



Local Land Services



Native Pasture & Alternative Fertiliser Trial - Binalong/Bookham NSW -

Spring Field Day Notes – Sept 2014

Trial Summary - 2009 to 2013

Conducted by Binalong Landcare Group subgroup of Harden-Murrumburrah Landcare Group with technical support from South East Local Land Services Yass & NSW DPI.

Project Supported by:



Primary Industries



Catchment Management Authority Murrumbidgee



Local Land Services South East



Local Land Services Riverina



Office of Environment & Heritage



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Bookham Agricultural Bureau

Table 1 - Description of fertiliser products used

Fertiliser product	Description
Single superphosphate	Granulated fertiliser containing 8.8% Phosphorus (P) (8.6% of this is soluble P), 11% Sulfur (S) and 20% calcium (Ca). (Single superphosphate containing Molybdenum (0.05%) was used in years 1 and 5).
Agri-ash	A burnt sewage ash product produced at the ACTEW Molonglo Sewage works, ACT. The product contains 6.6% P (1.12% of this is soluble P), 0.85% S and a range of other macro and micro nutrients. It also has an average neutralising value of 65%. It does contain some heavy metals but all below threshold limits. FertSpread, Gunning have the sole rights to the sale of this product.
Trio-min/ Eco-min Balance	Both fertilisers are a crushed rock (semi-granulated) product. Trio-min is made from igneous and metamorphic rocks with added phosphate. It contains 4.5% P plus a range of other macro and micro nutrients. Eco-min Balance is also made from igneous and metamorphic rocks containing 2.4% P plus a range of other nutrients. The products were supplied by Munash Fertilisers, Ballarat.
SEP Pig Manure	A waste product from pigs. The liquid and solid manure is put into sedimentation evaporation ponds (SEP) to dry and then manure is scooped into piles for further air drying before being spread on paddocks. The product contains a range of macro and micro nutrients. Nutrient levels vary from batch to batch. The product was sourced from "Windridge Farms", Young.
Groundswell Compost	This is a food and garden waste compost, which is part of a project called 'Groundswell' funded by the Department of Environment and Heritage through an Environment Trust Grant. The product contains small amount of macro and micro nutrients. The nutrient content will vary from batch to batch.
YLAD Compost Mineral Blend	A dry product containing humus compost, lime, soft rock phosphate and gypsum. Refer to Table on reverse side for the varying percentages applied over the 5 years at each site. The compost used is produced from local organic waste. This product was sourced from YLAD Living Soils, Young.
YLAD Bio TX 500 Compost Tea Extract	A liquid product containing 95% humus compost tea extract, 2% molasses and 3% liquid fish. This product was sourced from YLAD Living Soils, Young.
BioAg Blend	A blend of dry and liquid fertilisers was applied. The dry products are a mix of BioAgPhos (reactive phosphate rock treated with a proprietary microbial culture), lime and gypsum. The liquid fertilisers applied in year one were a combination of 'Soil and Seed' (product containing nutrients plus microbes marketed by BioAg Pty Ltd), milk thistle and vitamin B5. These products were supplied by BioAg Pty Ltd, Narranderra.
Ecology Fluid Fertiliser/ Dical 64	Ecology Fluid Fertiliser is a liquid foliar fertiliser containing a mix of macro and micro nutrients and microbes. Dical 64 is a granular fertiliser containing 18% P (approximately 2% of this is soluble P) and 24% calcium. Both products were supplied by Ecology Pty Ltd. Note in Year 5 Gypsum was also applied with the Dical 64.
Urea	Granulated fertiliser containing 46% N

Source: Information presented has been obtained from the respective alternative fertiliser suppliers. Information presented for single superphosphate and urea has been taken from the product label

Table 2 - Treatments & rates applied each autumn over period 2009 - 2014

Treatment	Spreading rate					
	Year 1 (2009)	Year 2 (2010)	Year 3 (2011)	Year 4 (2012)	Year 5 (2013)	Year 6 (2014)
Control (nil)	Nil	Nil	Nil	Nil	Nil	Nil
Single Superphosphate	125 kg/ha Molybdenum (0.05%)single superphosphate	125 kg/ha single superphosphate	125 kg/ha single superphosphate	125 kg/ha single superphosphate	125 kg/ha Molybdenum (0.025%)single superphosphate	125 kg/ha single superphosphate
Agri-ash	2.5 t/ha	Nil	Nil	Nil	Nil	Nil
Trio-min/Eco-min Balance	300 kg/ha Trio-min	300 kg/ha Eco- min Balance	300 kg/ha Eco-min Balance	300 kg/ha Eco-min Balance	300 kg/ha Eco-min Balance ⁸	300 kg/ha Eco-min Balance ⁸
SEP Pig Manure	4.88 t/ha	Nil	Nil	4.0 t/ha	Nil	Nil
Groundswell Compost	3 t/ha	Nil	3 t/ha	Nil	3 t/ha	Nil
YLAD Compost Mineral Blend	1.1 t/ha ¹	1.235 t/ha ²	1.58 t/ha (Kia-Ora) ³ 1.23 t/ha (Glenroy) ⁴ 1.23 t/ha (Te Kooti) ⁴	0.81 t/ha (Kia-Ora) ⁵ 0.41 t/ha (Glenroy) ⁶ 0.7 t/ha (Te Kooti) ⁷	0.5 t/ha Compost	0.40 t/ha (Kia-Ora) ⁹ 0.29t/ha(Glenroy) ¹⁰
YLAD Bio TX 500 Compost Tea Extract	100 L/ha	100 L/ha	100 L/ha	100 L/ha	100 L/ha	100 L/ha
BioAg Blend	130 kg/ha BioAg Phos + 400 kg/ha lime + 3 L/ha 'Seed & Soil' + 30000 mg/ha milk thistle + 450 mg/ha Vitamin B5	200 kg/ha BioAg Phos + 100 kg/ha gypsum	Nil	200 kg/ha BioAg Phos + 100 kg/ha gypsum	Nil	200 kg/ha BioAg Phos + 100 kg/ha gypsum + Molybdenum (50 grams/ha)
Ecology Fluid Fertiliser (EFF)/Dical 64	50 L/ha EFF	50 L/ha EFF	80 kg/ha Dical 64	80 kg/ha Dical 64	80 kg/ha Dical 64 + 75 kg/ha Gypsum	80 kg/ha Dical 64 + 75 kg/ha Gypsum (+ Molybdenum coated on product to deliver 50 g/ha)
Urea	100 kg/ha	22 kg/ha	100 kg/ha	100 kg/ha	100 kg/ha	100 kg/ha

¹Treatment contains 45.5% compost; 45.5% lime; 9% Soft Rock Phosphate.

