BioAg Demonstration

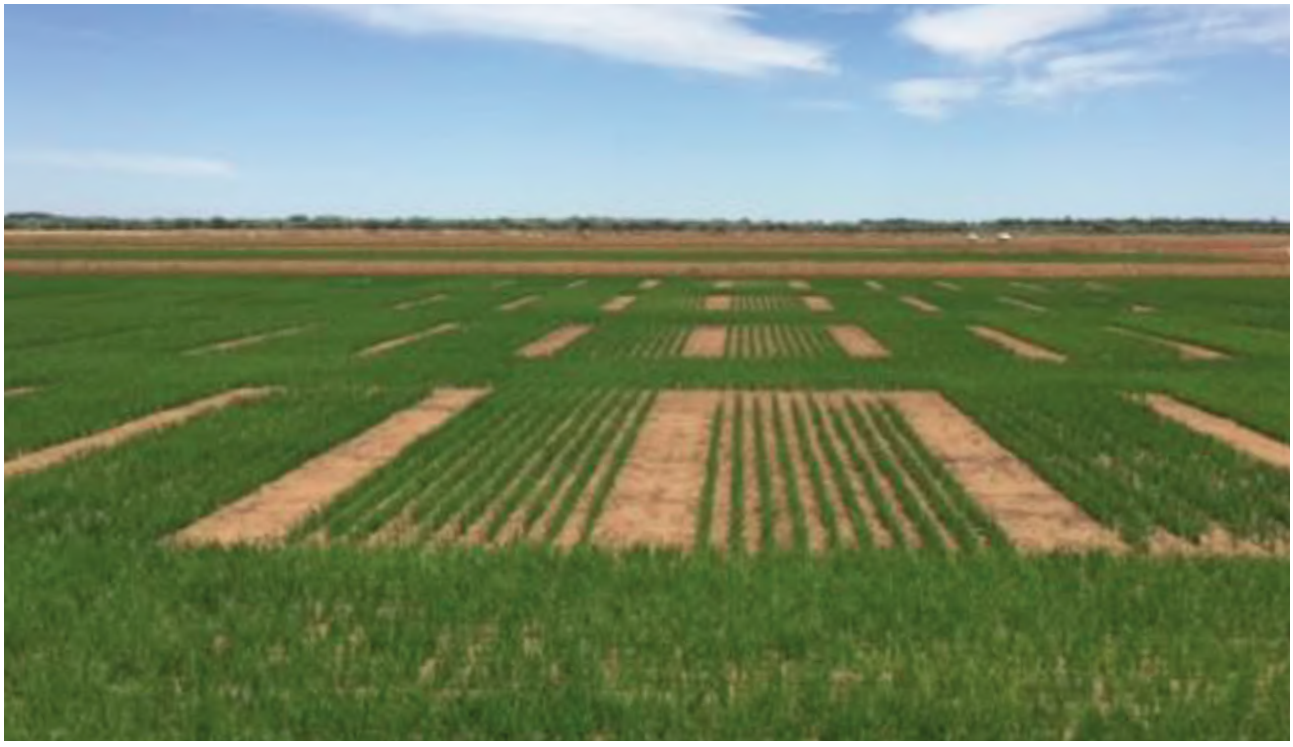
BioAg Rice Nutrition Trial 2016

Murray Valley	**2016**
Location	Year
Rice Research Australia	**Rice**
Conducted by	Crop
Replicated Plots	
Trial Type	

Investigating the benefits of BioAg's *Soil & Seed* in drill sown rice in the Murray Valley.

Aim

To assess the benefits of BioAg *Soil & Seed* in drill sown rice under standard farmer practices (as described by researcher) in the Murray Valley and compare that to Standard Farmer Practice without BioAg *Soil & Seed* treatments.



