

SCIENCE & INNOVATION AWARDS FOR YOUNGER PEOPLE 2004

FINAL REPORT

Assessment of NutriSmart a new environmentally friendly fertiliser, in the Herbert River sugar-growing region applied into the trash blanketing system.

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Australian Government

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1.0 Introduction/Summary

"In recent years Australian cane growers have sought to maintain viability and world competitiveness in an increasingly tougher export market environment by adopting new farming practises which are more profitable and sustainable" (www.canegrower.com.au). In addition the industry is confronting the ever-increasing pressure of potential environmental issues, particularly with regards to nutrient losses and influence on sensitive ecosystems, such as the Great Barrier Reef Lagoon.

There is a growing awareness and tremendous change in attitude among sugarcane growers in the Herbert River region about concerns for the environment and its preservation. Growers are becoming much more accepting of new strategies and innovations which may assist with future sustainability.

It is claimed that NutriSmart (NS) is an active eco fertiliser that improves soil health and balance to achieve good crop production, with a long-term positive effect on the environment. NS provides growers with a softer option, whilst maintaining their yields and improving soil health.

Results obtained have shown that NS when applied using an over-the-row application method depresses yield, however, 25%NS applications had a positive effect on CCS levels. This increase in sucrose level resulted in 25%NS treatment plots equalling gross margin results obtained from grower's standard plots. Although NS plots experience a reduced crop yield, the increased CCS levels resulted in economic returns not significantly different to standard fertiliser plots.

2.0 Objectives

Previous work has verified the efficacy of sub-surface application of NS blended with chemical fertiliser. However, the efficacy of NS applied into the trash blanket of ratoon cane rather than under the ground still needed to be assessed. The objective of this study was to evaluate the efficiency of differing ratios of NS and traditional fertiliser applied to a trash blanket situation using above ground application equipment.

3.0 Background to research project

The Herbert River region is an area that has been identified as a high-risk catchment in terms of nutrient run-off to the Great Barrier Reef (Water Quality Protection Plan). Herbert River growers are keen to use environmentally friendly fertilisers that provide equal yields, do not increase cost of production, whilst working in with current application methods associated with trash blanketing systems.

4.0 Materials and Methods

4.1 Field Trials

Two trials were conducted in the Herbert River district, North Queensland. Three treatments replicated three times were applied to each trial. Sites were chosen in accordance with the following:

- Similar soil colour and texture across the paddock, minimal variance, within replicates.
- Large enough area to allow for commercial application of treatments.
- Plot sizes were 0.6ha, to yield sufficient cane for mill weight and CCS (sugar) evaluation.
- The same previous history for the entire trial area in all respects, including cropping, cultivation and cultural practices.
- Over-the-row surface fertiliser application to the trash blanket of ratoons.
- Growers who harvest their own crops and were willing to fulfil harvesting requirements.
- Growers who were dependable, patient, willing to take a responsible part in the trial and with a genuine interest in the objective of this trial.

The trials consisted of three base fertiliser treatments, with three replicates per site. The application method was the same for all treatments. Fertiliser was applied using an over-the-row fertiliser applicator with chains dragged behind the applicator to ensure fertiliser penetrated the trash blanket. Treatments consisted of varying percentages by weight of NS mixed with manufactured fertiliser. The treatments were:

- | | |
|--|-------|
| 1. Grower's standard base fertiliser - | 0%NS |
| 2. 50/50 NutriSmart/grower standard - | 50%NS |
| 3. 25/75 NutriSmart/grower standard - | 25%NS |

The applicators were calibrated to deliver the grower standard rate to all treatments.

Daily rainfall records were obtained for a Bureau of Meteorology Ingham Composite Station (032078). The weather Station was within 15 km of both trials and was the most reliable recording site available.

Yield and CCS figures were used to calculate gross margins (\$/ha). The formulae below were used to calculate gross margins to determine if treatment influenced financial returns:

- ♦ Cane Payment Formula

$$\text{Price cane (PC)} = \$/\text{t 94 NT sugar} * 0.0009 * (\text{CCS} - 4)) + 0.578$$
 Where $\$/\text{t 94 NT sugar} = \320 .
- ♦ Gross Margin (GM)

$$\text{GM} = (\text{PC} * \text{TCHA}) - (\text{TCHA} * \text{Harvesting and levies cost}) (\$/\text{t cane})$$
 Where TCHA equals tonnes cane yield per hectare and GM equals gross return for cane per hectare ($\$/\text{ha}$) minus harvesting and levie cost ($\$/\text{ha}$). There was no allowance for differing cost of treatments as NS and standard fertiliser currently have equivalent pricing.