²Treatment contains 42.8% compost; 38.9% lime; 6.2% Soft rock phosphate; 11.7% gypsum; 0.39% Zinc Hepta.

³Treatment contains 31.6% compost; 47.5% lime; 5.1% Soft Rock Phosphate; 15.8% gypsum.

⁴Treatment contains 40.7% compost; 40.7% lime; 6.5% Soft Rock Phosphate; 12.1% gypsum.

⁵Treatment contains 31% compost; 31% lime; 7% Soft Rock Phosphate; 31% gypsum.

⁶Treatment contains 61% compost; 15% Soft Rock Phosphate; 24% gypsum.

⁷Treatment contains 36% compost; 36% lime; 7% Soft Rock Phosphate; 21% gypsum.

⁸Treatment contains 33.3% Biosolids and 66% Eco-min Balance.

⁹Treatment contains 57% compost; 9% Soft Rock Phosphate; 34% gypsum.

¹⁰Treatment contains 86% compost; 14% Soft Rock Phosphate.



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Mean Spring Herbage Mass relative to unfertilised control treatment 2009 – 2013

Figure 1: GLENROY

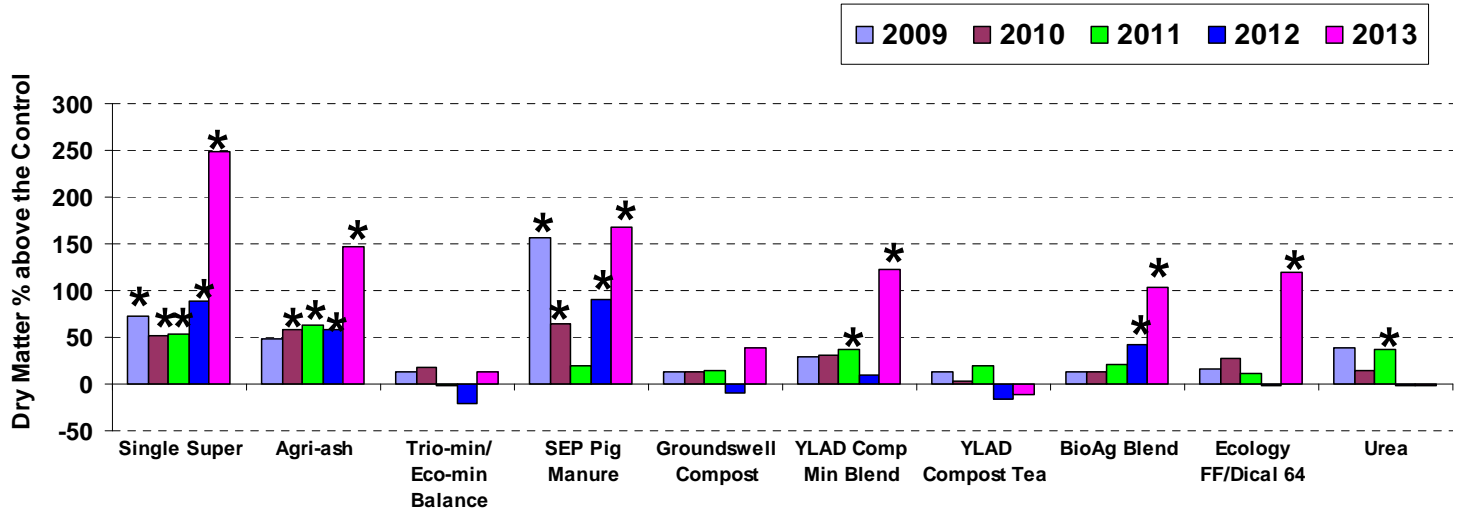


Figure 2: KIA-ORA

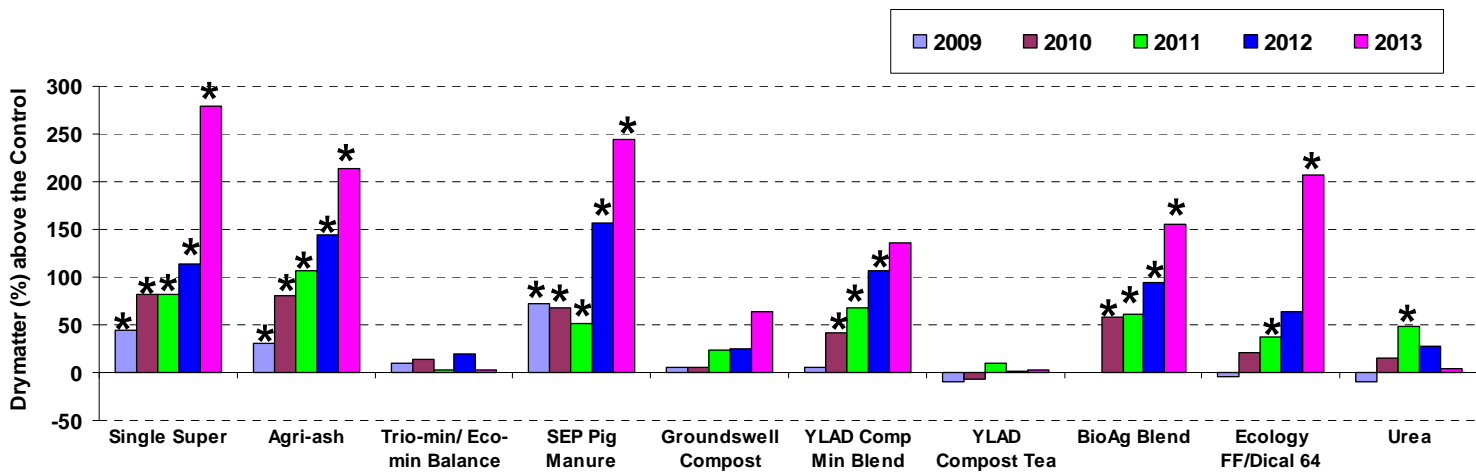
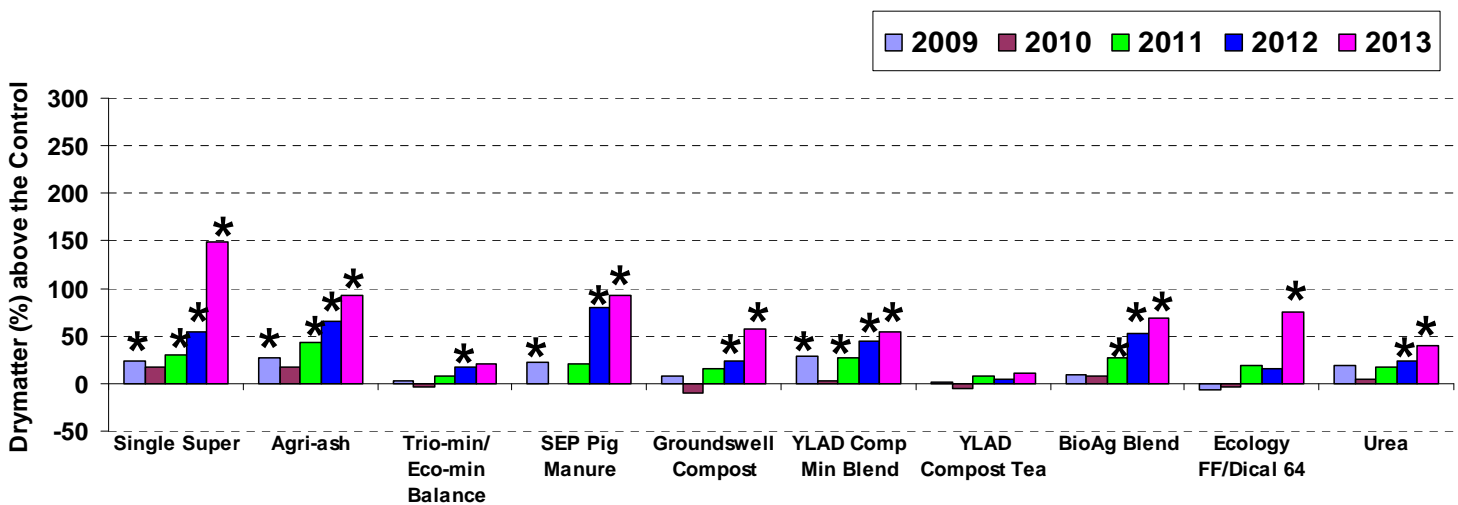


