

Project Catalyst Trial Report

Ag Lime Products

Grower Information

Grower Name:	Alan Lynn
Entity Name:	Jenallynn Holdings Pty Ltd
Trial Farm No/Name:	Ag Limes products trial 138A
Mill Area:	Herbert
Total Farm Area ha:	200
No. Years Farming:	33
Trial Subdistrict:	Forest Home
Area under Cane ha:	198.38

Background Information

Aim:

To improve cane yield and soil health focusing on pH levels & aluminium saturation

Background: (Rationale for why this might work)

The trial is focusing on Agricultural lime products and which one is most beneficial to yield, sugar and economics.

We will look at a pH timeline of when and how much the lime products shift pH levels, and which one is more economic over a crop cycle.

Potential Water Quality Benefit:

By improving soil pH, soil health will improve.

By correcting the soil pH balance, plant nutrients will become more available to the plant which will better utilise nutrient uptake and reduce losses to waterways

Expected Outcome of Trial:

That economically the ag lime products will be better in a crop cycle compared to the economics of the prilled lime which needs to be applied every year. Which product will shift pH levels more effectively is still to be determined?

Service provider contact: Megan Zahmel 0447 317 102

Where did this idea come from: Alan Lynn

Plan - Project Activities	Date: (mth/year to be undertaken)	Activities : (breakdown of each activity for each stage)
Stage 1	Establish trial 2016/2017	Baseline soil nutrient samples taken and GPS'd. - 20 th of Dec 2016 EM mapping – 21/06/2017 Applied Ag lime and Kiln dust mix – 7/07/2017 Lime sample tested for quality – 28/07/2017 NMP completed – August 2017
Stage 2	Plant Cane 2017	Q231 planted on 10/08/2017 Prilled Lime applied to trial as one of the treatments – 11/10/2017
Stage 3	Sampling 2017/2018	1 st pH testing – 13/11/2017 2 nd pH testing – 20/12/2017 3 rd pH testing – 30/01/2018 4 th pH testing – 30/08/2018 – after harvest sampled 3 rd leaf samples taken - 24th April 2018 Final yield and CCS data through mill – 2 nd of August 2018 Re-applied prilled lime – 14 th of September 2018
Stage 4	Economic analysis	Economic analysis Oct 2018
Stage 5	Sampling 2019	3 rd leaf sampling – 15 th May 2019 pH & soil sampling – 20 th June 2019 (having difficulties getting to trial site due to a heavy continuous wet season) Harvest trial – 15th Oct 2019 pH sampling after harvest. 28 th Oct 2019 Re-applied Prilled Lime – 18th Nov 2019
Stage 6	Sampling 2020	3 rd leaf sampling – April 2020 pH sampling – April 2020 Harvest Data – 2020 season

Project Trial site details

Trial Crop:	Sugar cane
Variety:	Plant cane – Aug 2017
Rat/Plt:	Q231
Trial Block No/Name:	Block # 7-1
Trial Block Size Ha:	2.567ha
Trial Block Position (GPS):	Refer to google earth map
Soil Type:	Clay/ Terrace loam

Lime Product Trial								
Headland								
Rep 3			Rep 2			Rep 1		
Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9
T2	T1	T3	T2	T1	T3	T3	T2	T1
R3	R3	R3	R2	R2	R2	R1	R1	R1
5 rows	5 rows	6 rows	5 rows	5 rows	6 rows	6 rows	5 rows	5 rows
Rep 3			Rep 2			Rep 1		

Sachs Lane

Headland

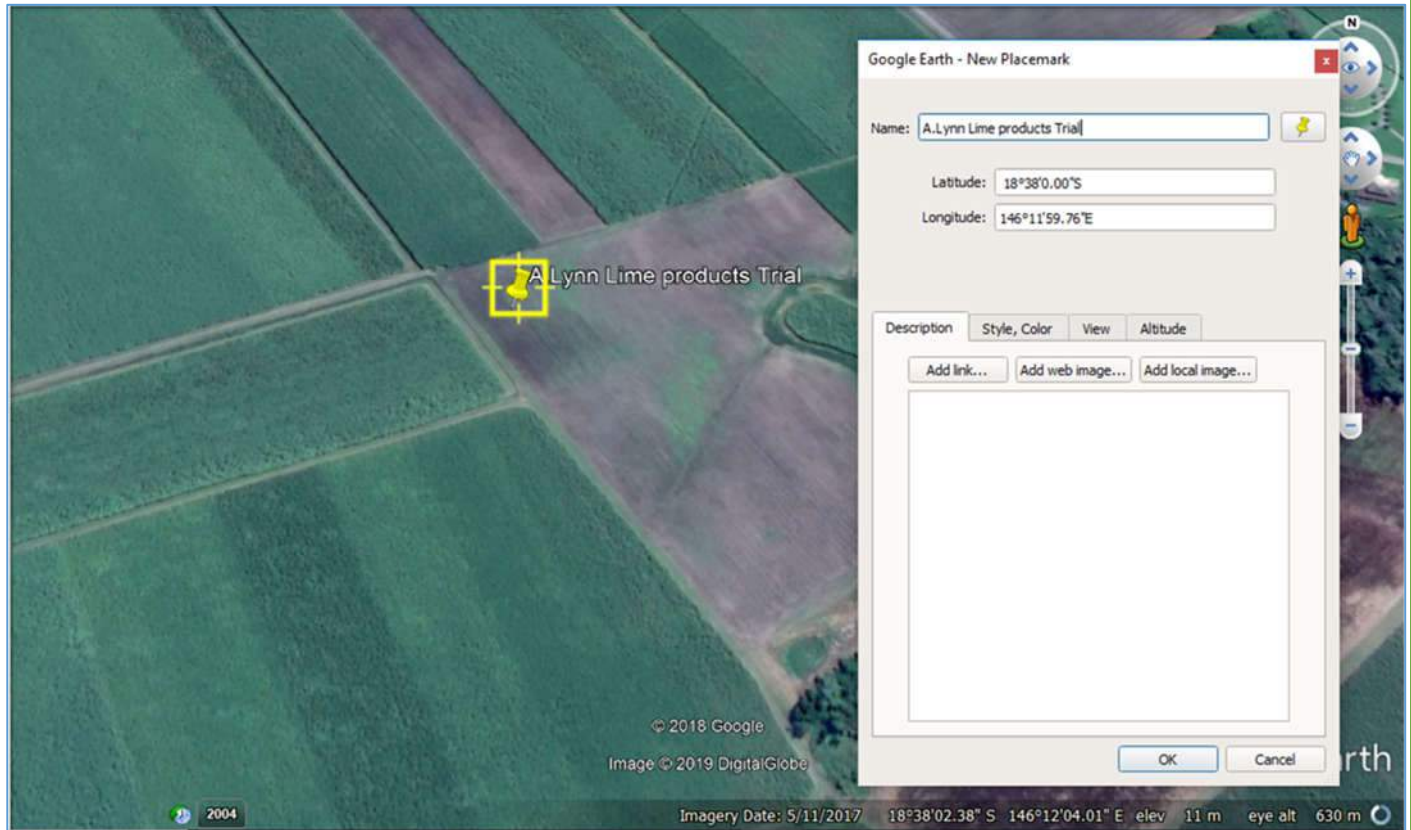
T1	Ag Lime
T2	Kiln Dust 20% Ag Lime 80%
T3	Prilled lime

Row width: 1.8m

Trt 1 – Agriculture Lime 4t/ha
Trt 2 – Kiln Dust 20% Ag Lime 80% 4t/ha
Trt 3 – Prilled lime @ 350kg/ha

Results:

Google Earth Reference Map



Laboratory Results for Analysis of Lime products

Below is a table showing particle size of Lime products and there overall effectiveness:

3 soil samples supplied by Herbert Cane Productivity Services Ltd on 28th July, 2017. Lab Job No. G1619

Analysis requested by M Zahmel. Your Reference: Ag Lime/Kiln Dust

PO Box 135 INGHAM QLD 4850

SAMPLE ID	>2mm Gravel/ Organic Matter	1 - 2mm Very Coarse Sand	500µm - 1mm Coarse Sand	250 - 500µm Medium Sand	125 - 250µm Fine Sand	63 - 125µm Very Fine Sand	<63µm Mud (Silt/Clay)	Percentage of effective lime
Sample 1 - lynn farm	1.18%	1.28%	17.37%	25.60%	16.88%	23.12%	14.56%	80.17%
Sample 2 - trial sample	0.02%	0.13%	18.04%	27.76%	15.73%	16.48%	21.84%	81.81%
Sample 3 - Kiln dust 20% mix	2.97%	0.43%	9.67%	22.05%	15.55%	28.31%	21.01%	86.93%

Note:

1: The Dry and Wet Sieving Analysis method was used for this grain size determination (Method of: Lewis and McConchie, 1994. Analytical Sedimentology. Chapman and Hall, USA.)

