CanetoCreek² Cane to Creek 2.0



Nutrient demonstration results

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Introduction

This document provides a summary of all nutrient focused demonstrations implemented as part of the Cane to Creek 2.0. Where demonstrations have been harvested average yield, CCS and tonnes of sugar per hectare are supplied for all treatments. These results have been shared with growers involved in Cane to Creek activities. Where demonstrations are yet to be harvested the demonstration is summarised to date and organisation responsible for the future harvest is indicated. Cane to Creek 2.0 is funded by a partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation with support from SRA.

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Refining rates on final ratoons, 2019 and 2020 harvest

Fertiliser rates can be reduced on a final ratoon without impacting crop performance; this is only recommended once in a crop cycle. The following demonstrations have been undertaken between Mossman and the Herbert sugarcane growing districts as part of the Cane Creek project.

El Arish, Sixth Ratoon Q200^A, Maria

Fertilised November 20, 2019. Harvested November 21, 2020.

Summary: Very similar results across the three rates with a cost saving of between \$67 and \$112 a hectare at the two lower rates.

Demonstration fertiliser rates

Applied fertiliser		Ν	Р	К
T1 Full rate	Liquaforce 15.1.9 @ 900L	135	9	81
T2 15% Reduction	Liquaforce 15.1.9 @ 765L	114.75	7.65	68.85
T3 25% Reduction	Liquaforce 15.1.9 @ 675L	101.25	6.75	60.75

	Full rate	15% Reduction	25% Reduction
Tonnes/ha	74.635	70.422	69.048
CCS	13.498	13.875	14.088
Tonnes Sugar/ha	10.030	9.751	9.722
\$/ha (@\$0.50/L)	900L/ha \$450/ha	765L/ha \$382.50/ha	675L/ha \$337.50/ha



Euramo Eighth Ratoon Q200^A, Tully

Fertilised November 19, 2019. Harvested November 1 and 2, 2020.

This grower was already fertilising at reduced rate across the crop cycle on Tully soils, which has helped increas CCS without impacting yield. The demonstration site harvested well with yields averaging between 75 and 80 tonne to the hectare at eighth ratoon. The lower rates saved between \$67 and \$112 per hectare. However, the 15% reduced rate suffered a reduction slight reduction in tonnes indicating that caution may be needed when making these reductions on a crop that has consistently been fertilised at a reduced rate.

Demonstration fertiliser rates

Fertiliser applied		Ν	Р	К	S
T1 Current rate	CK 140 S @ 550kg/ha	126	11	99	22
T2 15% Reduction	CK 140 S @ 468kg/ha	108	9.4	84	19
T3 25% Reduction	CK 140 S @ 413kg/ha	95	8.3	74	16.5

Averaged harvest results

	Full rate	15% Reduction	25% Reduction
Tonnes/ha	80.30	73.73	75.21
CCS	13.01	13.18	13.33
Tonnes Sugar/ha	10.6	9.7	10.10
Fertilising costs \$/ha (@\$824/tonne)	550kg/ha \$453.2/ha	468kg/ha \$385.63	413kg/ha \$340.31/ha

Mossman, Fifth Ratoon Q208A, Clifton

Fertilised December 6, 2020. Harvested 26/10/2021.

The discounted rate of fertiliser made no significant discount to cane yield and saved the grower \$87 a hectare in fertilising costs.

Demonstration fertiliser rates

Fertiliser applied		N	Р	К	S
T1 Current rate	LF201 @ 875L/ha	131	0	88	9
T2 Discount	LF201 S @ 700L/ha	105	0	70	7

	Full rate	Reduction
Tonnes/ha	53.7	57
CCS	13.4	13.68
Tonnes Sugar/ha	7	7.8
Fertilising costs		
\$/ha (@\$0.50/L)	875/ha \$437.50/ha	700L/ha \$350L/ha





Mossman, Sixth Ratoon Q231^A, Clifton

Fertilised 6/12/2020. Harvested 26/10/2021.

The discounted rate of fertiliser made no significant discount to cane yield and saved the grower \$93 a hectare in fertilising costs.