Figure 3: TE KOOTI



- Data presented for 2009, 2010, 2011, 2012 and 2013 have been statistically analysed and an asterisk (*) indicates a significant difference when compared to the control (nil) treatment ($P \leq 0.05$ using multiple pair-wise comparison tests).
- 2009 - 2012 data = total pasture grown for period Aug to Oct (approx 10 weeks for each year).
- 2013 data = total pasture grown for period May to mid Oct (22 weeks).
- The figures presented must be interpreted in conjunction with the table detailing rates of product spread over the 6 year period (2009 – 2014).

2013/14 Mean Winter Herbage Mass and 2013 Winter-Spring combined Herbage Mass relative to unfertilised control treatment

Figure 4: GLENROY

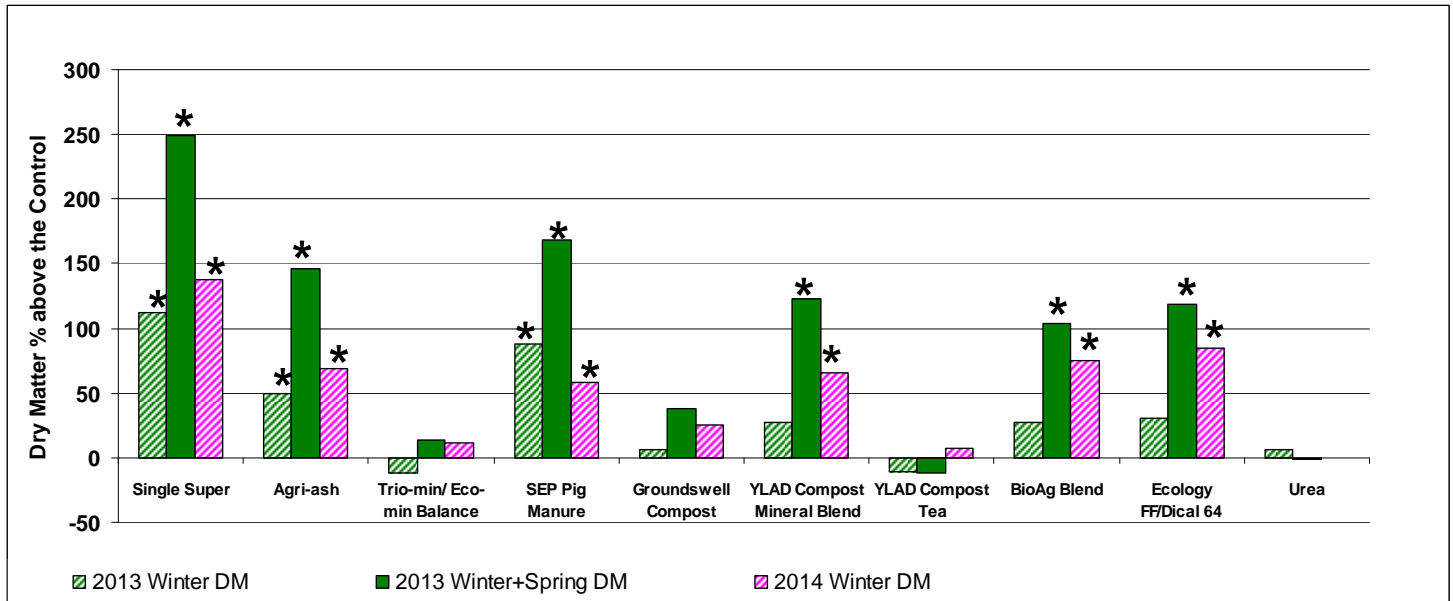


Figure 5: KIA-ORA

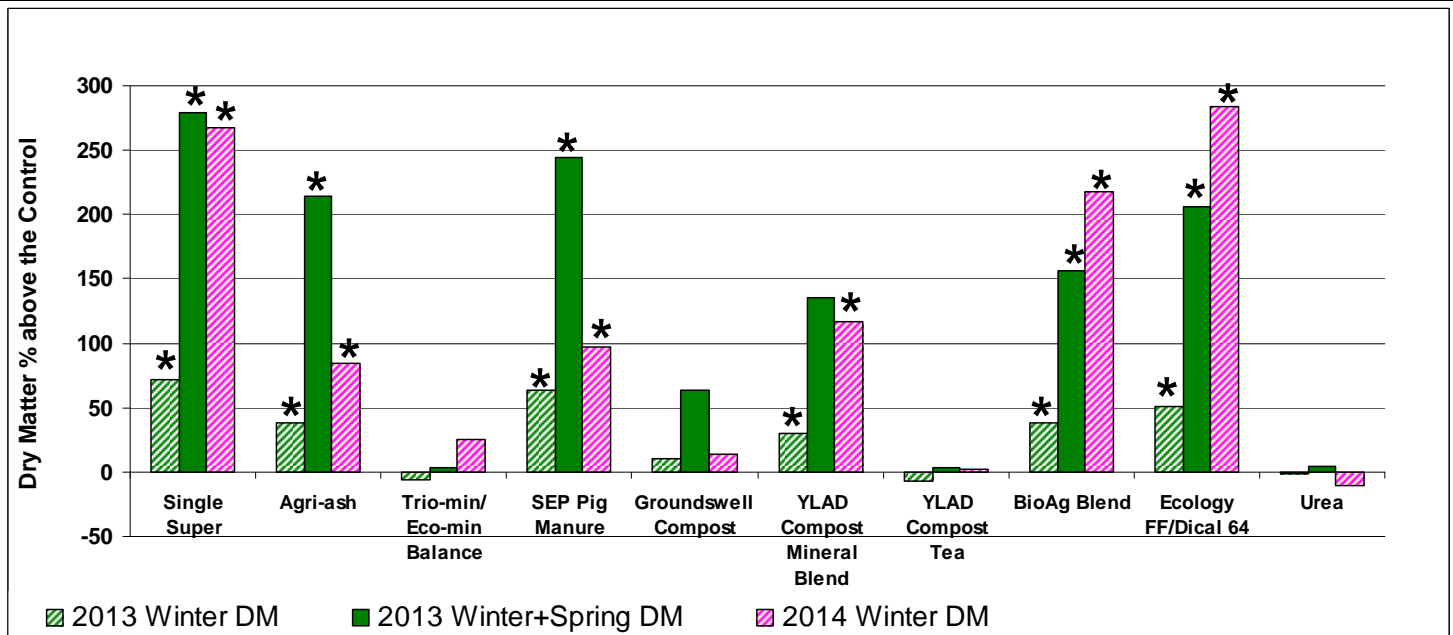
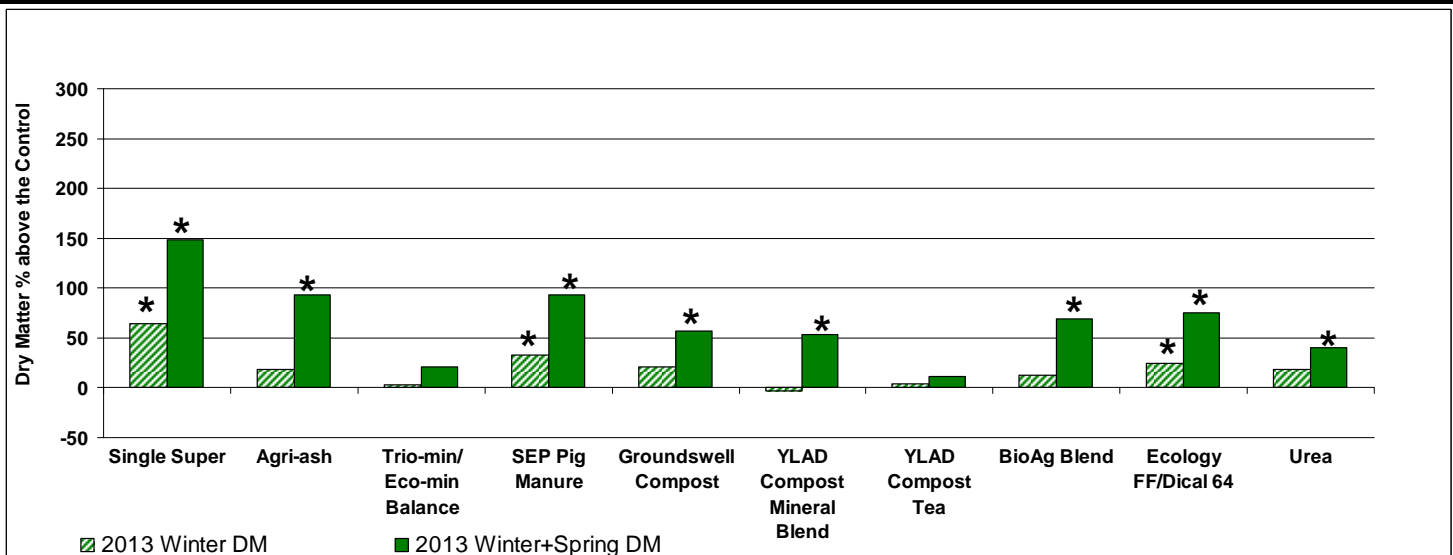


Figure 6: TE KOOTI



Notes to accompany winter herbage mass Figures 4, 5 & 6

- Data presented in the previous figures for mean winter herbage mass and combined winter-spring herbage mass have been statistically analysed and an asterisk (*) indicates a significant difference ($P \leq 0.05$ using multiple pair-wise comparison tests).
- 2013 winter DM = total pasture grown for period mid May to end Aug (15 weeks).
- 2013 winter + spring DM = total pasture grown for period mid May to mid Oct (22 weeks).
- 2014 winter DM = total pasture grown for period mid May to end Aug (15 weeks).
- We are no longer monitoring the Te Kooti site in 2014. Trial data collected on Te Kooti ended in 2013.

Table 3 - Annual Rainfall at each trial site

Site	Rainfall (mm)					
	2009	2010	2011	2012	2013	2014 (to 22 Sep)
Glenroy	535	975	619	694	480	503
Kia-Ora	643	1280	798	718	444	622
Te Kooti	660	1235	775	803	459	n/a

Fertiliser Pricing Summary 2009 to 2013