Below is a Table showing nutrient and neutralising capacity of lime products:

3 samples supplied by HCPSL on the 28 July, 2017 - Lab Job No. G1619.

Analysis requested by M Zahmel.

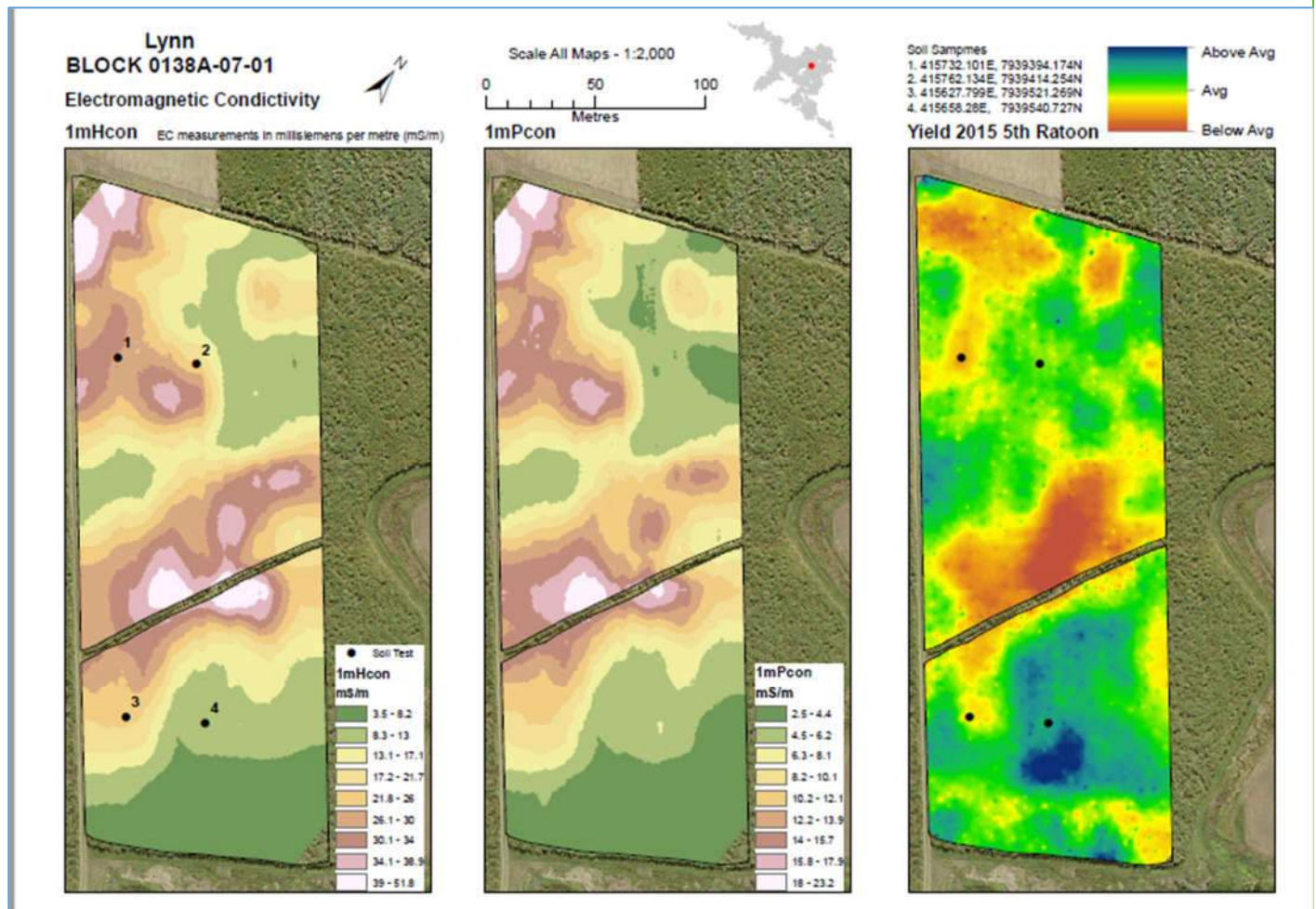
			Sample 1 Sample 1 Lynn Farm Ag Lime HCPSL	Sample 2 Sample 2 Trial site Ag Lime HCPSL	Sample 3 Sample 3 Trial site Kiln Dust HCPSL
Nutrient			G1619/1	G1619/2	G1619/3
Calcium	Ca	%	39.7	40.8	40.0
Magnesium	Mg	%	0.17	0.13	0.33
Acid Neutralising Capacity	CaCO ₃ Equivalents	%	72.0	67.1	82.1

Laboratory testing notes:

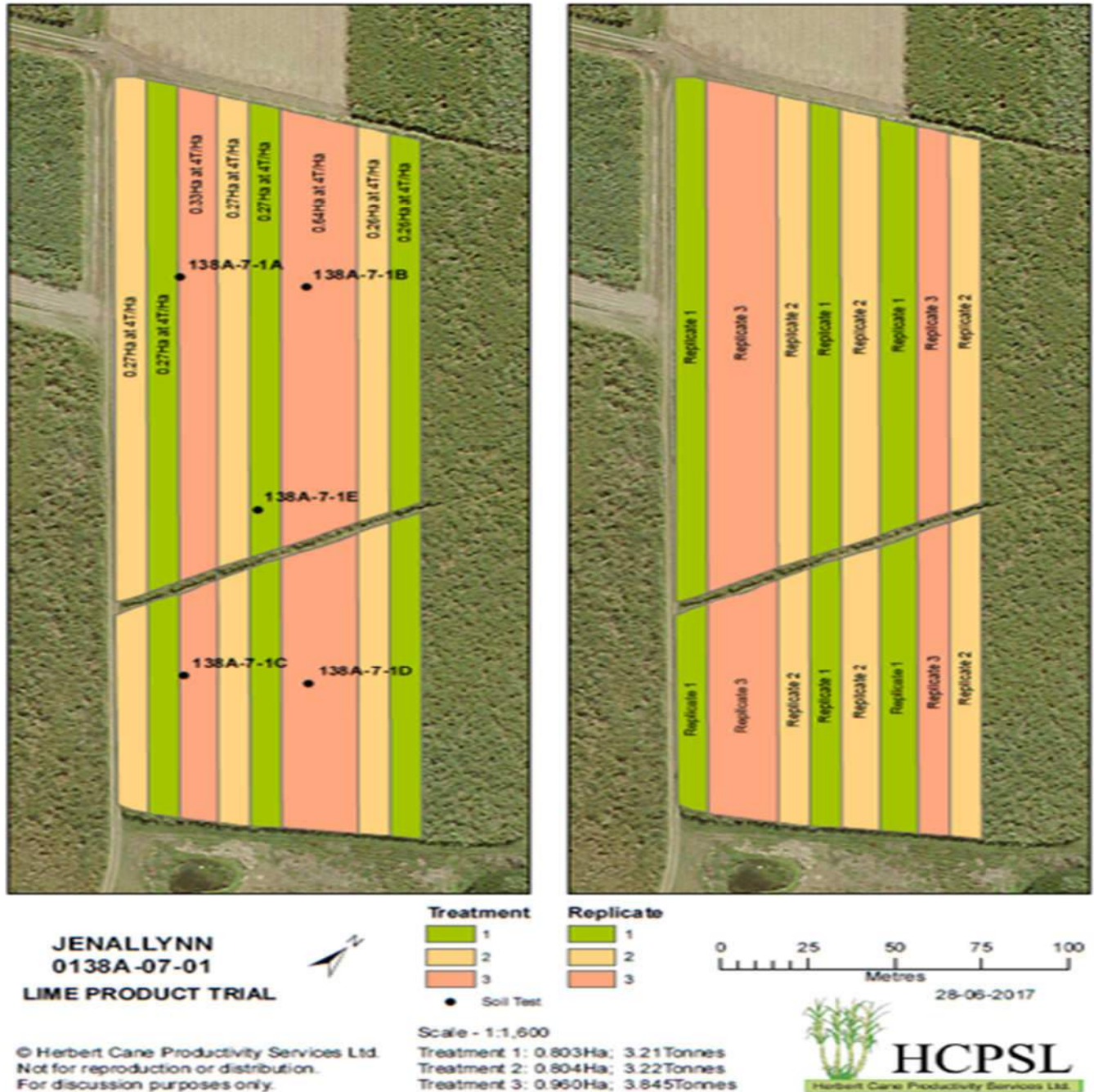
- All analysis conducted on sample as supplied. (Samples are lightly crushed as required)
- Samples are digested on a hotblock digester using Nitric acid then read on the ICP-MS (EPA3050B and APHA 3125 ICPMS or ICP-OES for Sulfur).
- Carbon / Nitrogen measured using a LECO CNS2000 Analyser
- mg/kg = ppm; 1% = 10,000ppm
- Moisture based on sample dried at 105° C
- Total Soluble Phosphorus = Water Soluble Phosphorus + 2% Citrate Soluble Phosphorus