Method

The trial was undertaken at Rice Research Australia Pty Ltd, 'Old Coree', Jerilderie NSW. Soil tests were taken at 0-10cm depth in September 2015 prior to sowing. The treatments and one control as described in Table 2 were replicated 4 times in plots that measured 10m by 3m. Plots were sown in a completely randomised trial design with 125kg/ha MAP + 1% Zinc and 150kg/ha Reiziq on 200mm row spacing with a disk drill on the 22nd of October 2015. BioAg *Soil & Seed* was liquid injected into the soil at sowing at the rates described in Table 2. The trial was flushed on the 1st of November 2015, 5th of November 2015, 18th of November 2015 to promote germination, growth and to build a moisture profile for the crop. 250kg of Urea was applied to all plots with a dry soil surface pre permanent water on the 15th of December 2015. Plant analysis samples were taken at Panicle Initiation (PI) for NIR tissue tests to determine the amount of Nitrogen the crop required for optimal production.

Table 3 indicated tissue test results and nitrogen requirements per treatment at PI. High water levels were maintained through PI to reduce the effects of cold induced sterility, the crop reached PI on the 7th of January 2016.

The trial was harvested on the 28th of April 2016 once the crop was fully mature. Each plot was individually harvested with a plot harvester. RRAPL staff collected harvest measurements from each plot which included harvested area, weights and grain moisture was measured using a grain spec machine for each plots sample. Harvested weights were adjusted to a 14% moisture weight to provide a comparable plot yield. The raw data was analysed using ANOVA.

Table 1 – Soil Test Results for Sheepwash 6 September 2015

Measurement	Reading	Soil Health Rating
Sample Depth (cm)	0–10	–
Soil Texture	Heavy Clay	–
Soil Colour	Brown Grey	–
pH (1:5 CaCl2)	5.1	Sufficient
pH (1:5 H2O)	6.1	Sufficient
EC (1:5 H2O) dS/m	0.05	Sufficient
EC (se) (dS/m)	0.2	Sufficient
Chloride (1:5 H2O) mg/kg	32	Sufficient
Electrochemical Stability Index	0.012	Low
Organic Carbon (Walkley Black) %	1.05	Sufficient
Nitrate Nitrogen (KCl) mg/kg	19	Sufficient
Ammonium Nitrogen (KCl) mg/kg	2	Sufficient
Phosphorus (Colwell) mg/kg	51	High
Phosphorus Buffer Index (PBI)	149	Sufficient
Potassium (Colwell) mg/kg	288	–
Potassium (BaCl2/NH4Cl) cmol+/kg	0.74	High

Table 1 – Soil test results for Sheepwash 6 September 2015 continued

Measurement	Reading	Soil Health Rating
Sulfur (KCl-40) (mg/kg)	9.1	Low
Calcium (BaCl2/NH4Cl) cmol+/kg	5.12	Sufficient
Calcium % of Cations	44.2	–
Calcium Carbonate %	0.3	Sufficient
Magnesium (BaCl2/NH4Cl) cmol+/kg	5.14	Sufficient
Magnesium % of CEC Group	44.3	Sufficient
Calcium: Magnesium Ratio (cmol+/kg)	1	–
Sodium (BaCl2/NH4Cl) cmol+/kg	0.44	Sufficient
Aluminium (KCl) cmol+/kg	0.15	Sufficient
Exch Hydrogen (KCL) cmol(+)/kg	0.16	–
Effective Cation Exchange Capacity (cmol+/kg)	11.6	Sufficient
Calcium Carbonate %	0.3	Sufficient
Sodium % Cations	3.8	Sufficient
Copper (DTPA) mg/kg	2.51	Sufficient
Zinc (DTPA) mg/kg	0.64	Low
Manganese (DTPA) mg/kg	21.5	Sufficient
Iron (DTPA) mg/kg	190.1	High
Boron (hot CaCl2) (mg/kg)	1.2	Sufficient
Phosphorus Environmental Risk Index	0.30	Sufficient
Sodium: Potassium Ratio	0.6	Sufficient

Table 2 – BioAg Nutrition Trial Treatments

Treatment	Description	Rates	Application	Timing
1	Standard Farmer Practice	As described by Researcher		
2	BioAg *Soil & Seed*	3L/ha	Liquid Inject	At Sowing
3	BioAg *Soil & Seed*	6L/ha	Liquid Inject	At Sowing
4	BioAg *Soil & Seed*	10L/ha	Liquid Inject	At Sowing

