rhizosphere – the zone of soil very close to roots. They also move up into the plant tissues and end up throughout the plant.



# Benefits of TwinN in Rice

There are two main reasons why farmers use TwinN in rice

## 1. Decrease N fertiliser rates by 25%.

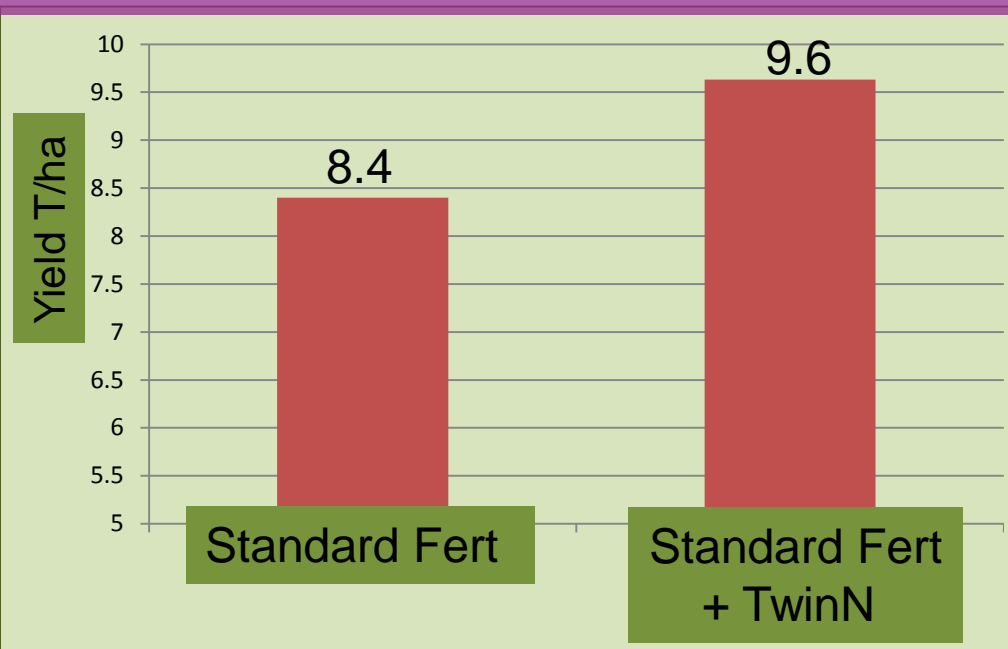
- Saves the farmer money. As fertiliser costs increase this becomes very important
- Improve soil pH. N fertiliser and flood irrigation have reduced soil pH to critical levels in some areas. TwinN with reduced N fertiliser will help this problem
- Reduced carbon footprint and water pollution by nitrates – better for the environment

## 2. Improve yields and profits to farmers

- TwinN will improve yields of rice (see rice data in later slides)
- Increased yields plus reduced fertiliser costs = better profits
- Increased yields mean a stronger national rice industry
- See Cost Benefit next slide



# On-farm rice trial, Tocemwal, NSW, Australia, 2011 - 12



TwinN was used in an on-farm demonstration on a rice farm at Tocemwal, a rice growing district in NSW. Crop details were:

- 50 kg N/ha as DAP applied at planting (dry drilled)
- Flood irrigated
- 124 kg N/ha applied at early panicle initiation and flood irrigated
- TwinN applied in flood irrigation at panicle elongation stage (**this is much later than recommended**)
- TwinN trickled into flood irrigation stream over 5 hours
- Standard fertiliser treatment was compared to Standard plus TwinN in separate bays

**RESULT**                      Standard: 8.40 T/ha  
    Standard + TwinN: 9.63 T/ha

Per Ha	Standard Fertiliser	Standard + TwinN
Yield kg	8.40	9.63
Yield value* \$	1680	1926
TwinN cost \$	0	30
<b>Total Profit \$</b>	1680	1896
<b>Profit increase \$</b>	0	<b>216 (13%)</b>
* Assuming \$200/T rice price		