All results were analysed statistically for significant differences.

4.2 Field Trial One (Russo)

Field trial site number one was conducted in a commercial ratoon crop of cane variety Q204^h with a heavy trash blanket. This site was located approximately 2 km North West of Trebonne (Appendix 1). The trial was laid on the 2nd of November 2004 and harvested on the 4th and 5th of October 2004.

Prior to the application of fertiliser, pre-trial soil samples were taken from plots allocated to the treatments within each replicate. The results obtained were therefore representative of the soil allocated to the individual treatments. Each sample consisted of a combination of 25 cores to a depth of 20 cm taken at random from the three replicates collectively. The three treatments were applied using the farmer's standard fertiliser application equipment, calibrated to apply the rates listed in Table 1. Nutrients applied by the application of grower standard fertiliser were 165 kg N/ha, 17.82 kg P/ha, 97.68 kg K/ha and 23.76 kg S/ha.

Table 1. Fertiliser treatments applied into the trash blanket Site no 1.

	<i>Treatment 1</i> <i>Grower</i> <i>Standard</i>	<i>Treatment 2</i> <i>25/75</i> <i>NS/Grower Standard</i>	<i>Treatment 3</i> <i>50/50</i> <i>NS/Grower Standard</i>
GF 560	660 Kg/ha	495 Kg/ha	330 Kg/ha
NS	0 Kg/ha	165 Kg/ha	330 Kg/ha
TOTAL	660 Kg/ha	660 Kg/ha	660 Kg/ha

The trial was laid as a randomised complete block design as shown in Fig. 1.