Table 3 – BioAg NIR Rice Tissue Test Results

Treatment	SFP 1	BioAg 2	BioAg 3	BioAg 4
Nitrogen %	3.83	3.87	4.04	3.72
Potassium %	3.08	3.04	3.05	3.10
Phosphorus %	0.332	0.319	0.321	0.330
Sulphur %	0.252	0.256	0.271	0.243
NITROGEN UPTAKE @ PI (kg N/ha)	**270**	**235**	**263**	**265**
Provisional Nitrogen Fertilizer Recommendation with deep water at PI				
N Rate (kg N/ha)	0	0	0	0
Urea Rate (kg/ha)	0	0	0	0

Table 3 indicates that no further Nitrogen was required by the crop at PI for optimal production. According to the Rice Growing Guide 2015-16 (DPI NSW 2015) if the N uptake in Reiziq at PI is greater than 130 no top dressing is required at PI. As a result and in line with the project protocol plots were not top dressed with any Nitrogen at PI.

Key Findings and Results

An analysis of variance (ANOVA) was conducted utilising Genstat 18. The model essentially states that the yield of a plot is the result of the overall mean, the treatment effect, block (run) and any residual variance. Significance between treatments was considered at $\alpha = 0.05$. There was no significant difference between the treatments for both yield and plant emergence counts. The mean yield was 11.62mt/ha and the mean plant emergence count was 215.05 plants/m^2.

Table 4 – BioAg Plant Emergence Data and Yield Data with Statistics

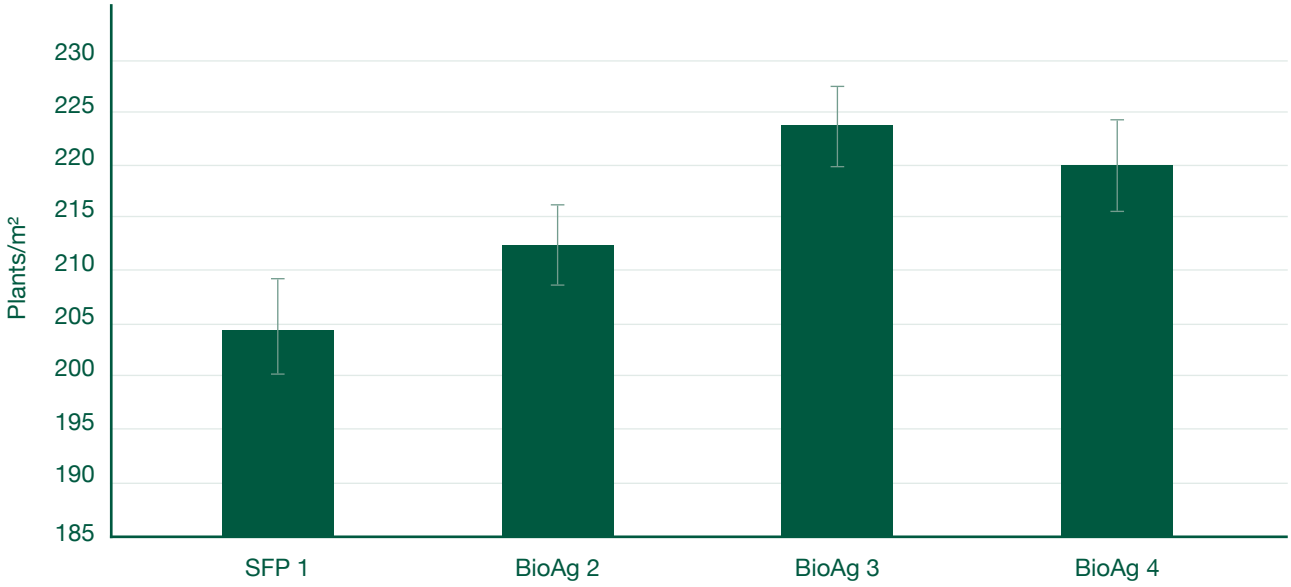
Treatment	Emergence Counts (plants/m^2)	Yield (mt/ha) 1
1. Control (SFP)	204.6	10.81
2. BioAg *Soil & Seed*	212.3	12.32
3. BioAg *Soil & Seed*	223.3	11.39
4. BioAg *Soil & Seed*	227.0	12.07
p-value	0.54	0.11
LSD	ns	ns
CV %	2.05	5.5