Demonstration fertiliser rates

Fertiliser applied		Ν	Р	К	S
T1 Current rate	LF201 @ 930L/ha	140	9	93	9
T2 Discount	LF201 S @ 744L/ha	112	7	74	7

Averaged harvest results

	Reduction
66.2	71
13.4	14.6
9.9	10.4
/ha \$165/ha	7111 /ba \$3721 /ba
	66.2 13.4 9.9 _/ha \$465/ha

Mulgrave (Aloomba), Fourth Ratoon Q208^A, Innisfail

Fertilised November 2018, Harvested 21 June 2020.

This grower saved between \$17 and \$70 a hectare on fertiliser costs without losing yield.

Demonstration fertiliser rates

Fertiliser applied		Ν	Р	К	S
T1 Current rate	Nitra-King S @ 551kg/ha	150	0	91	19
T2 13% Discount	Nitra-King S @ 478kg/ha	130	0	79	16
T3 27% Discount	Nitra-King S @ 404kg/ha	110	0	67	12

	Full rate	15% Discount	Discount
Tonnes/ha	92.8	97.2	102.5
CCS	11.1	11.1	11
Tonnes Sugar/ha	10.3	10.2	11.3
Fertilising costs \$/ha (@\$728.90			
/tonne)	551/ha \$365.18/ha	478/ha \$348.41/ha	404/ha \$294.47/ha



Mulgrave (Edmonton) Fourth Ratoon Q208^A, Clifton

Fertilised 6 November 2019, Harvested May 26, 2020.

The same grower as above (Aloomba) tried the refining nutrient rates demonstration on a different soil type and again saved \$70 a hectare on fertiliser costs without losing yield.

Demonstration fertiliser rates

Fertiliser applied		Ν	Р	К	S
	Innisfail Ratooner @				
T1 Current rate	507kg/ha	140	0	101	0
	Innisfail Ratooner @				
T2 Discount	406kg/ha	112	0	81	0

Averaged harvest results

	Full rate	Discount
Tonnes/ha	92.3	90.1
CCS	10.1	10.3
Tonnes Sugar/ha	9.3	9.3
Fertilising costs \$/ha (@\$728.90		
/tonne)	551/ha \$365.18/ha	404/ha \$294.47/ha



Mulgrave, Fourth Ratoon Q251^A, Thorpe

Fertilised 7 October 2019, Harvested 5-6 November 2020.

This grower gained sugar/ha through increased CCS, making the crop more profitable and less costly to grow.

Demonstration fertiliser rates

Fertiliser applied		Ν	Р	K	S
	Innisfail Ratooner @				
T1 Current rate	478kg/ha	131	0	88	0
	Innisfail Ratooner @				
T2 Discount	409kg/ha	105	0	70	0

	Full rate	Discount
Tonnes/ha	64.57	65.68
CCS	10.025	11.025
Tonnes Sugar/ha	6.47	7.24
Fertiliser costs \$/ha		
(@\$806/tonne)	478kg/ha \$385.26/ha	409kg/ha \$329.65/ha



Babinda, Fourth Ratoon Q241^A, Prior-Thorpe

Fertilised 12 December 2019 & 11 December 2020, 9 December 2020.

Tonnes of cane/ha harvest results indicate no difference in cane cut, however CCS was not available due to mill break down. The grower did not wish to fallow this block due to good yields in the fourth ratoon and requested the demonstration be repeated. The repeated demonstration will be harvested in 2021 by SRA. Water quality monitoring showed higher early losses of DIN from the full rate and the grower saved \$70 a hectare on fertilising costs.

Fertiliser applied		N	Р	К	S
T1 Current rate	LF @ 930L/ha	140	0	93	0
T2 Discount	LF @ 790L/ha	119	0	79	0

Demonstration fertiliser rates

	Full rate	20% Discount
Tonnes/ha	87	85
CCS	NA	NA
Tonnes Sugar/ha	NA	NA
\$/ha Liquaforce product @\$0.50./Litre)	930L/ha \$465/ha	790L/ha \$395/ha





Woopen Creek, Final Ratoon Q241^A, Liverpool

Fertilised 15 December 2019, Harvested 14 November 2020.

Tonnes of cane/ha harvest results indicate no difference in cane cut, however CCS was not available due to mill break down. The grower did not wish to fallow this block due to good yields in the fourth ratoon and requested the demonstration be repeated. The repeated demonstration will be harvested in 2021 by SRA.