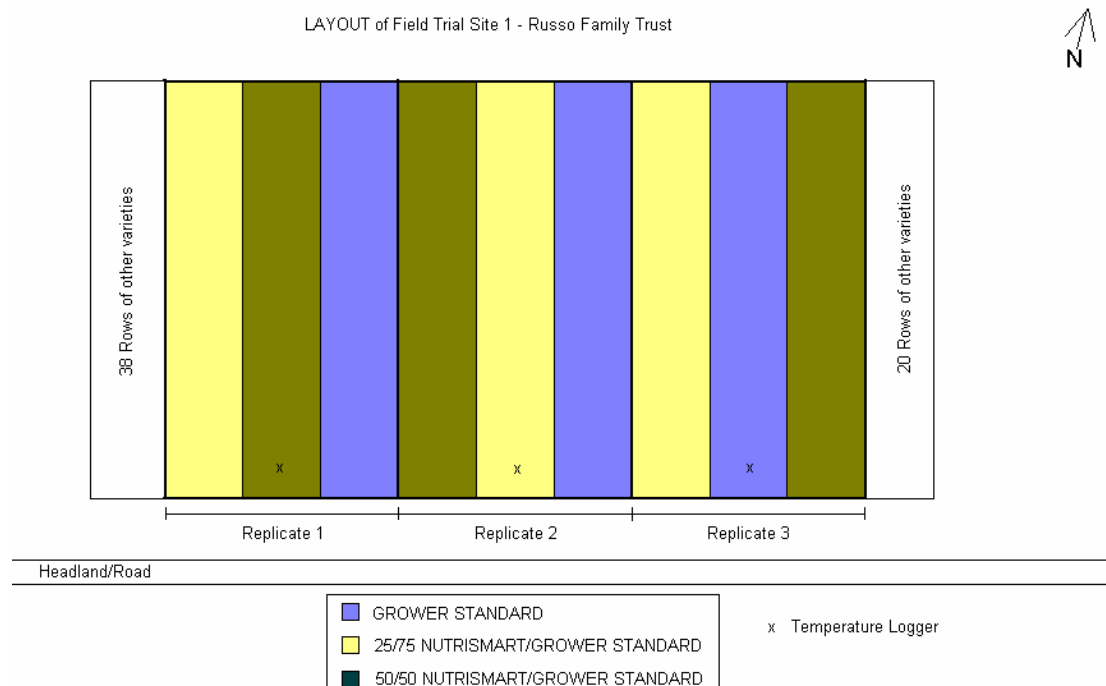


Fig. 1. Layout of Russo Trial. NutriSmart Blends vs Grower Standard

Once the trial was established, three Thermodata temperature loggers were placed beneath the trash blanket on the soil surface and temperature readings commenced. A logger was placed in the centre plot of each replicate as shown marked by “x” in Fig 1. Each were placed 25m in from the edge of the field so that they were accessible, but not influenced by an edge effect. The temperature loggers were used to measure the temperature in the vicinity of the fertiliser granules to determine that there were no significant extremities within the trial or between replicates. John Reghenzani calibrated the loggers against a standardised mercury thermometer prior to the trial commencement and provided linear regressions for each. Application of a linear regression to the recorded readings ensured that the temperature data were accurate. The loggers were set to record hourly and required periodic changeovers to download the information. There were two logger failures experienced in the Reinaudo block, which adversely influenced mean comparisons if all available data was used in the calculation. A comparison was also made where the mean was calculated from only common data recordings.

During the peak growth period leaf samples were taken to determine the nutrient status of the plants. As standard practise, centre 200 mm of leaf blades from the third partially expanded leaf were sampled. At this site, nine leaf samples were taken, one from each treatment in each of the three replicates. Each sample consisted of 20 healthy leaves. Samples were sent to the Nutrient Advantage laboratory for analysis. Results were then analysed statistically using the software program Statistix 8.0 to determine significant effects of treatments.

4.3 Field Trial Two (Reinaudo)

Field trial site two was located at Hamleigh (Appendix 2) sited on a commercial third ratoon crop of cane variety Q158[®]. The site was chosen to represent different situations to that of trial one, such as differing soil conditions, cane variety, crop age and importantly a lighter trash blanket. Pre-trial soil samples were taken using the same technique as trial one. The trial was laid on the 17th of November 2004 and harvested on the 5th and 6th of December 2004.

The block had a slight variation across the paddock caused by hollows and ridges, although no large variations occurred within the trial area, as variability was taken into account when selecting plot location. Replicates and plots were positioned to minimise variation caused by difference in field elevation.

Three treatments were applied using the farmer's standard over-the-row application equipment. The grower standard rate applied to this trial was less than trial one. The treatments listed in Table 2 were applied, followed by chains to facilitate penetration of the trash by the granules. Nutrients applied in the grower standard fertiliser were 106.85 kg N/ha, 16.5 kg P/ha and 123.75 kg K/ha.

Table 2. Fertiliser treatments applied into the trash blanket Trial no 2.

	<i>Treatment 1</i> <i>Grower Standard</i> <i>0%NS</i>	<i>Treatment 2</i> <i>25/75</i> <i>NS/Grower Standard</i> <i>25%NS</i>	<i>Treatment 3</i> <i>50/50</i> <i>NS/Grower Standard</i> <i>50%NS</i>
GF 404	330 Kg/ha	250 Kg/ha	165 Kg/ha
UREA	200 Kg/ha	150 Kg/ha	50 Kg/ha
NS	0 Kg/ha	130 Kg/ha	265 Kg/ha
TOTAL	530 Kg/ha	530 Kg/ha	530 Kg/ha

The trial was laid as a randomised complete block experiment as shown in Fig. 2.