Figures in the table below represent an annualised cost per hectare for each fertiliser based on a product price landed at Yass plus spreading cost on farm (all prices GST exclusive). Fertiliser price, freight and spreading costs are obtained in autumn of each year and are then used to calculate relative cost effectiveness of the various fertilisers based on winter-spring herbage production.

Table 4 – Cost of fertiliser landed at Yass and spread on farm (\$/ha) over period 2009 to 2013

Fertiliser Product	Annualised cost of product landed at Yass & spread on farm \$/ha						
	2009	2010	2011	2012	2013	Average Annualised Cost (\$/ha)	Application frequency
Single Super	44.33	43.50	51.63	46.50	49.75	47.14	Annual
Agri-ash	42.40	42.40	42.40	60.50	64.50	50.44	Every 5 years
Trio-min/Eco-min Balance	170.50	121.00	128.37	130.68	135.40	137.19	Annual
SEP Pig Manure	68.05	68.05	68.05	80.00	80.33	72.90	Every 3 years
Groundswell Compost	116.00	116.00	116.00	117.50	122.00	117.50	Every 2 years
YLAD Compost Mineral Blend							Annual
Glenroy	188.80	194.25	195.21	115.84	115.00	161.82	
Kia-Ora	188.80	194.25	221.32	147.74	115.00	173.42	
Te Kooti	188.80	194.25	195.21	133.35	115.00	165.32	
YLAD Compost Tea	39.30	39.30	39.50	39.50	39.50	39.40	Annual
BioAg Blend	134.74	49.50	52.85	53.90	55.65	69.33	Every 2 years
Ecology Fluid Fertiliser/Dical 64/Gypsum	59.00	59.00	69.84	70.24	77.37	67.09	Annual
Urea	71.70	20.67	71.00	75.00	74.50	62.57	Annual

Relative Cost Effectiveness of Fertiliser Products

An economic comparison of each of the products tested has been presented in Figure 7, based on the winter + spring herbage mass measured in 2013. Only products that had grown significantly more pasture than the control treatment during this period have been presented. Any product which did not yield more than the control was regarded as not being cost effective.