Plant Emergence Counts

Plant emergence counts were collected by RRAPL on the 24th of November 2015.

According to Brian Dunn, Research Agronomist NSW DPI, Yanco who has conducted extensive trials on rice population and effect on yield, the desired plant population is in the range of 100-300 plants/m². Brian's studies have revealed that there's no difference in grain yield for plant populations between 40 and 700 plants/m² in research where a direct comparison between plant population and grain yield were measured at over 800 sites. Our research in this trial that recorded plant emergence counts of 177-197 plants/m² which are within the recommended range to avoid compromising yield and allow for a buffer should any establishment problems occur.

Graph 1 – Plant Emergence Counts

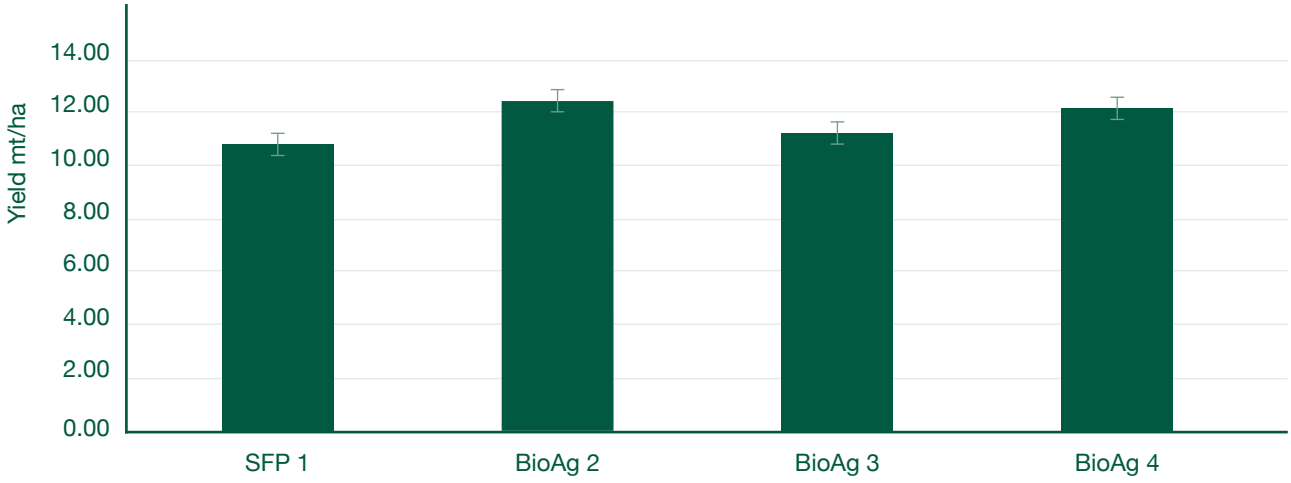


As indicated in Table 4 there was no significant difference between treatment and plant emergence counts.