Quality Checked: Kris Saville
Manager, Agricultural testing division

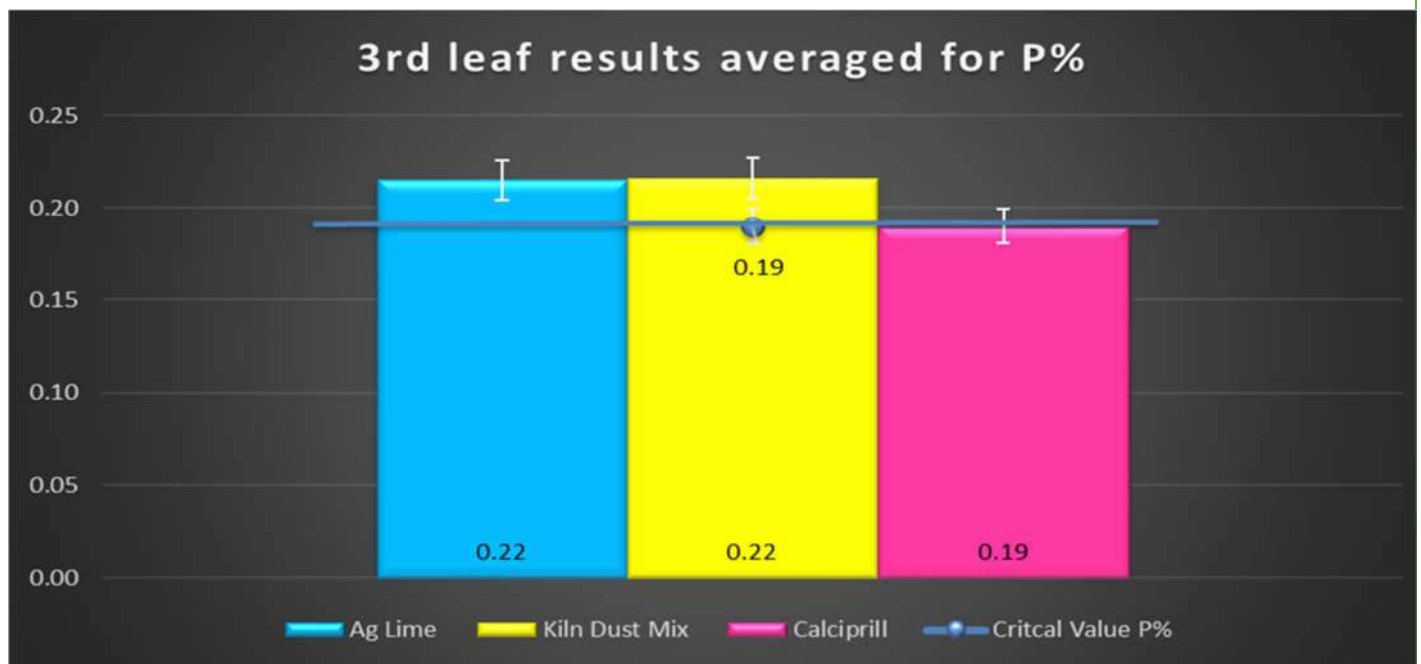
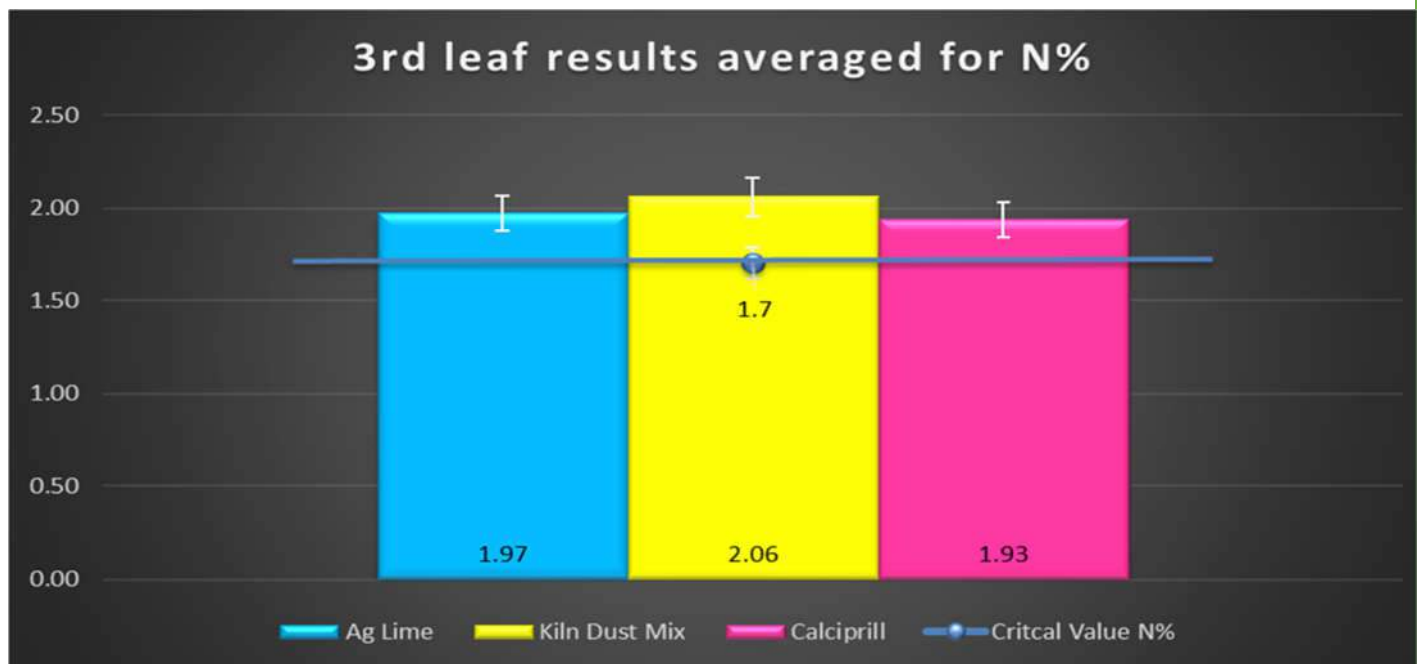
EM map of trial block with baseline soil sample points