Demonstration fertiliser rates

Fertiliser applied		Ν	Р	К	S
T1 Current rate	Babinda Ratooner @ 500kg/ha	142	8	85	0
T2 20% Discount	Babinda Ratooner @ 410kg/ha	116	6	70	0

Averaged harvest results

	Full rate	20% Discount
Tonnes/ha	95.5	93
CCS	NA	NA
Tonnes Sugar/ha	NA	NA
\$/ha (Babinda Ratooner @\$825/tonne)	500kg/ha \$412.50/ha	338.25kg/ha \$338.25/ha

Eubanangee, Final Ratoon Q208^A, Eubanangee

Fertilised November 10, 2019, Harvested October 5 November 2020.

Tonnes of cane/ha harvest results indicate no difference in cane cut, however CCS was not available due to mill break down.

Demonstration fertiliser rates

Fertiliser applied		N	Р	К	S
T1 Current rate	@ 500kg/ha	110	15	105	0
T2 20% Discount	@ 410kg/ha	90	12	86	0

	Full rate	20% Discount
Tonnes/ha	59	58
CCS	NA	NA
Tonnes Sugar/ha	NA	NA
\$/ha (Babinda Ratooner @\$825/tonne)	500kg/ha \$412.50/ha	338.25kg/ha \$338.25/ha



Abergowrie, Final Ratoon Q200^A Abergowrie - Manor

Fertilised 08 December 2019, Harvested 23 – 25 November 2020.

This was a seventh ratoon grown on a clay loam, harvest results indicate no statistical difference in yield and sugar. There were a wide range of results across the replicated strips of each rate applied.

Demonstration fertiliser rates

Fertiliser applied		Ν	Р	К	S
T1 Current rate	GF506 @ 617kg/ha	140	12	106	27
T2 20% Discount	GF506 @ 493kg/ha	112	10	85	22
T3 40% Discount	GF506 @ 374kg/ha	85	7	64	16

	Full rate	15% Discount	27% Discount
Tonnes/ha	80	73	70
CCS	15.7	15.9	15.9
Tonnes Sugar/ha	12.6	11.6	11
\$/ha (@\$728.90 /tonne)	617kg/ha \$522/ha	493kg/ha \$3420/ha	374/ha \$315/ha

Mull mud demonstrations

Accounting for mill mud nutrients in year two

Fishery Falls; first ratoon Q208^A; Thorpe

This crop followed plant cane that had been grown after a legume crop planted into 100 tonne to the hectare broadcast mill mud (Site 5 in accounting for legume nitrogen section). The demonstration had two rates, one that accounted for the nitrogen and phosphorus supplied by the mill mud and the other only accounting for the phosphorus. The 20kg per hectare reduction in nitrogen did not result in a loss of productivity and saved the grower around \$50 a hectare ha in fertilising costs.

Demonstration fertiliser rates

Fertiliser applied to ra	atoons	Ν	Р	К	S
T1 Current rate	Innisfail Ratooner @ 507kg/ha	140	0	101	0
T2 Discount	Innisfail Ratooner @ 435kg/ha	120	0	87	0

Averaged harvest results

	Full rate	Discount
Tonnes/ha	116.27	116.57
CCS	13.34	13.62
Tonnes Sugar/ha	15.51	15.87
\$/ha (@\$806/tonne)	507kg/ha \$408.64/ha	435kg/ha \$350.61/ha

Accounting for mill mud nitrogen after a banded mill mud application

Lower Herbert, first ratoon Q200^A; Macknade

Fertilised 11/11/2019, harvested 6/11/2020.

When discounting for nitrogen and phosphorus from in mill mud applied in a band at 75 tonne/ha there was no difference in yield and the grower saved approximately \$60 a hectare ha in fertiliser costs. Leaf analysis found there was no difference in nutrient uptake by the plant across the two treatments.