Yield

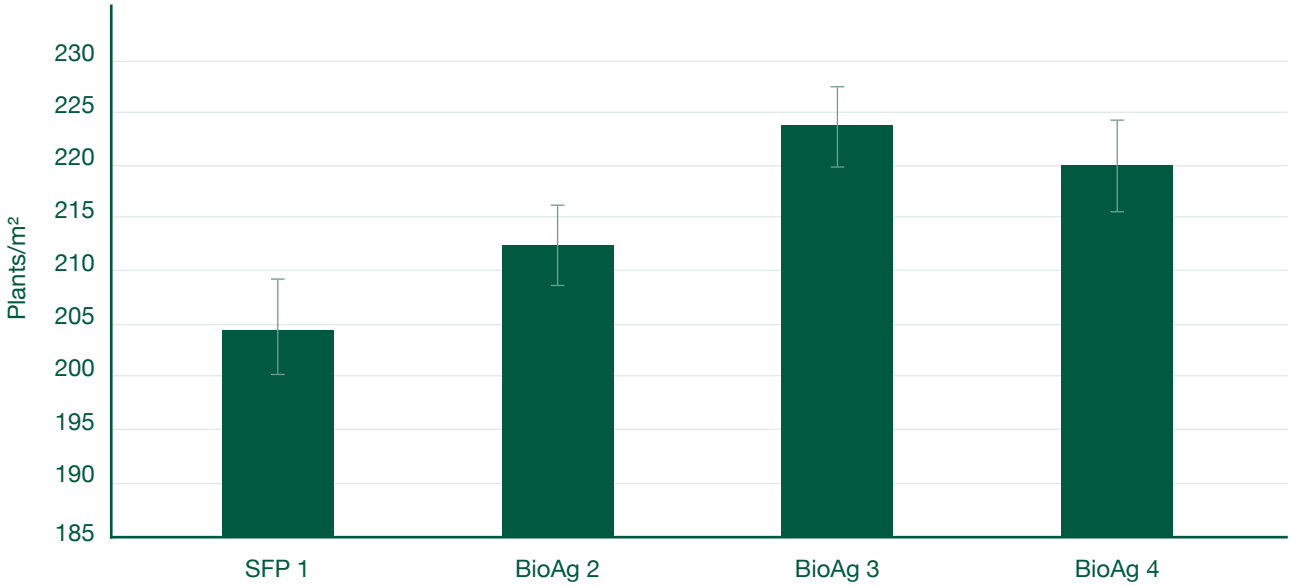
Yield data was collected by RRAPL on the 28th of April 2016. Each plot was individually harvested with a plot harvester. RRAPL staff collected harvest measurements from each plot which included harvested area, weights and grain moisture was measured using a grain spec machine for each sample. Harvested weights were adjusted to a 14% moisture weight to provide a comparable plot yield.

Graph 2 – Yield



As indicated in Table 4 there was no significant difference between treatment and yield. However the effect of the treatment was relatively close to becoming significant (p=0.11) with treatment 2 and 4 averaging 1.15 tonnes more than standard farming practice (10.8mt/ha).