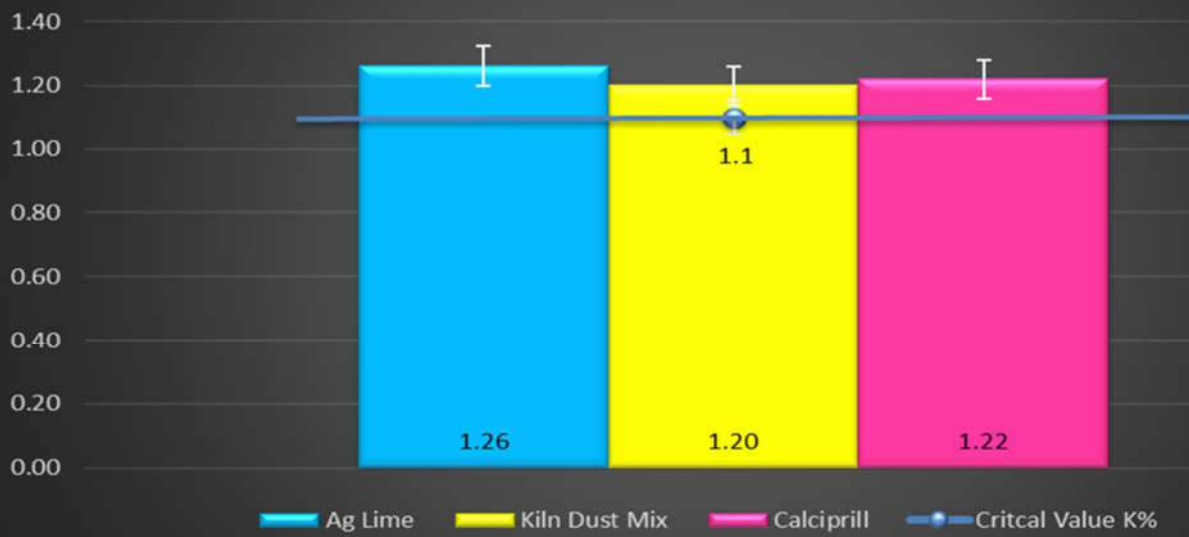
Plot areas of trial design



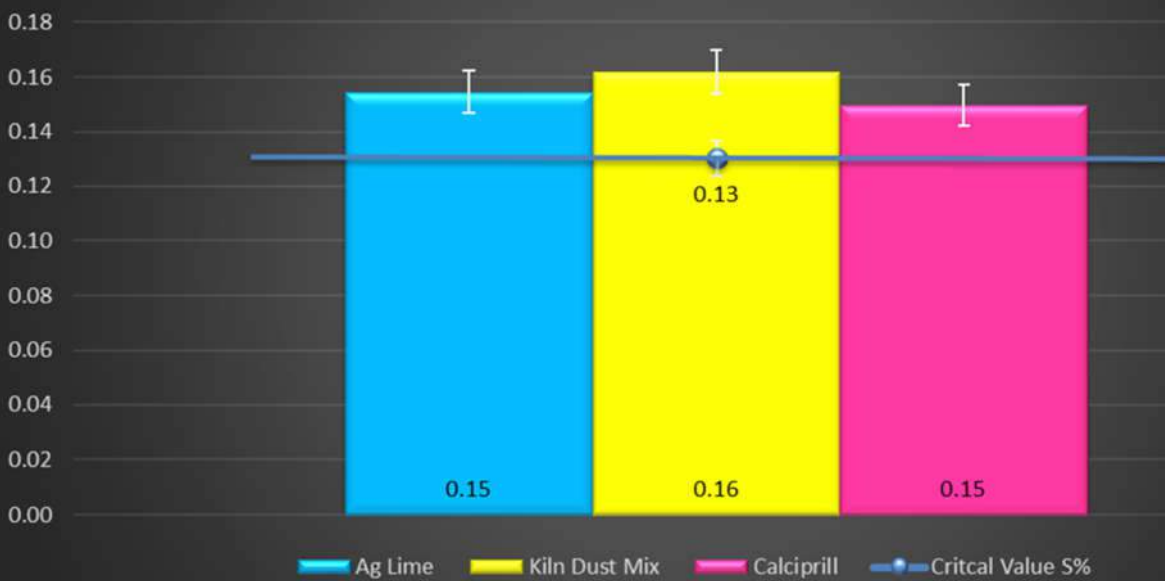
Leaf samples taken 24th April 2018



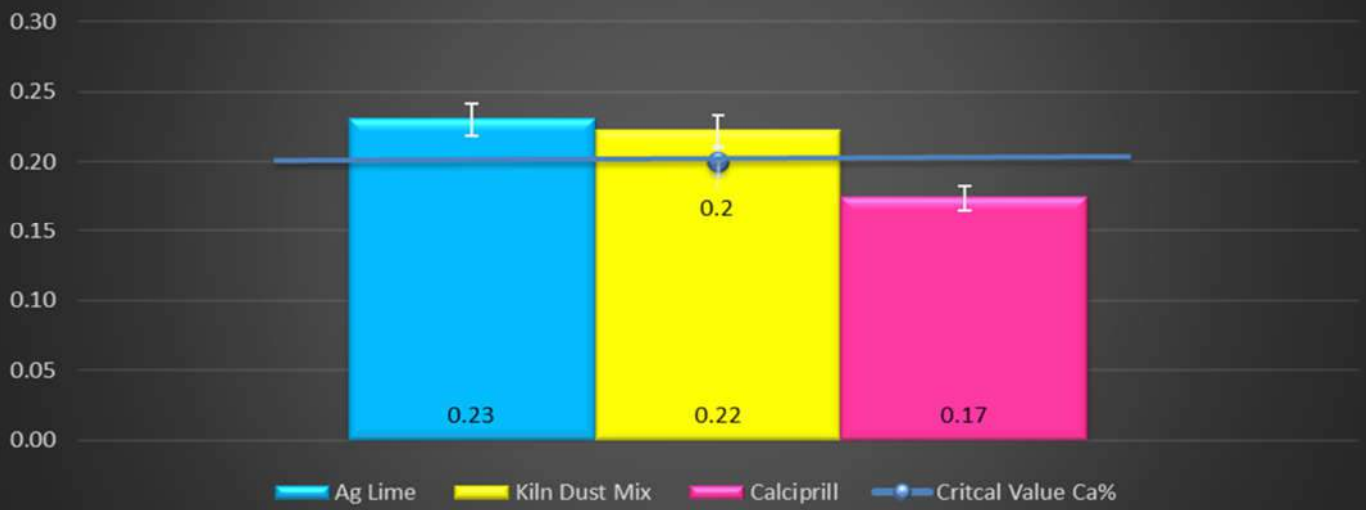
3rd leaf results averaged for K%



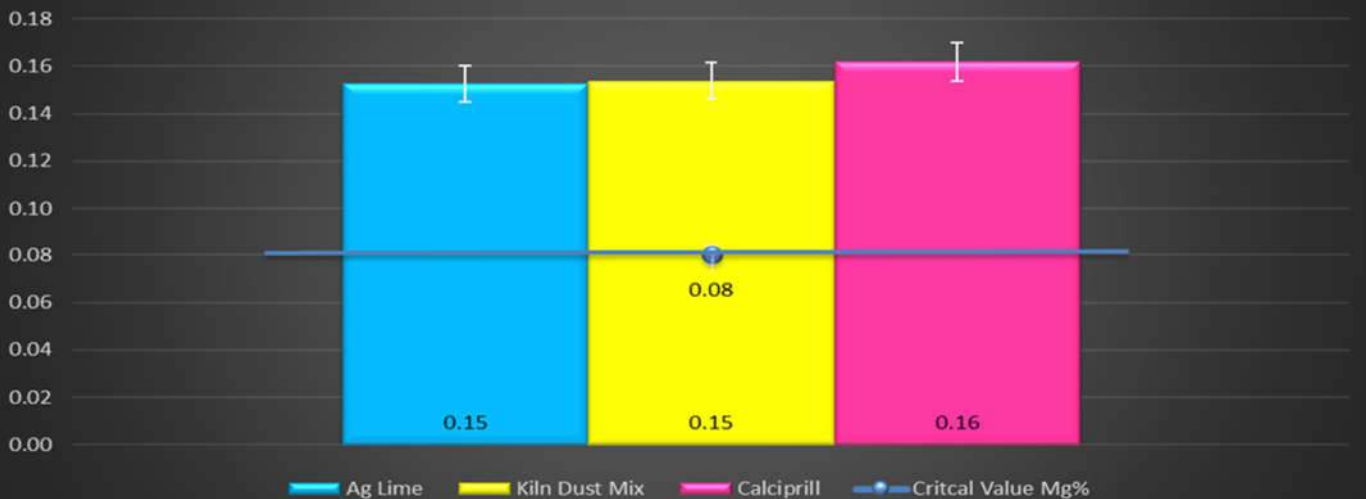