Demonstration fertiliser rates

Fertiliser applied to ra	atoons	Ν	Р	К	S
T1 Current rate with no discount	CB92173 @ 525kg/ha	120	21	105	0
T2 Discount	Innisfail Ratooner @ 435kg/ha	89.6	0	90	0

	Full rate	Discount
Tonnes/ha	85.6	85.8
CCS	15.25	15.26
Tonnes Sugar/ha	13.25	12.9
\$/ha (@\$806/tonne)	507kg/ha \$408.64/ha	435kg/ha \$350.61/ha

Third leaf assay	Unit	Critical level of assay	SIX EASY STEPS + MUD (FULL)	SIX EASY STEPS – MUD (DISCOUNTED)
Nitrogen (N)	%	March to May: 1.7	1.80	1.90
Phosphorus (P)	%	0.19	0.27	0.24
Potassium (K)	%	1.1	1.10	1.10
Calcium (Ca)	%	0.2	0.49	0.55
Magnesium (Mg)	%	0.08	0.16	0.16
Sulfur (S)	%	0.13	0.13	0.14
Copper (Cu)	mg/kg	2	4.2	4.6
Zinc (Zn)	mg/kg	15	12.0	14.0
Manganese (Mn)	mg/kg	15	150.0	160.0
Boron (B)	mg/kg	1	1.3	2.3
Molybdenum (Mo)	mg/kg	0.08	1.40	1.50
Silicon (Si)	%	0.7	-	-

Leaf analysis (table to left) showed there was no difference in nutrient uptake by the cane in either treatment with all nutrients other than zinc adequate.

This demonstration has been implemented for a second time in 2020 and will be harvested by HCPSL in 2021 as part of the GBRF funded Project CaNE.

Comparing banded and broadcast mill mud

Burdekin Q240^{A,} Fertilised 25 November, Harvest 5 October 2020

Year 1

Demonstration fertiliser rates

Fertiliser applied to ratoons		N	Р	К	S
T1 banded mud/ash @ 60 tonne/ha	Malanda @ 559kg/ha	185	0	60	17
T2 Broadcast mud	Lower Burdekin Ratooner @				
@ 100 tonne/ha	451 kg/ha	160	0	40	16

Both treatments have a total of 200kg/N/ha and 100kg/K/ha with fertiliser and mud/ash combined. The mud/ash application in Treatment one supplied 15kg/ha nitrogen and in Treatment two supplied 40kg/ha nitrogen.

Averaged harvest results

	Broadcast	Banded
Tonnes/ha	127.83	130.35
CCS	13.83	13.96
Tonnes Sugar/ha	17.67	18.19

This demonstration has been implemented for a second time in 2020 and will be harvested by Burdekin Productivity Services (BPS) in 2021.

Water quality monitoring data shows higher losses from the banded treatment, it is thought this is due to higher volumes of water moving through these treatments rather than the treatments themselves.

Comparing surface and subsurface application of fertiliser

When comparing surface and subsurface application of fertiliser no significant difference in yield was found in these demonstrations. The cost of fertiliser is the same, however subsurface application is slower.

Miallo, third ratoon Q183^A, Mossman soil type

Fertilised October 17, 2019, with 120kg/ha Nitrogen as Innisfail Ratooner applied at 435kg/ha. Harvest 15 October 2020

Water quality monitoring on this site found that there was less loss from the surface applied fertiliser than subsurface. This could have been due to soil disturbance in the subsurface treatment as indicated by the higher losses of particulate nitrogen (PN) on this treatment and a 52mm rainfall event the day following fertilising that would have washed some of the surface applied fertiliser in.

	Surface applied	Subsurface
Tonnes/ha	79.64	75.97
CCS	13.65	13.60
Tonnes Sugar/ha	10.87	10.29

Abergowrie, third ratoon Q253^A; Manor soil type

Fertilised November 7, 2019, with 100kg/ha of Nitrogen applied. Harvested 9 – 10 November 2020 In line with expectations this demonstration resulted in no difference in yield. This demonstration will be harvested for a second time in 2021 by HCPSL as part of the GBRF funded Project CaNE.

	Surface applied	Subsurface
Tonnes/ha	118.5	118.3
CCS	12.4	12.76
Tonnes Sugar/ha	14.6	14.2

Comparing fertiliser placement side dress, stool split and stool zippa

Burdekin KQ228, Fertiliser 7 October 2019, Harvest 26-27 August 2020

Water quality analysis completed by BBIFMAC shows higher early losses from the stool split and stool zippa with consistently lower losses from side dress during irrigation and rainfall events. This demonstration will be harvested for a second time in 2021 by BPS.

	Side Dress	Stool Zippa	Stool Split
Tonnes/ha	167.76	163.96	164.98
CCS	14.5	14	14.03
Tonnes Sugar/ha	24.20	22.95	23.13

Accounting for legume nitrogen with Cane to Creek

In 2019 SRA's Cane to Creek team harvested six demonstration sites looking at accounting for legume nitrogen in plant cane. On all sites legumes fallows were found to be contributing enough nitrogen that growers were able to use only the nitrogen applied at planting without inhibiting productivity.