**OUTCOME**  
 Use of TwinN increased yield by 14.6% and returns to the farmer by 13%

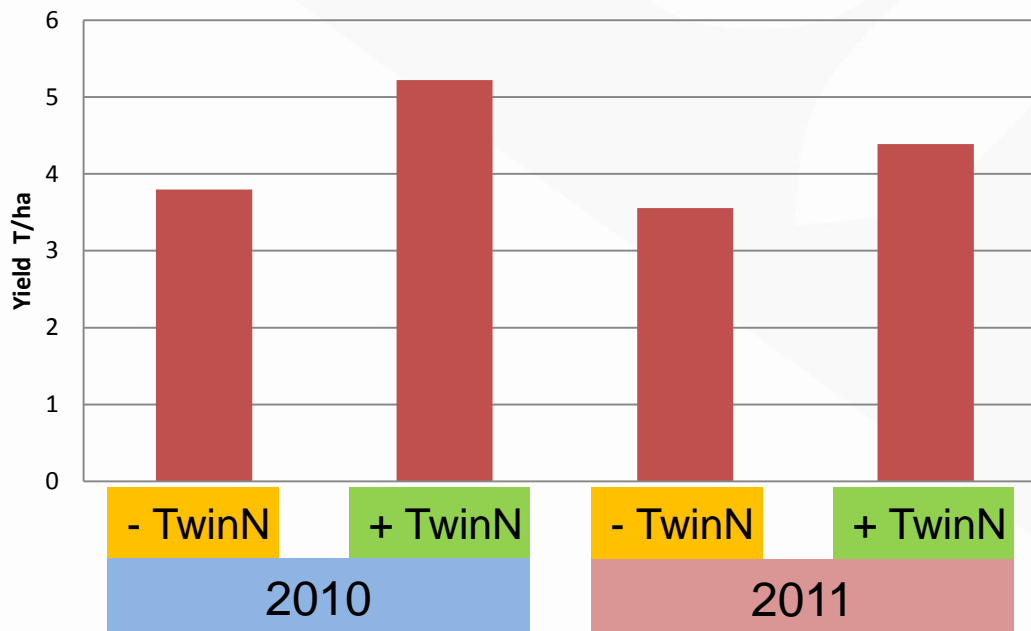


# Registration trials - India 2010 & 11 – Rice

## Key Results

- 2010 - Zero nitrogen fertiliser + **TwinN** = **38% more yield** than Zero nitrogen
  - – **Income increase**
- 2011 - Zero nitrogen fertiliser + **TwinN** = **23% more yield** than Zero nitrogen
  - – **Income increase**

Zero N Fertiliser Rice Yields 2010 & 2011



These were independent University trials for registration purposes







View of TwinN treated paddy field in India



Left: TwinN treated trial rice plant

- More tillers, more roots



Trial: 2<sup>nd</sup> spray of TwinN at floral initiation. 15<sup>th</sup> October 2009







General view across rice trial site - India



Good grain setting in rice paddy - India



**Table 2. Grain yield and mean values of other parameters**

Treatment	Yield (t / ha)	Number of Panicles / m <sup>2</sup>	Grain No / Panicle	1000 Grain Wt. (g)	Plant height(cm)	Number of Tiller/hill	Ripening Ratio (%)
T-1	3.8	329.2	64.7	24.47	74.6	15.3	71.6
T-2	4.0	329.2	65.8	25.24	75.0	16.0	70.3
T-3	5.5	350.8	81.8	24.84	77.7	17.3	63.6
T-4	4.0	330.0	62.4	24.75	75.5	13.3	70.6
T-5	6.0	400.8	84.4	25.31	81.2	21.7	59.3
T-6	3.8	323.3	68.9	25.00	76.8	16.0	63.4
T-7	5.2	413.3	67.5	25.49	79.0	17.7	63.9
T-8	6.2	455.0	87.6	26.19	83.7	22.0	55.8
CV(%)	16.2	12.1	10.5	9.8	4.5	17.8	8.7
F-Test	*	*	**	ns	ns	*	*
LSD 5%	1.0	63.8	11.0	-	-	4	8.1
LSD 1%	1.5	95.1	16.0	-	-	7	4

\* Significance at 5% in F-test; \*\*Significance at 1% in F-test; ns = not significant.

**Irrigated Rice Trial, Tanzania, 2008.**

Trial financed by Agric. Sector Dev. Program.

**Based on results of 50% N plus TwinN MAB has a standard recommendation for rice of 75% N plus one TwinN to target increased yield in commercial crops**

Treatment No.	Treatment name
T-1	Control (no fertilizer material applied)
T-2	FYM (Farm Yard Manure) alone (10t/ha)
T-3	FYM (10t/ha) + 50% recommended N from urea (100 kg/ha)
T-4	TwinN alone (recommended rate)
T-5	TwinN (recommended rate) + 50% recommended N from urea (100 kg/ha)
T-6	Azolla (500 kg/ha) alone
T-7	Azolla (500 kg/ha) + 50% recommended N from urea (100 kg/ha)
T-8	100% recommended N from urea (200 kg/ha)





TwinN

TwinN  
treated  
seedling  
nursery in  
Kenya



TwinN in an on-farm comparison near Guayaquil in Ecuador 2011.



TwinN

No TwinN



# Conclusion

- TwinN will increase yields in rice
- TwinN will decrease N fertiliser costs for rice production
- TwinN will increase the environmental sustainability of rice production in Australia

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