3rd leaf results averaged for S%



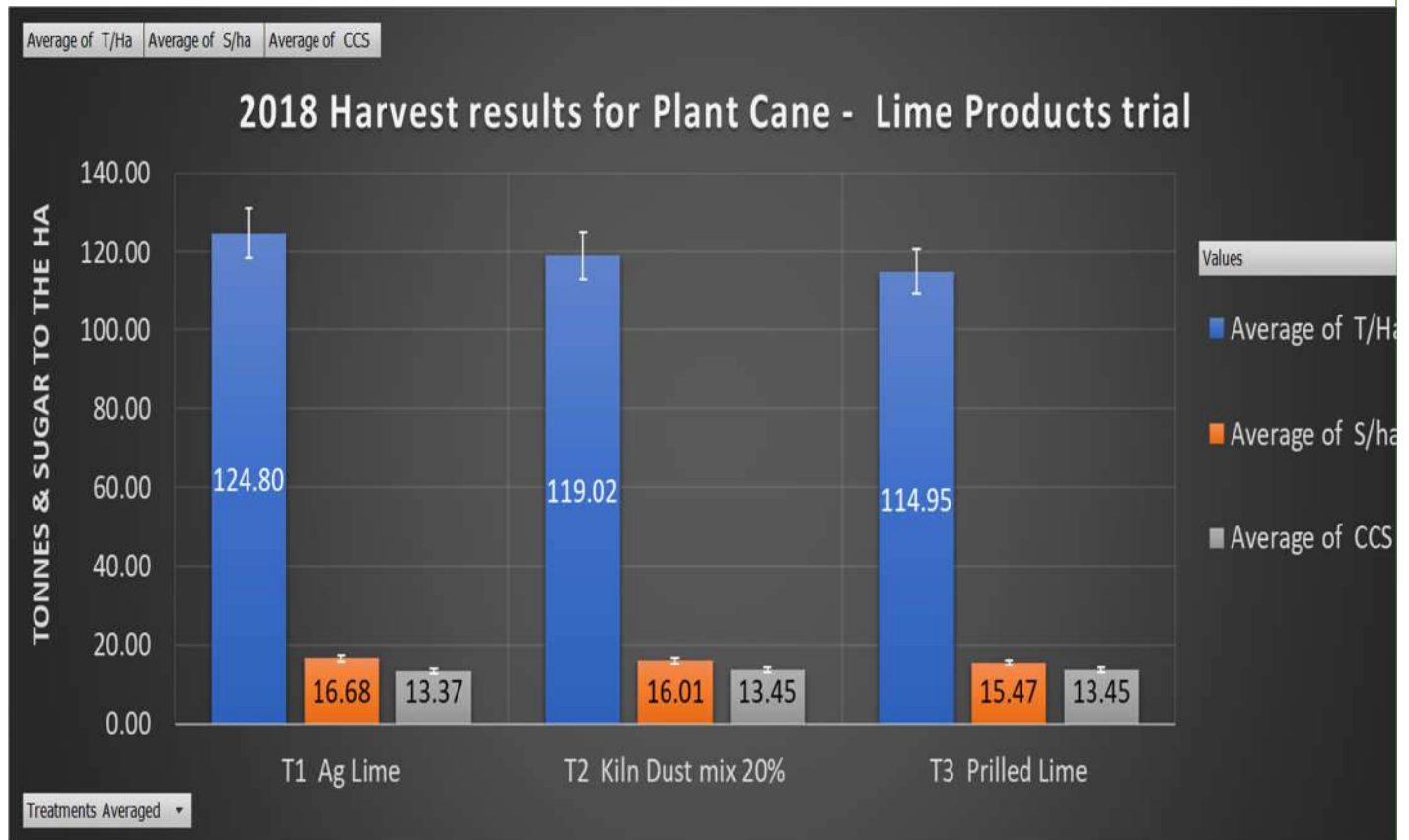
3rd leaf results averaged for Ca%



3rd leaf results averaged for Mg%



Harvest Data 2018



Economic Analysis for 1st year of trial

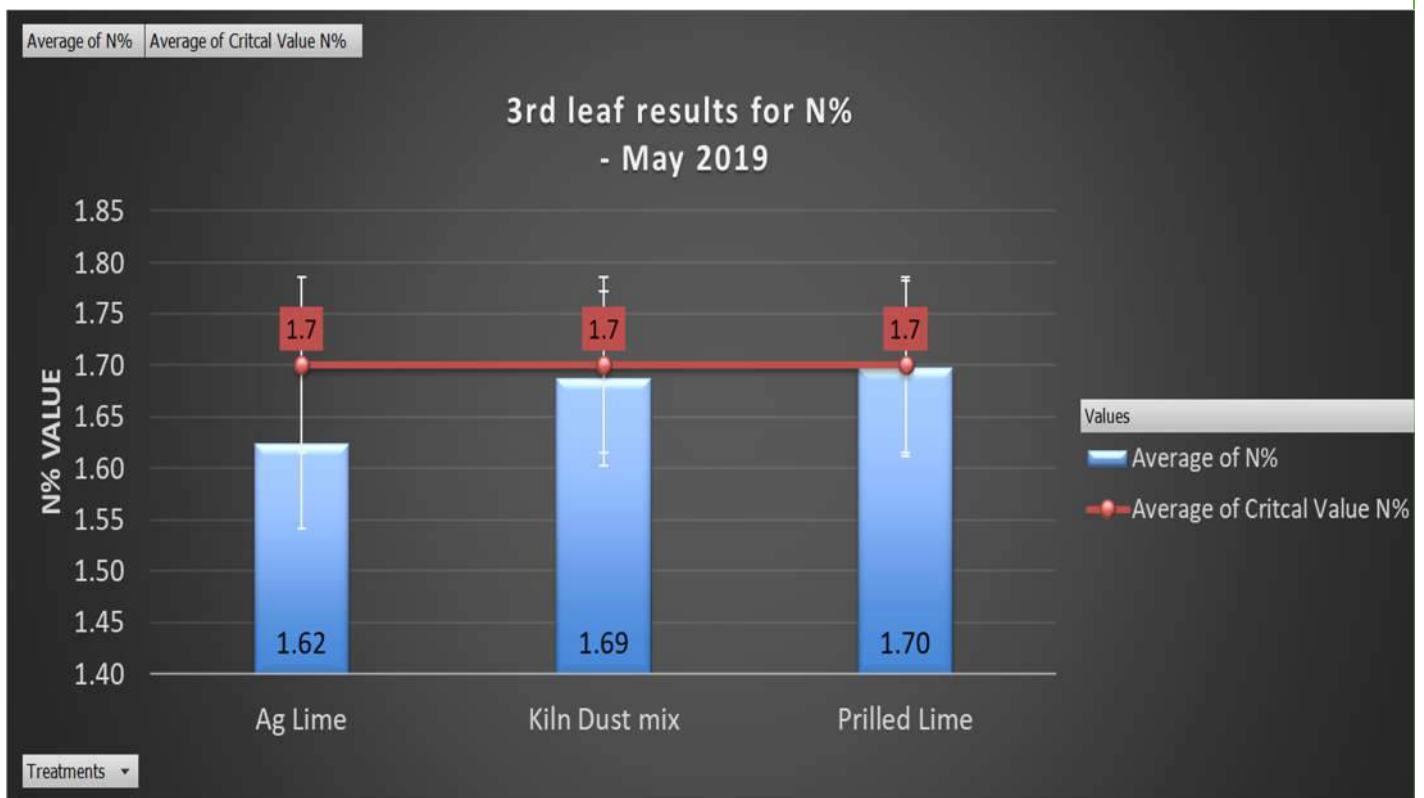
Gross margin results for the 1st year of trial.