Demonstrations compared three fertiliser strategies after the legume fallow using a replicated strip trial design:

- T1 Legume nitrogen + planting mixture
- T2 Legume nitrogen + planting mixture + some nitrogen at top dress

T3 – Legume nitrogen + planting mixture + remaining nitrogen at top dress (full SIX EASY STEPS)

Legume nitrogen estimates were calculated by weighing biomass samples of the legume crop from across each fallow block and calculating the dry weight (23 percent) from the average fresh weight. The dry weight was then multiplied by the estimated nitrogen content for each species grown. This can be found in the Nutrient Management (SIX EASY STEPS) Guidelines for each district. In Cane to Creek demonstrations to be harvested in 2021 dried legume plant matter was sent for analysis and the measured nitrogen percentage was used to calculate crop input.

The 2019 harvest sites were all in the Mulgrave area and were distributed across a range of soil and climate types with a range of legume break crops varying sizes grown as well as a harvested peanut crop. The tables below show the results with detail on the legume species and nitrogen inputs, soil type and rainfall, and importantly yield, CCS and fertiliser cost.

2018/19 provided excellent conditions for maximising legume nitrogen inputs with dry conditions between incorporations of the legume crop and top dressing the plant cane.

Cane to Creek 2.0 2021 harvest will add to this data set with demonstrations across the Burdekin, Tully, Mulgrave, Babinda and Mossman to be harvested by project partners in 2021. These new demonstrations are also summarised below.

Due to there being no statistical difference between the treatments (signified by the superscript A), the economics are based on only the difference in fertiliser costs between treatments.

Mount Sophia

Site 1: Soybean – 7.5t/ha dry biomass		Calculated N contribution from legume: 370 kg/ha		
Soil type: Thorpe (Kandosol)		Rainfall between planting and top dress: 211 mm		
Variety: Q253 ^A		Planting date: 09/05/2018		
Plant mixture across all treatments: 50 kg N/ha		Top dress date: 24/8/2018		
Treatment	Yield/ha	CCS	\$/ha	
T1: 50kg total N/ha applied	88.86 ^A	13.11 ^A	(+) \$109.37/ha	
T2: 90kg total N/ha applied 85.16 ^A		13.23 ^A	(+) \$60.63/ha	
T3: 130kg total N/ha applied	88.44 ^A	13.06 ^A	\$ -	

Gordonvale

Site 2: Soybean – 8t/ha dry biomass		Calculated N contribution from legume: 372 kg/ha		
Soil type: Virgil (Kandosol)		Rainfall between planting and top dress: 41mm		
Variety: Q240 ^A		Planting date: 15/06/2018		
Plant mixture across all treatments: 16 kg N/ha		Top dress date: 27/9/2018		
Treatment	Yield/ha	CCS	\$/ha	
T1: 56kg total N/ha applied	122.12 ^A	14.00 ^A	(+) \$95.41/ha	
T2: 80kg total N/ha applied 125.14 ^A		13.95 ^A	(+) \$43.57/ha	
T3: 110kg total N/ha applied	122.37 ^A	14.07 ^A	\$ -	

Sandy Creek

Site 3: Cowpea & lablab – 5t/ha dry biomass		Calculated N contribution from legume: 170 kg/ha		
Soil type: Thorpe (Kandosol)		Rainfall between planting and top dress: 54 mm		
Variety: Q253 ^A		Planting date: 25/05/2018		
Plant mixture across all treatments: 16 kg N/ha		Top dress date: 21/9/2018		
Treatment	Yield/ha	CCS \$/ha		
T1: 58kg N/ha total N/ha applied	98.60 ^A	14.64 ^A	(+) \$96.20/ha	
T2: 89kg N/ha total N/ha applied 103.54 ^A		14.34 ^A	(+) \$34.40/ha	
T3: 117kg N/ha total N/ha applied	102.51 ^A	14.20 ^A	\$ -	