The average annualised cost for each product appearing in Table 4 was used to determine the cost effectiveness of each product. Note that the values presented for the cost of additional pasture grown over the control (nil) treatment are only a relative measure of the cost effectiveness of each product as it is based on pasture grown for only a short period, i.e. winter + spring period in 2013 (mid May to mid Oct – 22 weeks). The relative cost was calculated by dividing the average annualised cost per ha (consisting of a product cost, freight charge to Yass and spreading cost all GST exclusive) by the winter + spring herbage mass (kg DM/ha). Note that if the total amount of pasture grown throughout the year had been measured, the cost of additional pasture grown would have been much less.

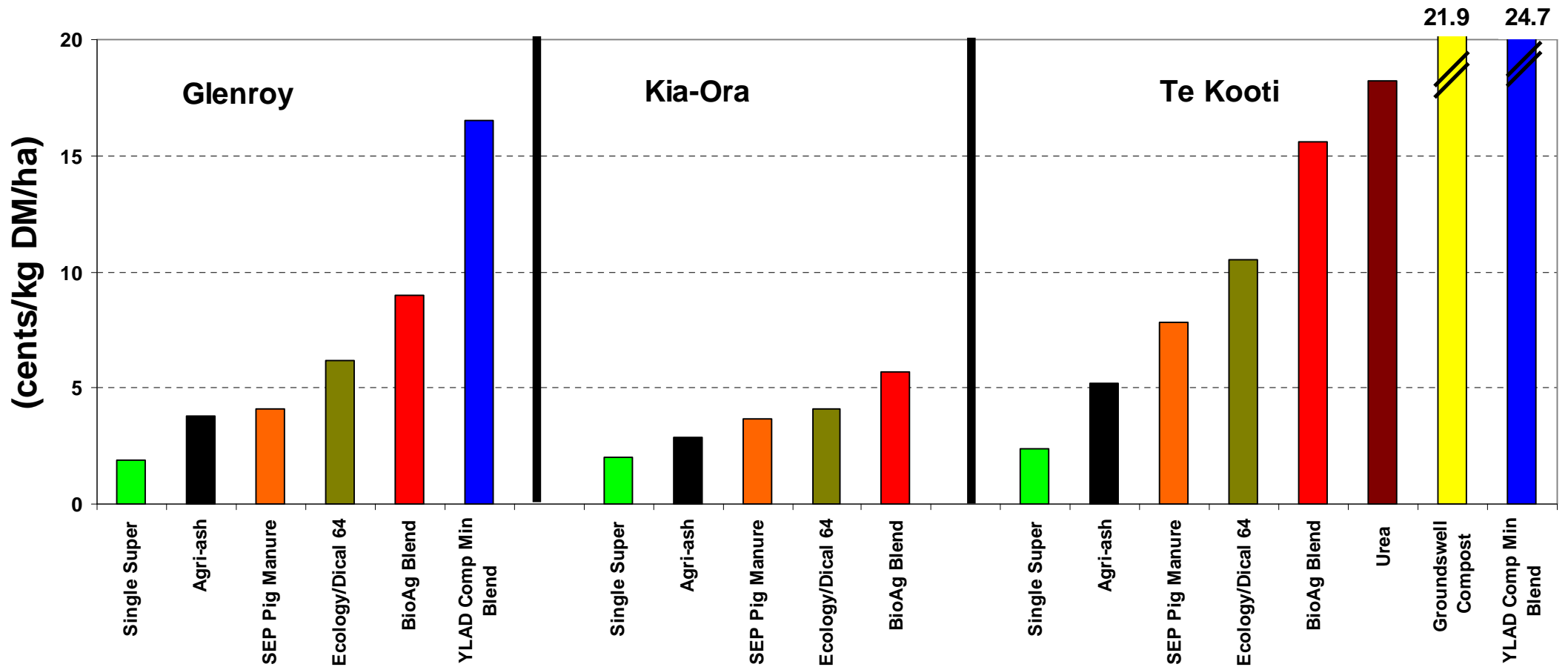


Figure 7: Economic comparison of fertiliser products showing the cost of additional pasture grown above control in 2013 winter + spring sampling period

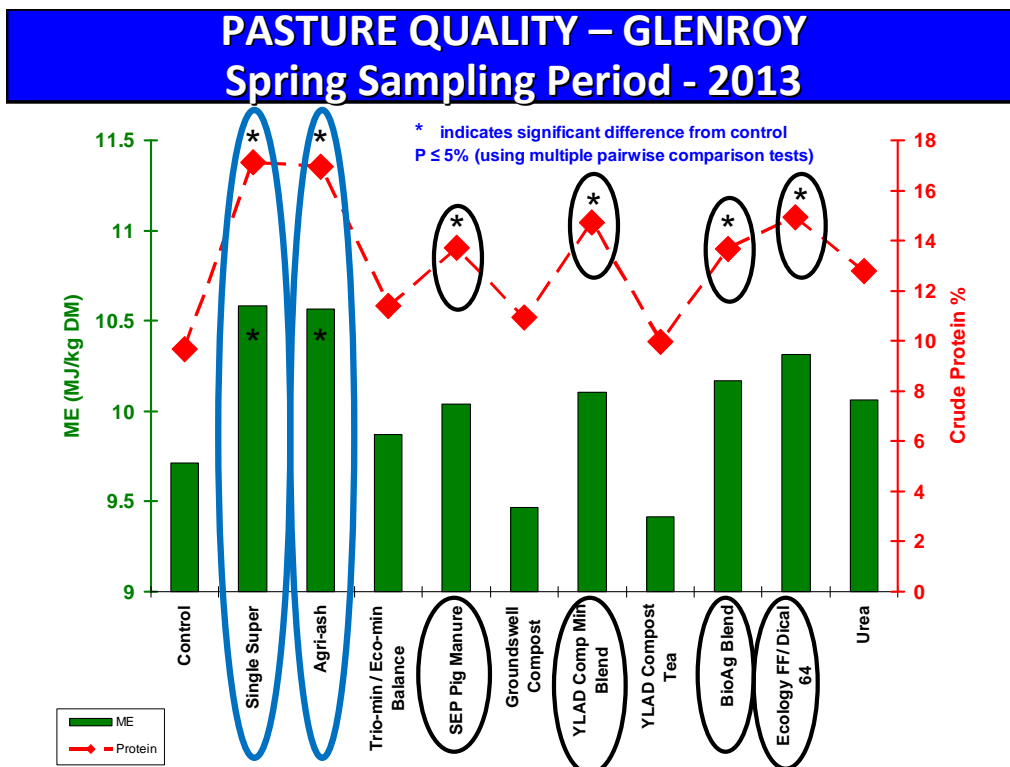


Figure 8: Metabolisable Energy (MJ/kg DM) and Crude Protein % for pasture growing on respective fertiliser treatments as well as the unfertilised control treatment on Glenroy trial site. Pasture sampling occurred on 3rd October 2013.