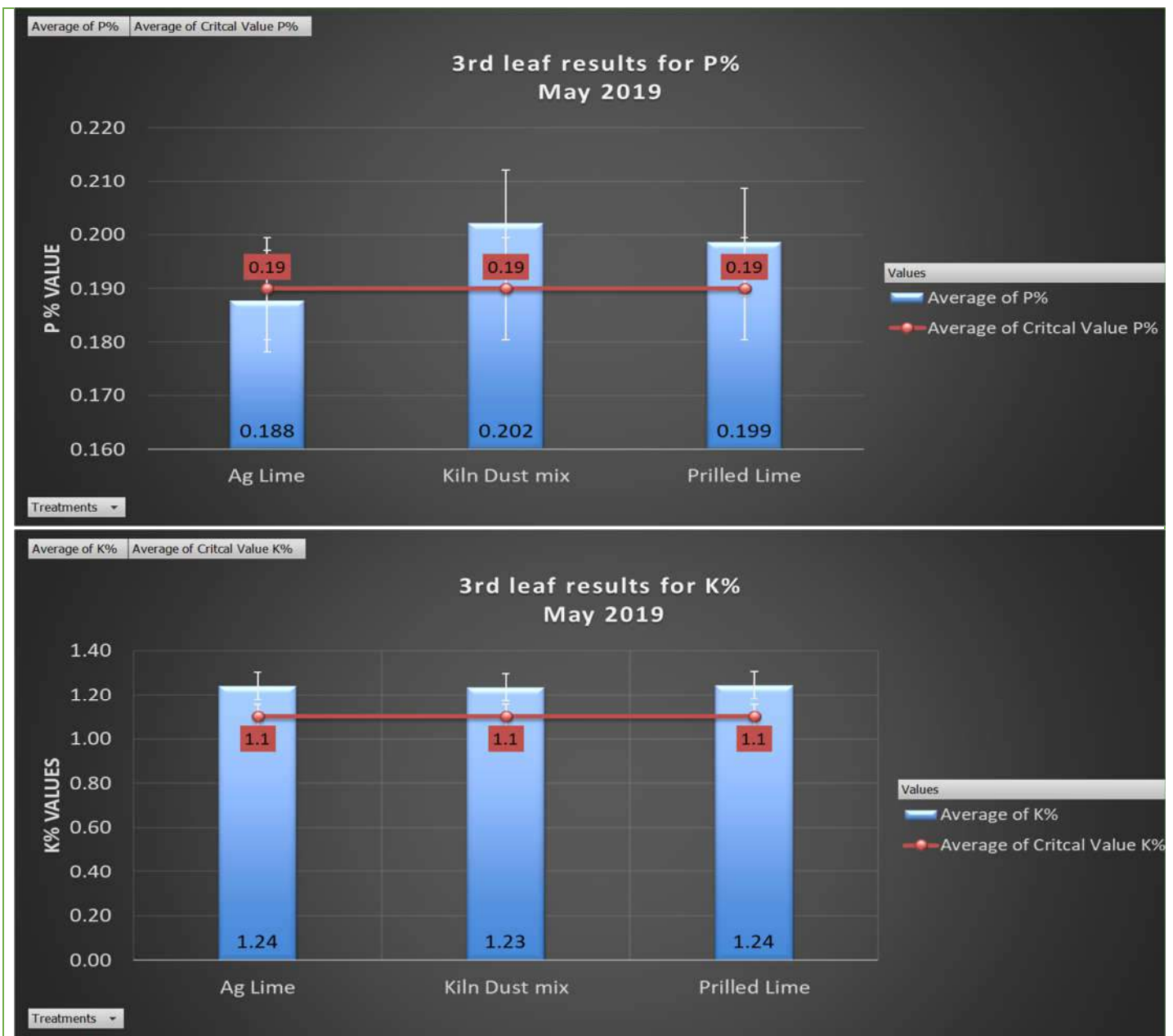


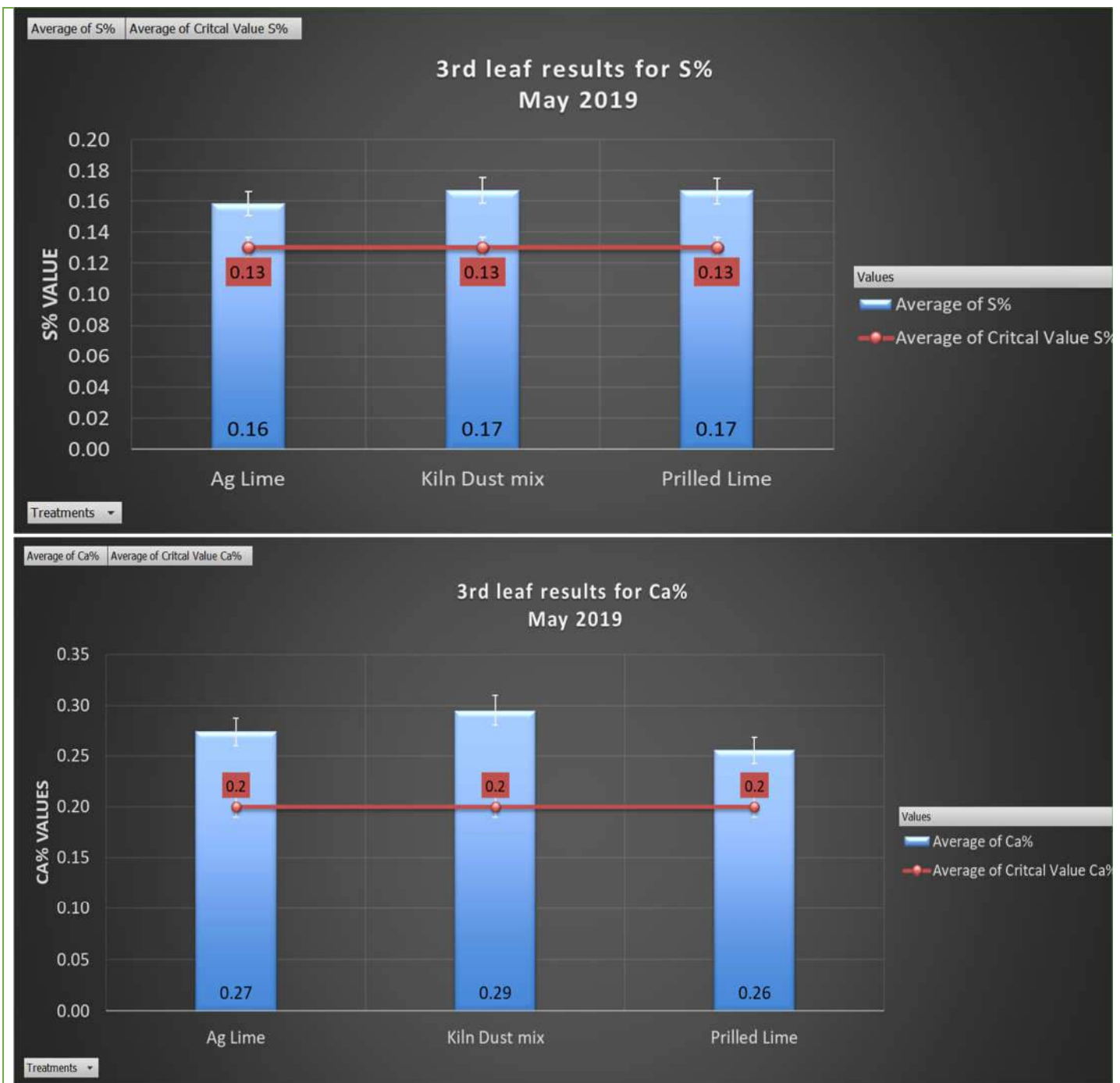
Costing table of products over 5-year period

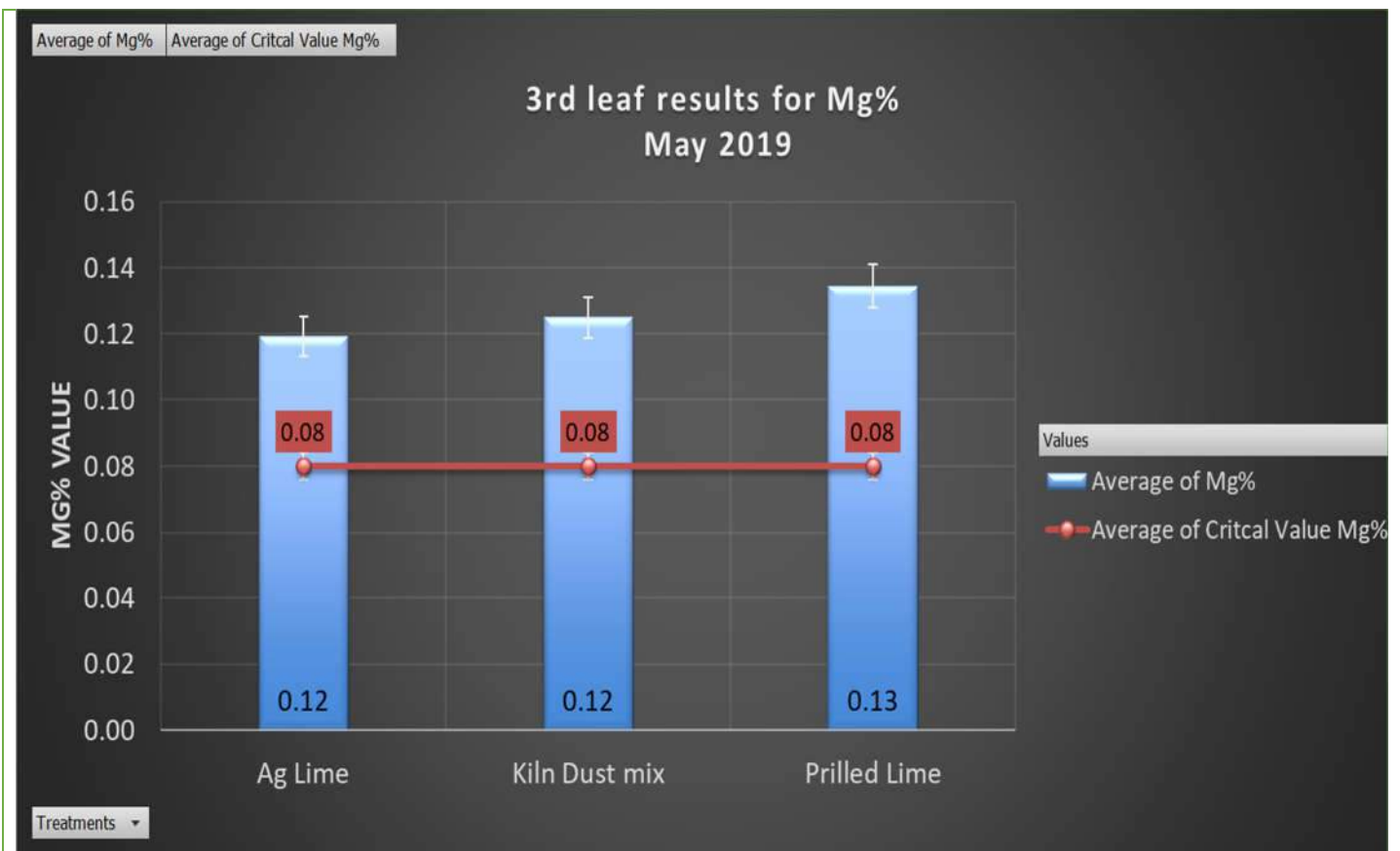
Product	Cost of Product per Tonne	Cost of product per ha	Ca % per product	kg of Ca per Tonne	Rate in kg of product per ha applied	kg of Ca applied per ha	\$ paid per ha for Ca	Cost Ca per kg/Tonne	Price of product per ha over 5 years
Ag Lime	\$165.00	\$660.00	40.80	408.00	4,000.00	1632.00	\$4,035.49	\$0.40	\$825.00
Kiln Dust 20% Ag Lime 80%	\$196.92	\$787.68	40.00	400.00	4,000.00	1600.00	\$3,250.05	\$0.49	\$984.60
Prilled Lime	\$560.00	\$196.00	36.00	360.00	350.00	126.00	\$81.00	\$0.64	\$980.00