Graph 1 – Plant Emergence Counts



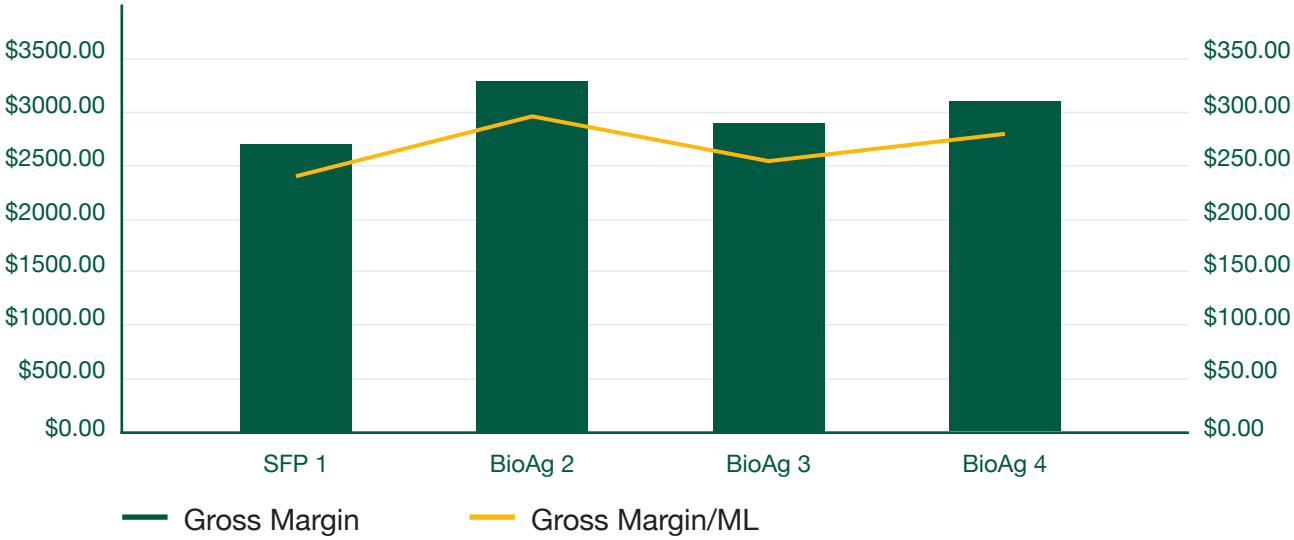
Gross Margin Analysis

Gross margin analysis was conducted using commercial rates for all operations and inputs based on 1 hectare using 13ML of irrigation water a hectare supplied from Murrumbigee Irrigation through the Billabong Creek. The fixed and variable cost for the supply of required irrigation water for the 2015/2016 rice season through this irrigation system was 73.07/ML as per the reports gross margin. This amount does not include the cost of any purchased temporary water or the opportunity cost of water. We would encourage you or growers to deduct this amount /ML from the gross margin/ML price in table 5 to establish a return/ML that reflects the operating environment that your enterprise exists in.

Table 5 – Gross margin all treatments

	SFP 1	BioAg 2	BioAg 3	BioAg 4
Yield	10.81	12.32	11.29	12.07
Price/mt	$415.00	$415.00	$415.00	$415.00
INCOME	**$4486.15**	**$5112.80**	**$4685.35**	**$5009.05**
Operations	$365.50	$365.50	$365.50	$365.50
Seed	$57.00	$57.00	$57.00	$57.00
Fertiliser	$207.50	$207.50	$207.50	$207.50
BioAg *Soil & Seed*	$0.00	$24.00	$48.00	$80.00
Chemical	$206.88	$206.88	$206.88	$206.88
Water	$949.91	$949.91	$949.91	$949.91
TOTAL VARIABLE COSTS	**$1786.79**	**$1810.79**	**$1834.79**	**$1866.79**
Approx. breakeven yield	4.31	4.36	4.42	4.50
GROSS MARGIN/HA	**$2699.37**	**$3302.02**	**$2850.57**	**$3142.27**
GROSS MARGIN/ML	**$207.64**	**$254.00**	**$219.27**	**$241.71**

Graph 3 – Gross Margin/ha and /ML



Recommendations

The trial achieved its aim of assessing the benefits of BioAg *Soil & Seed* in drill sown rice under standard farmer practices (as described by researcher) in the Murray Valley and compare that to Standard Farmer Practice without BioAg *Soil & Seed* treatments. However the ANOVA statistical results identified no significant effect of the treatments on plant emergence or yield in rice.

The economic analysis indicated there was an increase both return per hectare and megalitre by using BioAg *Soil & Seed* over standard farmer practice. The greatest return per ha and ML was achieved at the commercially recommended rate of 3L/ha for BioAg *Soil & Seed*. This result could be used to conclude that the commercially recommended rate for *Soil & Seed* is suitable for drill sown rice in the Murray Valley.

As this is the first year of trials focussing on *Soil & Seed* it is advisable to undertake further trials and economic analysis to take into account seasonal differences and soil type differences which will enable an average to be obtained. Given the results of the small plot work it may also be practical to investigate the application of treatments using commercial scale equipment in order to observe larger areas of commercial rice crops. This may also provide further evidence to support the results of this report.

Acknowledgments

This trial was a collaborative project between Rice Research Australia Pty Ltd (RRAPL) and BioAg. Thank you to Rob Gill and John Hill from BioAg for initiating the research and the staff at RRAPL for their assistance and co-operation in managing the trial.

Disclaimer

More Information

Author: Anna Jewell

T: 0409 567 429

E: ajewell@rrapl.com