Behana Creek

Site 4: Peanut – 4t/ha dry biomass (harvested)		Calculated N contribution from legume: 65 kg/ha		
Soil type: Liverpool (Tenosol)		Rainfall between planting and top dress: 119 mm		
Variety: Q253 ^A		Planting date: 26/06/2018		
Plant mixture across all treatments: 5 kg N/ha		Top dress date: 19/10/2018		
Treatment	Yield/ha	CCS	\$/ha	
T1: 50kg N/ha total N/ha applied 121.78 ^A		11.40 ^A	(+) \$29.06/ha	
T2: 70kg N/ha total N/ha applied	129.39 ^A	11.59 ^A	\$ -	

Fishery Falls

Site 5: Soybean (2 dry t/ha) & mud/ash mixture (100 t/ha - broadcast)					
Soil type: Thorpe (Kandosol)		Rainfall between planting and top dress: 211 mm			
Variety: Q208 ^A		Planting date: 14/5/2018			
Plant mixture across all treatments: 40 kg N/ha		Top dress date: 22/8/2018			
Treatment	Yield/ha	CCS \$/ha			
T1 : 0kg N (40kg N/ha)	76.82 ^A	13.07 ^A	(+) \$115.20/ha		
T2: 40kg N (80kg N/ha)	83.70 ^A	13.44 ^A	(+) \$57.60/ha		
T3: 80kg N (120kg N/ha)	85.98 ^A	13.23 ^A	-		

This site was inundated by flood waters numerous times over the wet season, with parts of the block remaining waterlogged for long periods. The third replicate was situated in the lowest part of the paddock saw the greatest impact on yields, particularly impacting Treatment one, which received the longest periods of water logging.

Pine Creek

Site 6: Soybean (8 dry t/ha) & mud/ash mixture (100 t/ha - banded)					
Soil type: Malbon-Prior (Kandosol)		Annual rainfall: 4	1mm		
Variety: Q253 ^A		Planting date: 18/6/2018			
Plant mixture across all treatments: 14 kg N/ha		Top dress date: 14/9/2018			
Treatment	Yield/ha	CCS	\$/ha		
T1: 36kg N (50kg N/ha)	89.27 ^A	12.25 ^A	(+) \$115.20/ha		
T2: 76kg N (90kg N/ha)	93.44 ^A	12.00 ^A	(+) \$57.60/ha		
T3: 116kg N (130kg N/ha)	96.15 ^A	11.92 ^A	-		

This site (Pine Creek) suffered from water (drought) stress in parts of the block early in the growing season, resulting in poorer plant establishment at the ends and edges of the block, however harvest results indicate no significant difference in crop yield or sugar.

Crop calculations – 2020 Accounting for legume nitrogen in plant cane

Warrami

Plant 18 – 20 August 2020, Fertilised 13 November 2020; Warrami

Mixed species cover crop with additional cow pea. The majority of species present were cowpea, forage sorghum and sunflowers. Biomass occurred April 23 just prior to spray out. A plant cane demonstration with three rates was implemented in 2020. Harvest will occur in 2021, supported by SRA and CANEGROWERS Tully.

	N kg/ha	P kg/ha	K kg/ha	S kg/ha
Treatment 1	40	33	100	15
Treatment 2	80	33	100	15
Treatment 3	140	33	100	15

Wet weight	31.05
met meight	01.00

- Dry weight (25% of wet) = 7.7 tonne/ha
- Nitrogen percent in crop 2.5%
- = 252kgN/ha (including roots)

DIN losses as mg/L from plant cane sampling undertaken over 2020-2019 wet season. Runoff did not occur on the site until December 28/12/2021. Higher losses on the 80 kgN/ha treatment than on the 120 kgN/ha could be attributed greater amount of runoff in this section of the block.

Behana Creek

Plant July 2020, Top dress 9 October 2020; Tyson

Harvested peanut fallow crop. Nitrogen inputs were calculated based on biomass taken after peanuts were harvested and discussion with the grower regarding crop size and grain harvest. Due to the reasonably poor crop which was followed by heavy rain only two nitrogen rates have been included in the demonstration to be harvested in 2021 by SRA.

Est Dry weight (25% of wet) = 4 tonne/ha

Nitrogen percent in crop 3%

75 = kgN/ha (including roots)

	N kg/ha	P kg/ha	K kg/ha	S kg/ha
Treatment 1	75	0	98	0
Treatment 2	120	0	101	0

Babinda

Plant 06 November 2020, Top dress 2 November 2020; Kirrama

A fallow crop of mixed Rongai, soy and cowpea was grown over the 2019 wet season in Babinda. Biomass samples were taken in 2020 and a demonstration with two nitrogen rates was implemented. SRA will harvest this demonstration in 2021.