3rd leaf results taken 15th May 2019





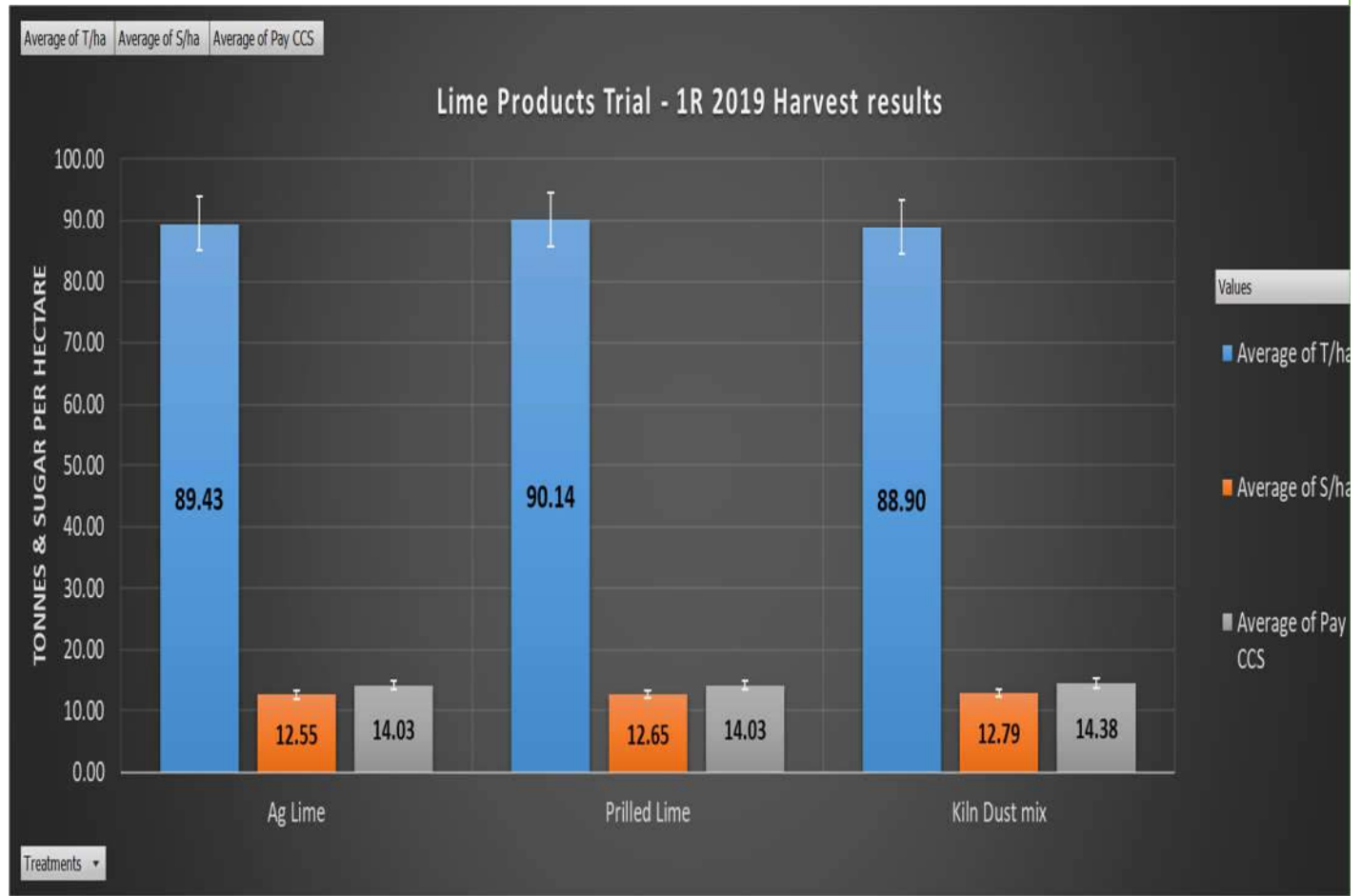




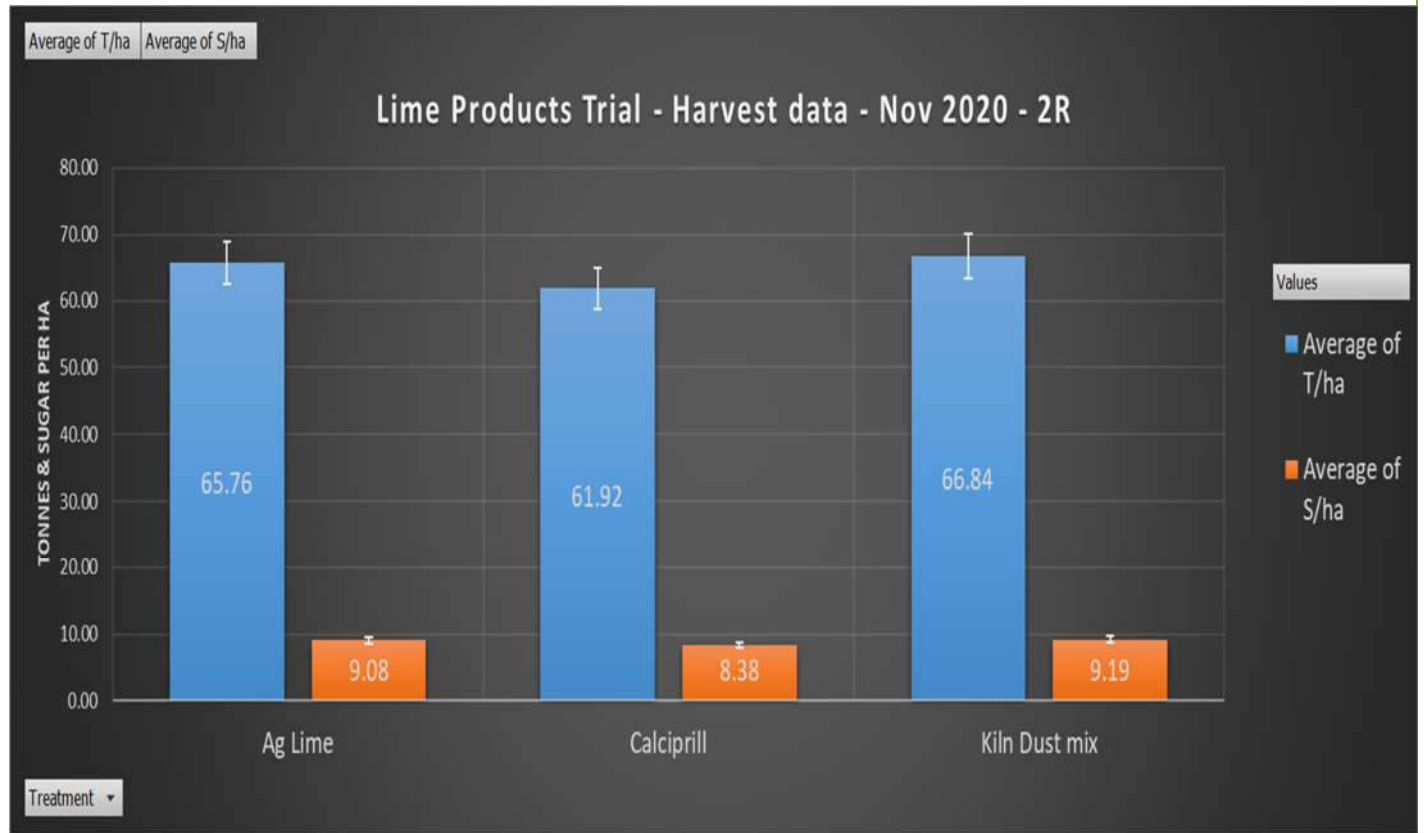
pH shift table over trial period up to the 02 Dec 2020