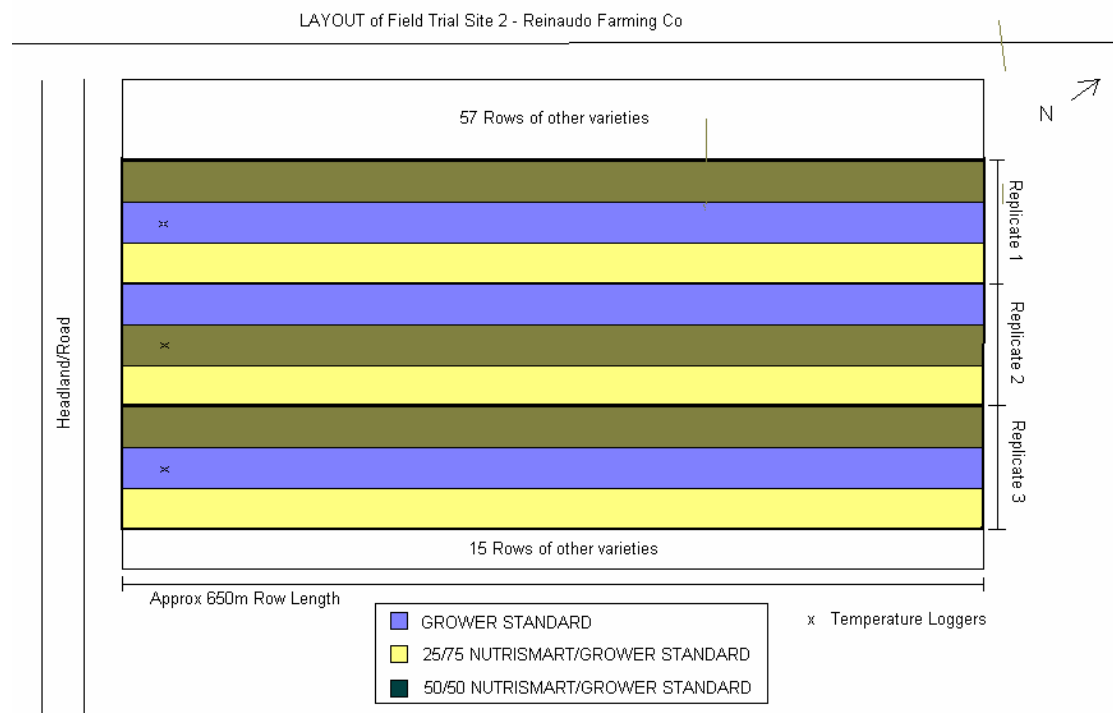


Fig. 2. Layout of Trial 2 Reinaudo. NutriSmart Blends vs Grower Standard

5.0 Results and Discussion

5.1 Rainfall Statistics

Rainfall received at the adjacent meteorological station as presented in Table 3 are typical of average rainfall received in the district. The crop was not stressed by excessive or insufficient moisture throughout the growing period.

Table 3: Rainfall (mm) from Ingham Composite (station 032078)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2004	143	438	349	220	73	27	52	51	45	15	180	84	1677
2005	457	85	244	143	37	78	78	83	9	53	11	66	1344

5.2 Field Trial (Russo)

5.2.1 Soil Sample Results

Pre-Trial

The site did not have any major differences in nutrient levels for the plots allocated to the three treatments as was evident from results presented in Table 4. The site had a few minor nutritional problems, common for the Herbert River district. These were:

- ♦ pH level requires attention as they were lower than satisfactory (5.5)
- ♦ Plant available potassium (K) levels were lower than the critical value of 0.27 meq/100g
- ♦ Organic Carbon was less than desired
- ♦ Iron (Fe) levels were greater then optimum and this could possibly risk nutrient lock up
- ♦ Aluminium (Al) was greater then optimum

Table 4: Pre trial soil sample results (0-20cm)

Treatment	T1	T2	T3
Analyte			
pH (1:5 water)	4.60	4.70	4.80
pH (1:5 CaCl ₂)	3.80	3.90	3.90
Organic Carbon %C	0.96	0.96	0.94
Sulphate Sulfur (MCP) mg/kg	17.00	17.00	15.00
Phosphorus (BSES) mg/kg	61.00	62.00	40.00
Potassium (Amm-acet.) meq/100g	0.18	0.18	0.18
Calcium (Amm-acet.) meq/100g	0.75	0.95	1.30
Magnesium (Amm-acet.) meq/100g.	0.28	0.32	0.41
Aluminium (KCl) meq/100g	2.80	2.60	2.20
Sodium (Amm-acet.) meq/100g	0.20	0.20	0.20
Elect.Conductivity dS/m	0.03	0.03	0.03
Copper (DTPA) mg/kg	0.78	0.76	0.79
Zinc (DTPA) mg/kg	0.94	0.79	1.00
Manganese (DTPA) mg/kg	14.00	12.00	12.00
Iron (DTPA) mg/kg	370.00	340.00	300.00
Zinc (BSES-HCl Zn) mg/kg	0.93	0.90	1.40
Potassium (BSES - Nitric K) meq/100	1.25	1.31	1.08
Cation Exch. Cap. Meq/100g	4.21	4.25	4.29
Calcium/Magnesium ratio	2.70	3.00	3.20
Aluminium Saturation %	70.00	60.00	50.00
Elec. Cond. (Sat.Ext.) dS/m	0.20	0.20	0.20
Silicon (BSES) mg/kg	150.0	160.0	170.0
Silicon (CaCl ₂) mg/kg	21.00	21.00	21.00

Post harvest

Results obtained from the post harvest soil sample (Table 5) are, as expected, slightly different to those taken pre-season (Table 4). The same generalised problems were still evident across the block. Variations between treatments are small and indicating that there have been no effects associated with the individual treatment during the experimental period.