	N kg/ha	P kg/ha	K kg/ha	S kg/ha
Treatment 1	99	16.5	98.5	57
Treatment 2	115	16.5	98.5	57

Wet weight = 17 tonne/ha Dry weight (25% of wet) = 4 tonne/ha Nitrogen percent in crop 1.3% 72 = kgN/ha (including roots)

Euramo

Plant 27 August 2020, Top dress 21 November 2020, Tully

Ebony and Meringa Cowpea, inoculated. This site received over 350mm of rainfall shortly after the block was sprayed and worked. For this reason, the low rate was not included in the demonstration.

Wet weight/ha 20.5

Dry weight (25% of wet) = 5.1 tonne/ha

Nitrogen percent in crop 1.7%

113= kgN/ha (including roots)

	N kg/ha	P kg/ha	K kg/ha
Treatment 1	90	20	100
Treatment 2	80	20	100

Kennedy

Plant July 2020, Top dress 01 November 2020, Malbon-Thorpe

Cowpea, inoculated. The cowpea was biomassed and a plant cane demonstration with three rates was implemented in 2020. Harvest will occur in 2021, supported by SRA and CANEGROWERS Tully.

Wet weight/ha 33

Dry weight (25% of wet) = 8.2 tonne/ha

Nitrogen percent in crop 2.7%

285 = kgN/ha (including roots)

	N kg/ha	P kg/ha	K kg/ha	S kg/ha
Treatment 1	40	33	100	15
Treatment 2	80	33	100	15
Treatment 3	140	33	100	15

Mossman

July 2020, Top dress 04 November 2020, Clifton

A relatively poor crop of inoculated Lab-Lab. Following biomass and calculation of crop nitrogen inputs a plant cane demonstration was implemented with two nitrogen rates.

Wet weight/ha 23.5

Dry weight (25% of wet) = 5.85 tonne/ha

Nitrogen percent in crop 2.1%

160 = kgN/ha (including roots)

	N kg/ha	P kg/ha	K kg/ha	S kg/ha
Treatment 1	80	8	100	0
Treatment 2	120	8	100	0

Burdekin harvested soybean

Demonstration 1.

Plant 25 March 2020, 24 June 2020, KQ228^A

Plant cane nitrogen input has been estimated based on a two-tonne harvest of soybean. This crop of soybean suffered a stem fly infestation not long before harvest.

	N kg/ha	P kg/ha	K kg/ha	S kg/ha
Treatment 1	110	18.8	100	11.6
Treatment 2	140	18.8	100	11.6
Treatment 3	170	18.8	100	11.6

The block was monitored for nitrogen losses during the fallow period. It should be noted that as the soybean was a commercially harvested crop it was fertilised. Monitoring data, courtesy of BBIFMAC, shows that, as with monitoring on sugarcane crops, losses were elevated during the first three irrigation events. Asterisks indicate rainfall events.

Demonstration 2

Plant 20 May 2020, Fertilise 9 September 2020, Q240

Plant cane nitrogen input has been estimated based on post soybean harvest soil testing and legume biomass sampling with a conservative estimate from the SIX EASY STEPS accounting for legume nitrogen guidelines. Three rates have been implemented in a replicated and randomised demonstration that will be harvested by BPS in 2021.

	N kg/ha	P kg/ha	K kg/ha	S kg/ha
Treatment 1	120	20	50	0
Treatment 2	160	20	50	0
Treatment 3	200	20	50	0

The block was monitored for nitrogen losses during the fallow period. It should be noted that although this soybean crop was a commercially harvested crop it was *not* fertilised. Monitoring data, courtesy of BBIFMAC, shows that, as with sugarcane crops, losses were elevated during the first three irrigation events. Asterisks indicate rainfall events.

Additional Legume break crop nitrogen input calculations

These calculations were undertaken by the Cane to Creek team to help growers account for legume nitrogen input. No demonstrations were initiated and the information is supplied for interest only.

Aloomba

Kaluna cow pea, no inoculant. Planted with lime. No demonstration was undertaken for this site.