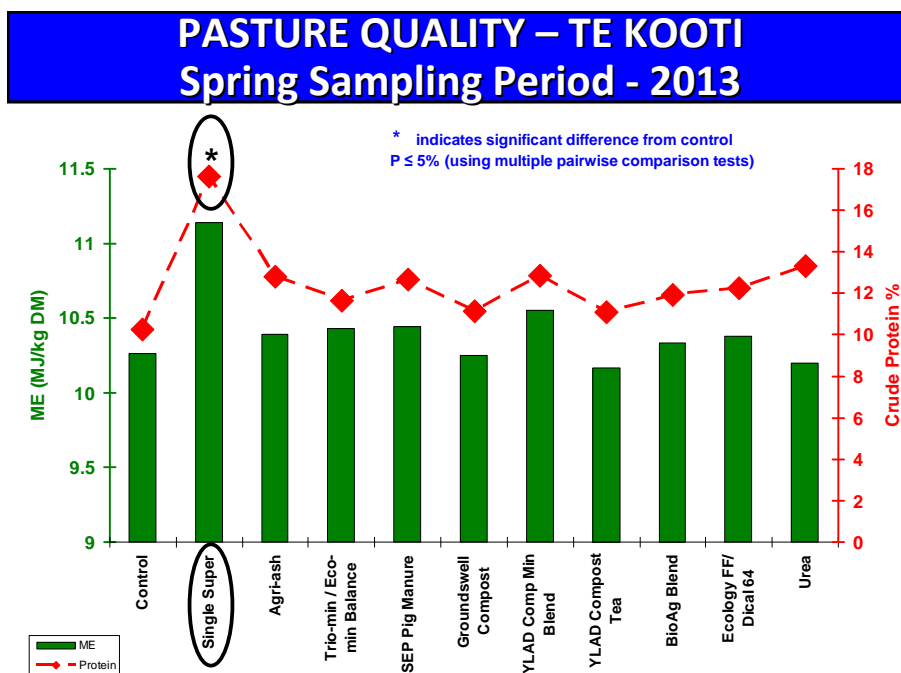


Figure 9: Metabolisable Energy (MJ/kg DM) and Crude Protein % for pasture growing on respective fertiliser treatments as well as the unfertilised control treatment on Te Kooti trial site. Pasture sampling occurred on 3rd October 2013.

- Data presented has been statistically analysed and an asterisk (*) indicates a significant difference when compared to the control (nil) treatment ($P \leq 0.05$ using multiple pair-wise comparison tests).
- Those treatments without an asterisk indicate the result is not different from the control treatment.
- All pasture samples were analysed using the Feed Quality Testing Service laboratory, NSW DPI, Wagga Wagga.
- No statistical difference was detected on “Kia-Ora” trial site for pasture quality at $P \leq 5\%$ (using multiple pair-wise comparison tests).