Table 5: Post Harvest soil sample results (0-20cm)

Treatment	T1	T2	T3
Analyte			
pH (1:5 water)	4.90	4.80	4.80
pH (1:5 CaCl ₂)	4.00	4.00	3.90
Organic Carbon %C	1.10	1.10	0.94
Sulphate Sulfur (MCP) mg/kg	12.00	12.00	15.00
Phosphorus (BSES) mg/kg	47.00	39.00	40.00
Potassium (Amm-acet.) meq/100g	0.26	0.26	0.18
Calcium (Amm-acet.) meq/100g	1.00	1.10	1.30
Magnesium (Amm-acet.) meq/100g.	0.58	0.47	0.41
Aluminium (KCl) meq/100g	2.40	2.20	2.20
Sodium (Amm-acet.) meq/100g	0.08	0.06	0.20
Elect.Conductivity dS/m	0.04	0.03	0.03
Copper (DTPA) mg/kg	0.72	0.72	0.79
Zinc (DTPA) mg/kg	0.59	0.62	1.00
Manganese (DTPA) mg/kg	23.00	23.00	12.00
Iron (DTPA) mg/kg	270.00	320.00	300.00
Zinc (BSES-HCl Zn) mg/kg	1.10	0.95	1.40
Potassium (BSES - Nitric K) meq/100	1.60	1.60	1.08
Cation Exch. Cap. Meq/100g	4.32	4.09	4.29
Calcium/Magnesium ratio	1.70	2.30	3.20
Aluminium Saturation %	56.00	54.00	50.00
Elec. Cond. (Sat.Ext.) dS/m	0.30	0.20	0.20
Silicon (BSES) mg/kg	170.00	160.00	170.00
Silicon (CaCl ₂) mg/kg	27.00	24.00	21.00

5.2.2 Temperature Readings

The temperatures recorded during the trial ranged from 12.0 to 46.7°C (14,757 readings) with the overall mean temperature at each recording position presented in Table 6 below:

Table 6: Mean surface temperature (°C) for replicates

	REPLICATES		
	1	2	3
Mean All Recorded Data	26.01	25.69	25.66

The fertiliser has been subject to a minimal temperature difference between replicates (maximum difference, 0.35°C, see Table 6), The diurnal temperature range recorded were not regarded as unusual, but was potentially large for a biological product.

5.2.3 Leaf Tissue Results

Statistical analyses of the tissue assay data indicated the following:

- ♦ Kjeldahl Nitrogen (%N) - N levels were low across the entire block (critical value 1.8% dm). There was no significant site by treatment interactions (Appendix 3 Statistical Analysis). Overall mean value was 1.57%N. Foliar N at the Russo site was significantly greater than at the Reinaudo site (Table 7).

Table 7: Foliar Kjeldahl nitrogen (%N dm) for both sites.

SITE	Mean
Russo	1.5667 ^a
Reinaudo	1.3667 ^b

Note: Mean values followed by the same superscript letter are not significantly different (P<0.05).

- ♦ Potassium (K) - NS has depressed the uptake of K (Table 8); this may be related to moisture relations, as K is a water-soluble element.

Table 8: Foliar potassium (%K dm) showing treatment differences.

SITE	Treatment	Mean
Russo	0%NS	1.3000 ^a
Reinaudo	0%NS	1.2667 ^{ab}
Russo	25%NS	1.2333 ^{bc}
Russo	50%NS	1.2333 ^{bc}
Reinaudo	25%NS	1.2000 ^c
Reinaudo	50%NS	1.2000 ^c

Note: Mean values followed by the same superscript letter are not significantly different (P<0.05).

- ♦ Iron (Fe) - Uptake of Fe at the Russo trial was higher than at the Reinaudo trial (Table 9). The pre-trial soil test indicated a higher Fe at the Russo trial, (Table 4 and Table 11) which would explain this finding.

Table 9: Foliar iron (mg Fe/kg) for both sites.

SITE	Mean
Russo	63.889 ^a
Reinaudo	45.556 ^b

Note: Mean values followed by the same superscript letter are not significantly different ($P < 0.05$).

5.2.4 Yield and CCS Results

Yield and ccs results are listed below in Table 10 and will be discussed in section 5.4.

Table 10: Russo site harvest yield (t cane and t sugar /ha) and ccs.