Wet weight/ha 25.6 Dry weight (25% of wet) = 6.4 tonne/ha Nitrogen percent in crop 2.8% 233= kgN/ha (including roots)

Sunn hemp

Sunn Hemp Crop grown in mill mud, no demonstration planned for this block, information supplied for interest only.

Wet weight/ha 83

Dry weight (25% of wet) = 20.8 tonne/ha

Nitrogen percent in crop 1.75%

472 = kgN/ha (including roots)

Mossman Soybean, inoculated x 2

Wet weight/ha 31.5 Dry weight (25% of wet) = 7.84 tonne/ha Nitrogen percent in crop 3.8% 387= kgN/ha (including roots)

Wet weight/ha 14.3 Dry weight (25% of wet) = 3.48 tonne/ha

Nitrogen percent in crop 3.6%

163= kgN/ha (including roots)

Phosphorus rate demonstrations

These results combine data from four small plot demonstrations conducted over different soil types with varying phosphorus buffer index. All sites had SIX EASY STEPS recommendations for zero phosphorus requirement. Demonstrations compared 0kg/ha, 10kg/ha and 30kg/ha applied phosphorus and compared leaf uptake and stalk count for each rate. Regulations allow for up to 9kg/ha phosphorus where a soil test recommends 0. Results show that, in all cases, phosphorus levels were adequate for in leaf sample analysis and stalk counts were even across the three rates.

Percentage phosphorus measured in leaf samples taken in March 2021. The red line shows the adequate level of phosphorus.

Stalk counts recorded over three months from planting.

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Liquid compared to granular fertiliser

Growers often question the difference between liquid and granular fertiliser. The liquid can be more convenient and faster to apply, but is it taken up faster by the crop and is there a difference in losses to runoff.

A demonstration sought to answer these questions and found that in this instance there was no difference in leaf uptake of nutrients or losses in paddock runoff. Runoff losses were measured in a rainfall simulation experiment conducted in December and through end of row flumes with time-based samplers over the wet season. These results could have been influenced by the early dry weather and the age of the ratoon.

Kennedy, eighth ratoon Q200^A, Malbon soil type

Harvested 15 to 21 October 2020, Fertilised 13 November 2020.

	N kg/ha	P kg/ha	K kg/ha	S kg/ha
Liquid, custom blend @ 1000L/ha	136	15	105	10
Granular, Valley Blend @ 620kg/ha	138	16.7	114	17.4

Rainfall simulation experiments appear to indicate that the granular fertiliser ran off less than the liquid product, however in the very dry block in late November and December the volume of water running off the plots may have influenced the DIN loss. The two rainfall simulations were conducted on the same plots one week apart. Generating rainfall was difficult in the dry conditions, requiring two and half hours of rainfall simulation per plot, although as expected the second simulation generated runoff more readily than the first.

*denotes plot with runoff from one side only.

End of row sampling during the wet season showed very little difference.

Leaf analysis was conducted in December 2020 and March 2021. Both samples showed similar results with total nitrogen below critical levels across the treatments.

Leaf Analysis		Dec-20		Mar-21		
Dec-20		Liquid/Blue	Granular/Yellow	Liquid/Blue	Granular/Yellow	Critical level
Total N %		1.8	1.9	1.575	1.525	1.9 (*Nov to mid Jan)
nitrate N	mg/kg	<50	<50	<50	<50	
Ammonium N	mg/kg	58	50	612.5	710	
Phos %		0.19	0.2	0.225	0.2325	0.19
Potassium	%	1.2	1.2	1.475	1.5	1.1
Sulphur	%	0.11	0.12	0.15	0.155	0.13
Calcium	%	0.2	0.22	0.5225	0.56	0.2
Mag	%	0.13	0.14	0.245	0.2425	0.08
Sodium	%	0.01	0.01	<0.01	<0.01	
Chloride	%	0.51	0.5	0.175	0.18	
Copper	mg/kg	6.3	6.5	5.35	5.225	2
Zinc	mg/kg	9.7	9.6	12.5	12.375	15
Manganese	mg/kg	110	120	300	327.5	15
Iron	mg/kg	48	34	105	103.75	
Boron	mg/kg	8.3	6.4	5.55	4.325	1
Moly	mg/kg	0.15	0.23	0.4025	0.4025	0.08
N/P ratio		9.5	9.5	6.7	6.7	
N/K ratio		1.5	1.6	1.1	1.1	
N/S ratio		16	16	11	10	