Soil Available Phosphorus (Colwell) Results

Figure 10: GLENROY

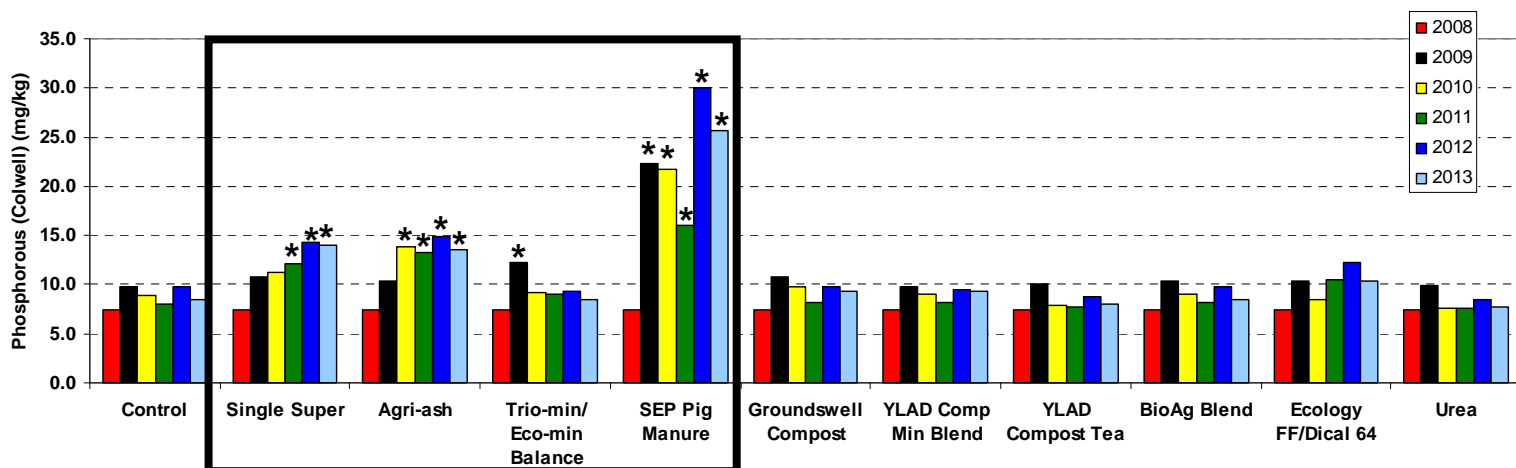


Figure 11: KIA-ORA

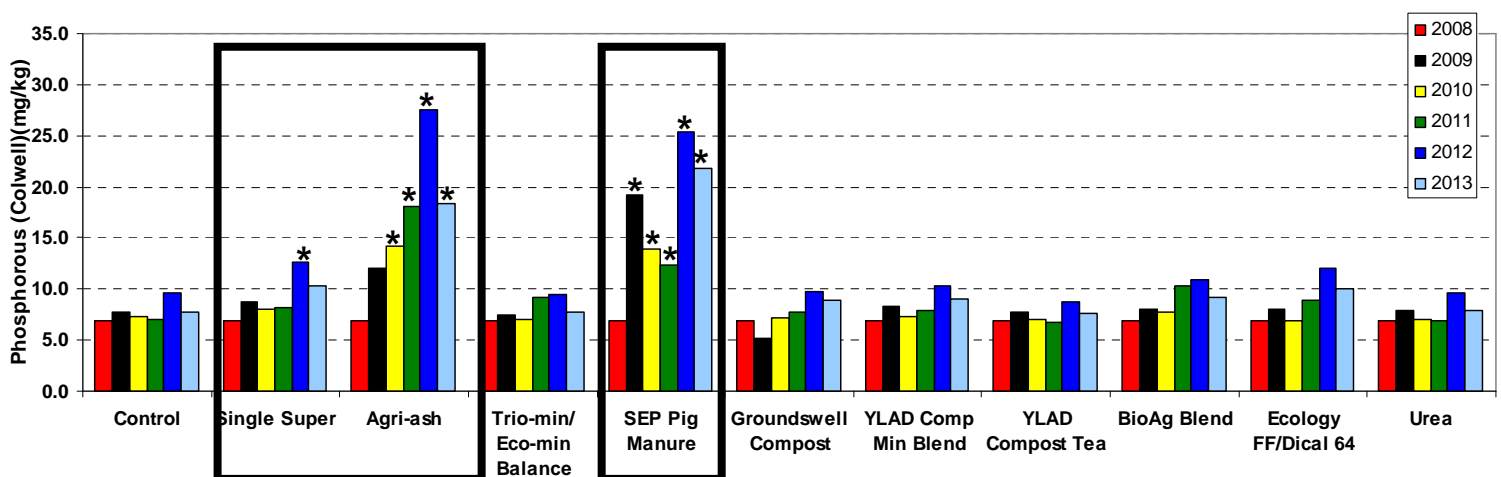
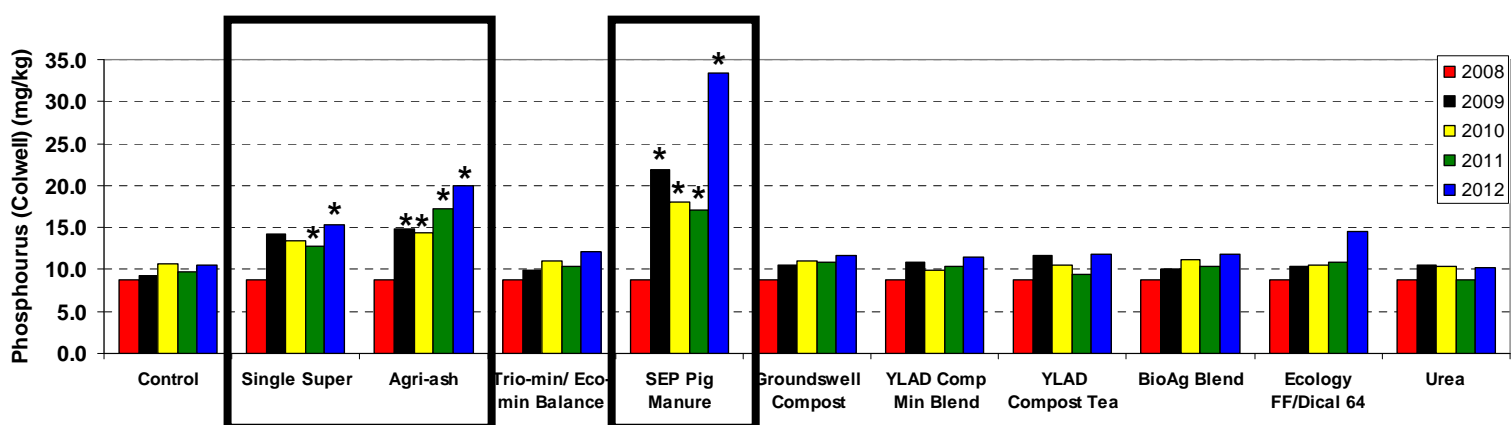


Figure 12: TE KOOTI

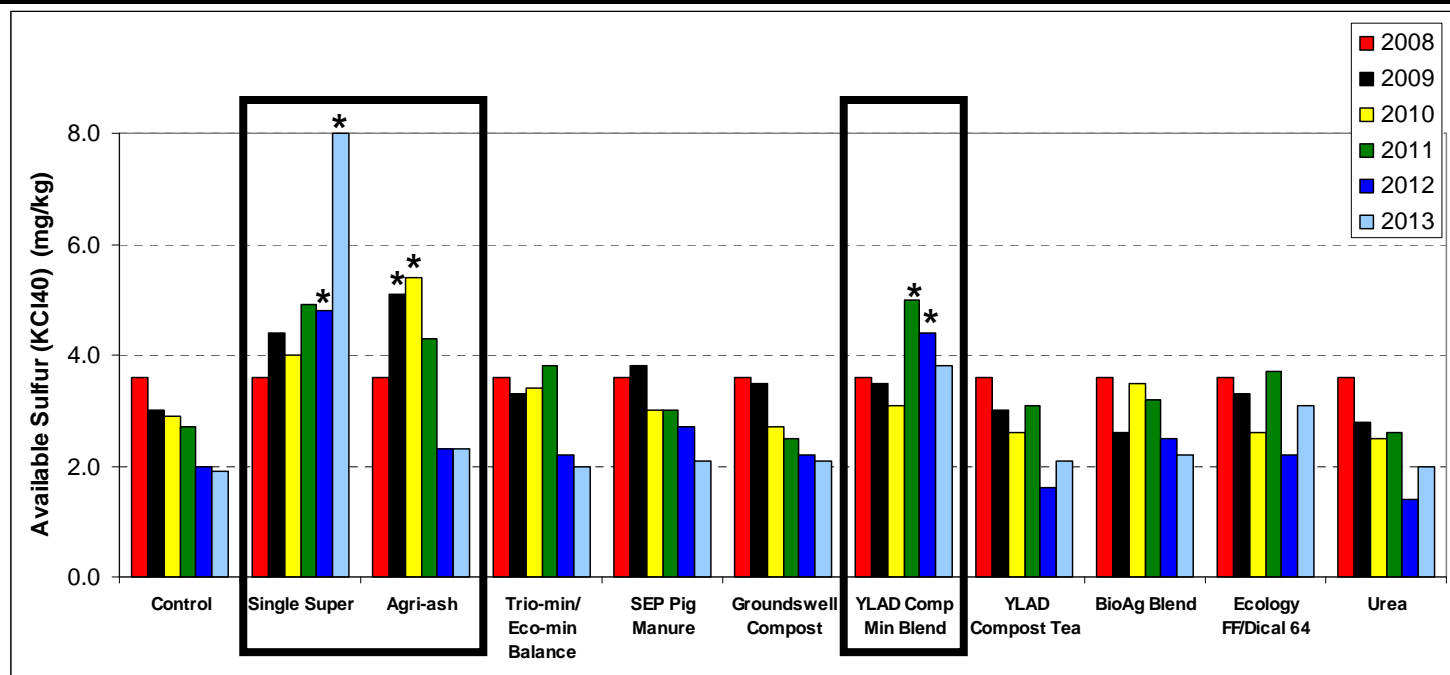


Comments:

- In late spring 2008, at the commencement of the trial available phosphorus (Colwell) was measured (red bar) before any fertiliser product was spread. The results for 2009 (black bar), 2010 (yellow), 2011 (green), 2012 (dark blue) and 2013 (light blue) were measured in late spring of each respective year.
- Data presented has been statistically analysed and an asterisk (*) indicates a significant difference when compared to the control (nil) treatment ($P \leq 0.05$ using multiple pair-wise comparison tests).
- 2013 soil available phosphorus (Colwell) test results for Te Kooti trial site have not been analysed at this point in time.
- All soil samples have been tested using the NSW DPI Soil Testing Service, Wollongbar.

Soil Available Sulphur (KCl₄₀) Results

Figure 13: GLENROY



Comments:

- In late spring 2008, at the commencement of the trial available sulphur (KCl₄₀) was measured (red bar) before any fertiliser product was spread. The results for 2009 (black bar), 2010 (yellow), 2011 (green), 2012 (dark blue) and 2013 (light blue) were measured in late spring of each respective year.
- Data presented has been statistically analysed and an asterisk (*) indicates a significant difference when compared to the control (nil) treatment ($P \leq 0.05$ using multiple pair-wise comparison tests).
- Available sulphur (KCl₄₀) test results for Kia-Ora and Te Kooti trial site have not been analysed at this point in time.
- All soil samples have been tested using the NSW DPI Soil Testing Service, Wollongbar.

Soil Carbon Results

Total soil carbon % has been measured on all trial sites using the Dumas (LECO) method. Statistical analysis has been completed on data collected on both Glenroy and Kia-Ora sites over the period 2008 to 2013. There has been no statistical difference found when comparing each fertiliser product to the unfertilised control treatment.

Statistical analysis has not yet occurred on data collected from Te Kooti trial site for period 2008 to 2013.

Statistical analysis has also not yet occurred on labile soil carbon measurements taken on all trial sites for the period 2008 to 2013.

Soil pH(CaCl₂) and Aluminium (Al) % Results

Table 5 - Rates of lime applied over the period 2009 to 2013 for products containing lime

Product	Lime Applied (t/ha)					
	2009	2010	2011	2012	2013	Total
Agri-ash	1.63	Nil	Nil	Nil	Nil	1.63
YLAD Compost Mineral Blend – ‘Glenroy’	0.5	0.48	0.5	Nil	Nil	1.48
YLAD Compost Mineral Blend – ‘Kia-ora’	0.5	0.48	0.75	0.25	Nil	1.98
YLAD Compost Mineral Blend – ‘Te Kooti’	0.5	0.48	0.5	0.25	Nil	1.73
BioAg Blend	0.4	Nil	Nil	Nil	Nil	0.4

Table 6 – Soil pH(CaCl₂) & Al % in 0 – 10 cm layer on treatments containing lime on Glenroy

GLENROY PRODUCT	pH (CaCl)						Aluminium %					
	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013
Control	4.1	4	4.3	4.4	4.3	4.3	24.6	27.8	25.3	25.2	20.3	22.7
Agri-ash	4.1	4.4	5.3	5.2	4.9	4.8	24.6	11.4	2.6	2.8	4.7	4.7
YLAD Compost Mineral Blend	4.1	4.2	4.6	4.9	4.9	4.8	24.6	18.9	11.4	4.2	3	3.8
BioAg Blend	4.1	4.2	4.6	4.6	4.4	4.4	24.6	13.3	13.3	12.8	13.3	12.3

Table 7 – Soil pH(CaCl₂) & Al % in 0 – 10 cm layer on treatments containing lime on Kia-Ora

KIA-ORA PRODUCT	pH (CaCl)						Aluminium %					
	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013
Control	4.0	3.9	4.3	4.3	4.3	4.3	Al% data still to be analysed as has variation in < values across yrs However preliminary analysis has shown that both Agri-ash and YLAD Compost Mineral Blend are significantly lower in Al% averaged over the 5 year period compared to the Control (Nil).					
Agri-ash	4.0	4.8	4.8	4.8	4.7	4.6						
YLAD Compost Min Blend	4.0	4.0	4.4	4.8	5.0	4.7						
BioAg Blend	4.0	4.0	4.3	4.4	4.6	4.4						

Table 8 – Soil pH(CaCl₂) & Al % in 0 – 10 cm layer on treatments containing lime on Te Kooti

TE KOOTI PRODUCT	pH (CaCl)					Aluminium %				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Control	4.0	3.9	4.2	4.3	4.2	20.3	21.9	21.2	22.9	18.9
Agri-ash	4.1	4.8	4.6	4.6	4.6	20.3	2.8	9.3	9.2	6.9
YLAD Compost Min Blend	4.1	4.3	4.5	4.7	4.6	20.3	12.9	14.6	9.1	6.7
BioAg Blend	4.1	4.2	4.4	4.4	4.3	20.3	13.6	14.0	17.0	12.7

Comments:

- Data presented has been statistically analysed and an asterisk (*) indicates a significant difference when compared to the control (nil) treatment ($P \leq 0.05$ using multiple pair-wise comparison tests).
- 2013 data collected from the Te Kooti trial site has not been statistically analysed at this point in time.
- Test results from NSW DPI Wollongbar laboratory.

Soil Biology Results

Two soil biology tests have been taken annually in late spring. These include a Fluorescein Diacetate Activity test (FDA) and a Biomass Carbon test. The tests were conducted by the NSW DPI Wollongbar Laboratory. Both tests are 'point in time' tests and comparisons should only be made across treatments within each year's set of results. The FDA test show whether the microbes are active or not while the Biomass Carbon test is a measure of the weight of carbon present in the soil microbes.

Statistical analysis of the results for the FDA and Biomass Carbon test over the five year period, 2009 to 2013 on both the Glenroy and Kia-Ora trial sites indicate that no product has consistently performed better or worse than the control treatment. The 2013 data collected on the Te Kooti trial site has not been statistically analysed at this point in time. However data analysed for the Te Kooti trial site over the four year period 2009 to 2012 also indicate that no product has consistently performed better or worse than the control treatment.

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