Site	Treat	Rep	TCHA	CCS	TSHA
Russo	Zero% NS	1	120.72	14.70	17.75
		2	116.04	14.40	16.71
		3	119.30	15.00	17.90
	25% NS	1	117.63	15.00	17.64
		2	114.49	14.60	16.72
		3	107.27	15.30	16.41
	50% NS	1	112.07	15.10	16.92
		2	119.38	14.40	17.19
		3	103.82	15.10	15.68

Graphical presentations of the effect of NS on cane and CCS content are presented below in Figs 3 and 4.

Fig. 3: Russo effects of treatment on t cane/ha yield.

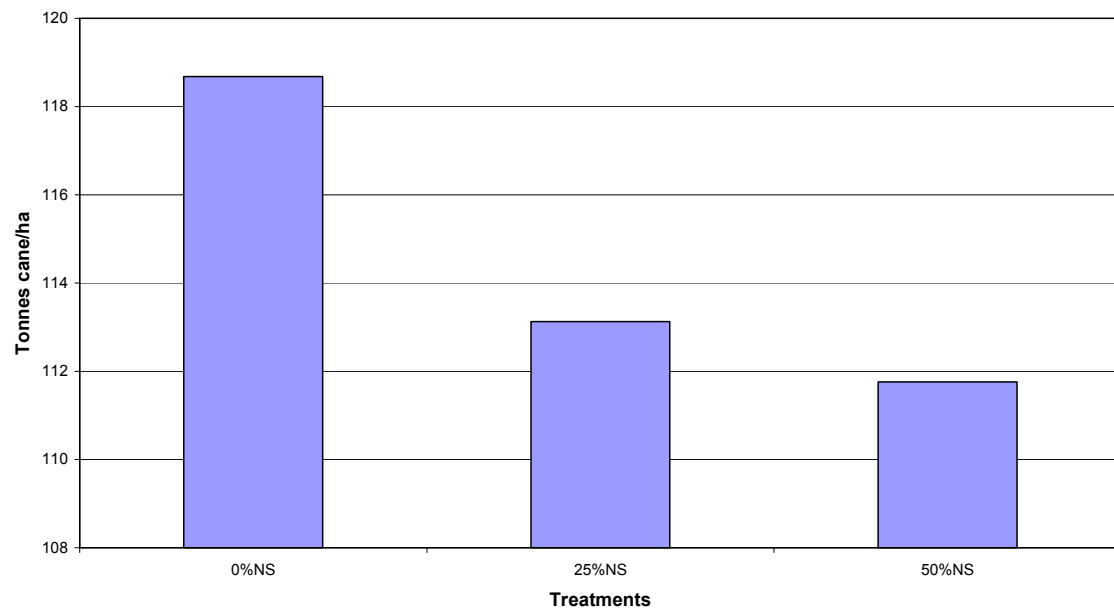
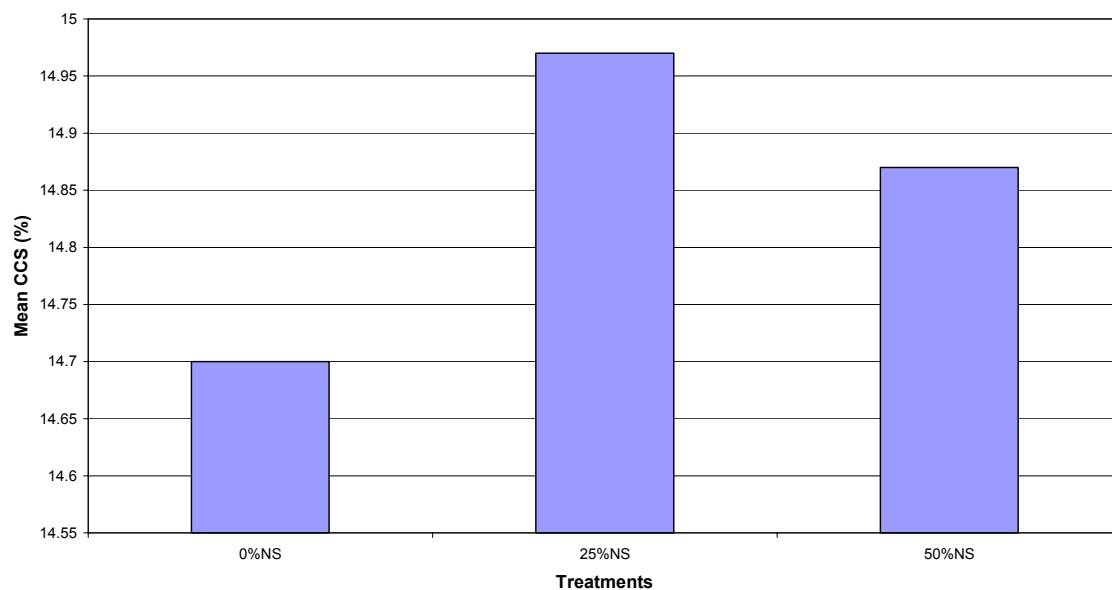


Fig. 4: Russo effect of treatment on CCS.