		<div>Lab results</div> <div>↓</div>	<div>*Note Lime was put down in July 2017</div> <div>pH meter reader</div>					
		Starting pH value @ baseline soil sample 26/12/2016	Average for 13/11/2017	Average for 20/12/2017	Average for 30/01/2018	Average for 30/08/2018 After Harvest	Average for 28/10/2019 After Harvest	Average for 02/12/2020 After Harvest
Treatment 1	Centre of row for Ag Lime	5	5.62	5.97	6.00	6.35	6.02	6.43
Ag Lime	Shoulder of row for Ag Lime	5	5.73	5.78	5.87	6.23	6.40	5.96
Treatment 2	Centre of row for Kiln Dust	5	5.32	5.12	5.40	5.58	5.93	5.69
Kiln Dust 20% mix	Shoulder of row for Kiln Dust	5	5.28	5.35	5.33	5.66	5.85	5.70
Treatment 3	Centre of row for Prilled Lime	5	4.88	4.98	4.83	5.50	5.76	5.94
Prilled Lime	Shoulder of row for Prilled Lime	5	4.87	4.92	4.72	5.23	5.75	5.01

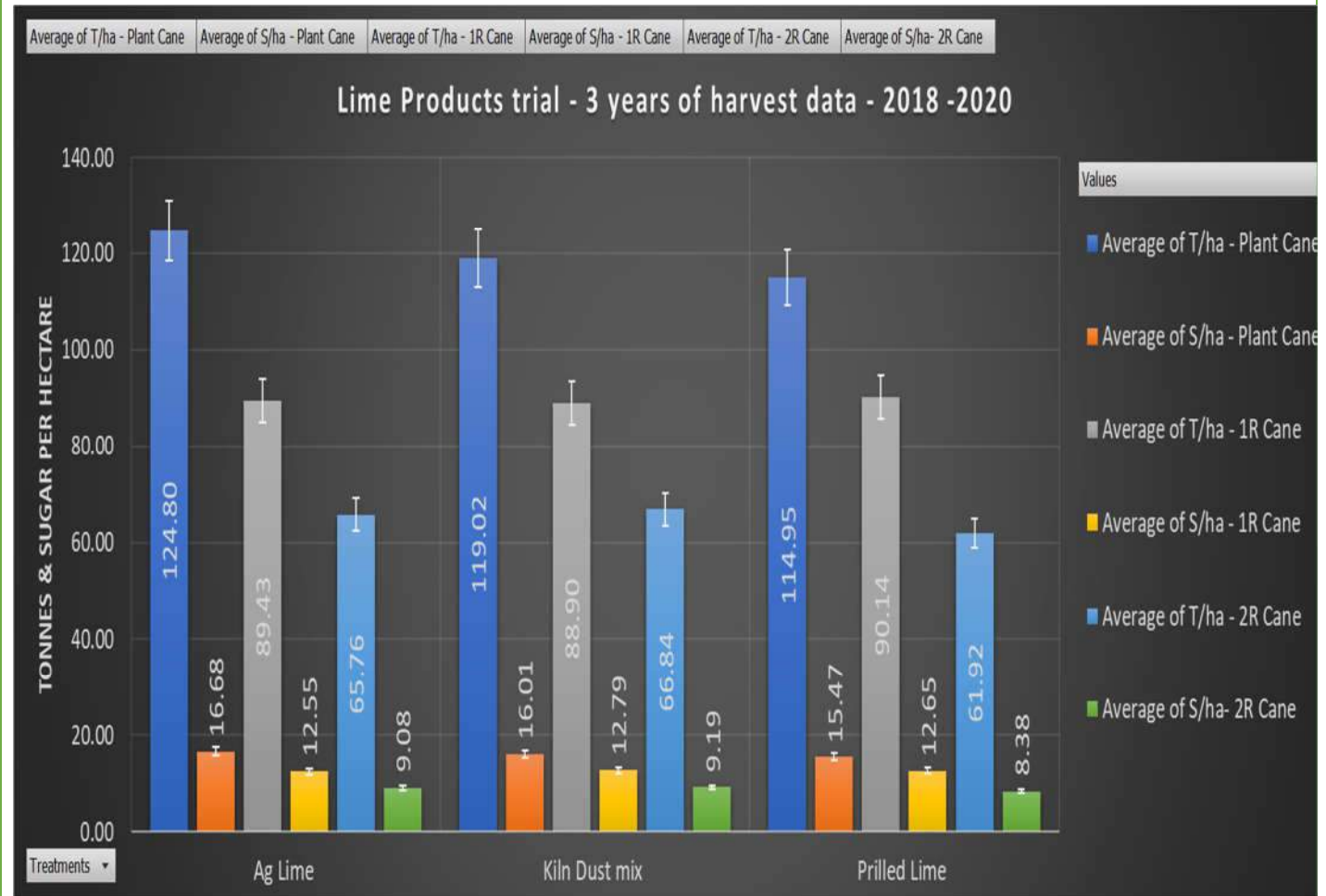
2019 Harvest Results



2020 Harvest Results



Combined Harvest Results 2018-2020



Conclusions and comments

2018 Conclusion: The 2018 season would suggest that the traditional use of Ag Lime has more benefits than the other treatments. The Ag Lime application cost is initially higher but will be a one-off payment for the crop cycle. The prilled lime will be added every year of the trial so over a crop cycle, the economics would change. Also, when looking at leaf results, pH results and harvest results, the Ag lime treatments have performed the best in shifting the pH value, nutrient uptake and yield in the 1st year of results.

2019 Conclusion: The 2019 season has been a hard one for growers with over 4m of rain recorded in the Herbert region for 2019. This tough year is reflected in the leaf sample results with all treatments being down in nutrients compared to the 1st year. The agricultural lime is still holding pH value at 6.4 while the other treatments have been slower to shift the pH value. The Kiln Dust mix and the prilled lime has started to move pH above industry recommendation this year, it has been slower than the ag lime treatments. This pH shift has not been reflected in the yield or CCS data when comparing results, as there are no statistical differences between treatments. The trial will continue to monitor pH shift, soil nutrients and aluminium saturation, as well as yield and sugar data over the coming crop cycle.

2020 Conclusion: The 2020 season is still trending to Agricultural Lime being a better product for holding onto pH values. After harvest when the last pH samples were analysed for 2020, the results show the Ag Lime is still holding soil pH at round 6.5 whereas the other treatments have risen in pH value but are holding around the high end of 5 pH value. Once again there was no statistical difference between yields.

Advantages of this Practice Change:

The Ag Lime application is a once a crop cycle application. If the weather is bad and the grower is unable to get onto the block, it will go without lime for a crop cycle. By using products like the prilled lime the growers can be assured that if he misses his initial application of lime because of rainy weather, he can still have an opportunity to apply a lime-based product to the paddock. This is especially important in the Herbert region as acidic soils are commonplace and this issue needs to be addressed to gain yield and CCS potential.

Disadvantages of this Practice Change:

Having to apply the prilled lime every year for a full crop cycle could become un-economical. From observations the prilled lime works better after decent rainfall has dissolved the product into the soil profile. Until the initial rain event, there is a delay in the prilled limes working to move pH values. This could be undesirable in a dry season due to the fact the pH value would not shift until heavy rainfall and this could impact on potential yield.

Will you be using this practice in the future?

Yes, Ag Lime will be the chosen lime product for future farm management of acidic soils.

% of farm you would be confident to use this practice:

All blocks will have Ag Lime as the chosen lime product for future farm management.