Harvest results will be discussed for both sites later in this section.

5.3 Field Trial Two (Reinaudo)

5.3.1 Soil Sample Results

Pre-Trial

Variations between treatments were minimal (Table 11), with little difference in the nutrient levels for the plots allocated to the three treatments. The site had a few minor nutritional problems, common for the Herbert River district.

These were:

- ♦ pH level requires attention as they were lower than satisfactory (5.5)
- ♦ Plant available potassium levels were lower than the critical level of 0.27 meq/100g.
- ♦ Calcium levels were unsatisfactory as they were below the critical value of 1.5 me%
- ♦ Organic Carbon were less than desired
- ♦ Calcium/Magnesium ratio moderate
- ♦ Iron levels greater than optimum, risking nutrient lock up
- ♦ Aluminium slightly greater than optimum

Table 11: Pre trial soil sample results (0-20cm), Reinaudo site.

	T1	T2	T3
Analyte			
pH (1:5 water)	4.70	4.70	4.70
pH (1:5 CaCl ₂)	3.90	3.90	3.90
Organic Carbon %C	0.91	0.99	0.95
Sulphate Sulfur (MCP) mg/kg	17.00	15.00	15.00
Phosphorus (BSES) mg/kg	26.00	30.00	28.00
Potassium (Amm-acet.) meq/100g	0.14	0.18	0.17
Calcium (Amm-acet.) meq/100g	0.40	0.34	0.41
Magnesium (Amm-acet.) meq/100g.	0.35	0.32	0.32
Aluminium (KCl) meq/100g	2.40	2.20	2.30
Sodium (Amm-acet.) meq/100g	0.20	0.20	0.20
Elect.Conductivity dS/m	0.04	0.03	0.04
Copper (DTPA) mg/kg	0.58	0.46	0.59
Zinc (DTPA) mg/kg	0.69	0.58	0.93
Manganese (DTPA) mg/kg	24.00	16.00	22.00
Iron (DTPA) mg/kg	240.0	240.0	240.0
Zinc (BSES-HCl Zn) mg/kg	0.87	0.72	1.20
Potassium (BSES - Nitric K) meq/100	1.23	1.33	1.25
Cation Exch. Cap. Meq/100g	3.49	3.24	3.40
Calcium/Magnesium ratio	1.10	1.10	1.30
Aluminium Saturation %	70.00	70.00	70.00
Elec. Cond. (Sat.Ext.) dS/m	0.40	0.30	0.40
Silicon (BSES) mg/kg	110.0	120.0	140.0
Silicon (CaCl ₂) mg/kg	16.00	14.00	14.00

Post Harvest

Results from the post harvest (Table 12) showed little change in soil nutrition from the pre treatment sample. The generalised problems shown in the pre-season results (Table 11) were still apparent. Variations between treatments were minor.

Table 12: Post trial soil sample results (0-20cm), Reinaudo site.

	T1	T2	T3
Analyte			
pH (1:5 water)	4.70	4.80	4.80
pH (1:5 CaCl ₂)	3.90	3.90	4.00
Organic Carbon %C	0.97	0.92	1.00
Sulphate Sulfur (MCP) mg/kg	16.00	20.00	15.00
Phosphorus (BSES) mg/kg	29.00	25.00	28.00
Potassium (Amm-acet.) meq/100g	0.21	0.30	0.18
Calcium (Amm-acet.) meq/100g	0.30	0.35	0.41
Magnesium (Amm-acet.) meq/100g.	0.21	0.26	0.27
Aluminium (KCl) meq/100g	2.20	2.00	2.10
Sodium (Amm-acet.) meq/100g	<0.020	0.03	0.03
Elect.Conductivity dS/m	0.04	0.06	0.03
Copper (DTPA) mg/kg	0.49	0.52	0.64
Zinc (DTPA) mg/kg	0.65	0.63	0.70
Manganese (DTPA) mg/kg	22.00	30.00	57.00
Iron (DTPA) mg/kg	280.0	250	280.0
Zinc (BSES-HCl Zn) mg/kg	0.56	0.60	0.81
Potassium (BSES - Nitric K) meq/100	1.40	1.60	1.40
Cation Exch. Cap. Meq/100g	2.94	2.94	2.99
Calcium/Magnesium ratio	1.40	1.30	1.50
Aluminium Saturation %	75.00	68.00	70.00
Elec. Cond. (Sat.Ext.) dS/m	0.40	0.50	0.30
Silicon (BSES) mg/kg	110.0	110.0	120.00
Silicon (CaCl ₂) mg/kg	17.00	18.00	18.00

5.3.2 Temperature Readings

The temperatures recorded during the trial ranged from 16.3 to 42.4 °C (11,739 readings). The range was not as large as for the Russo trial, however mean temperatures were similar. Mean temperatures for the replicates are presented in Table 13.

Table 13: Mean surface temperature (°C) for replicates

	REPLICATES		
	1	2	3
Mean All Recorded Data	26.07	17.90	26.03
Mean of Common Recorded Data	24.75	24.97	24.82

As explained in the methods section, the major cause of the difference in mean temperature between replicate two and the other two replicates for all recorded data (Table 13) was due to logger failure on two instances in replicate two, rather than from differing temperature characteristics present at the site. Mean temperature differences between replicates where common recorded data were used to calculate the mean were minor as temperatures were within a quarter a degree.

5.3.3 Leaf Tissue Results

Statistical analysis of foliar assay data (Appendix 3) allowed the following observations:

- ♦ Copper (Cu) – Differences in Cu uptake between treatments at the Russo trial were not significant, however there was a significant reduction in Cu uptake at the Reinaudo site where NS had been applied (Table 14). Russo Cu levels in the pre trial soil samples were greater than the Reinaudo site. However, both sites are well above the critical value, therefore Cu foliar values were not considered to be an issue.

Table 14: Copper Cu (mg/kg) for treatment comparison

SITE	Treatment	Mean
Russo	50%NS	7.8667 ^a
Russo	0%NS	7.3333 ^{ab}
Russo	25%NS	1.2333 ^{ab}
Reinaudo	0%NS	6.5000 ^b
Reinaudo	50%NS	5.5000 ^c
Reinaudo	25%NS	5.3333 ^c

Note: Mean values followed by the same superscript letter are not significantly different (P<0.05).

- ♦ Manganese (Mn) – Uptake of Mn was less where NS had been applied (Table 15). Mn deficiency is not recognised as a issue sugar cane growth and development in the area. “Acid soils, such

as most Australian canegrowing soils, supply ample manganese for crop growth.” (Calcino, 1994)

Table 15: Manganese (mg/kg) for treatment comparison.

SITE	Treatment	Mean
Reinaudo	0%NS	121.00 ^a
Russo	50%NS	96.00 ^b
Reinaudo	25%NS	94.67 ^b
Reinaudo	50%NS	94.67 ^b
Russo	25%NS	90.33 ^b
Russo	0%NS	85.00 ^b

Note: Mean values followed by the same superscript letter are not significantly different ($P < 0.05$).

- ♦ Potassium – There was a significant increase in uptake of K where 25%NS was applied (Table 8). However this finding was at variance to the results from the Russo site, where NS appeared to depress K uptake. Both sites were deficient in plant available K with the foliar value below the critical value. As potassium is water-soluble these variations could be related to moisture content of the soil at the time of sampling.

5.3.4 Yield and CCS Results

Harvest results indicate that NS depressed cane yield but increased CCS. Sugar content generally does increase as yield decreases. The results are displayed below in Table 16 and will be discussed in more detail in Section 5.4:

Table 16: Reinaudo site harvest yield (t cane and t sugar /ha) and ccs.

Site	Treat	Rep	TCHA	CCS	TSHA
Reinaudo	Zero% NS	1	110.43	13.10	14.47
		2	101.71	13.80	14.04
		3	108.13	13.20	14.27
	25% NS	1	106.83	13.40	14.32
		2	102.28	14.10	14.42
		3	107.89	13.60	14.67
	50% NS	1	96.93	13.30	12.89
		2	96.93	13.95	13.52
		3	97.75	13.90	13.59

Graphical presentations of the effect of NS on cane and CCS content are presented below in Figs 5 and 6.

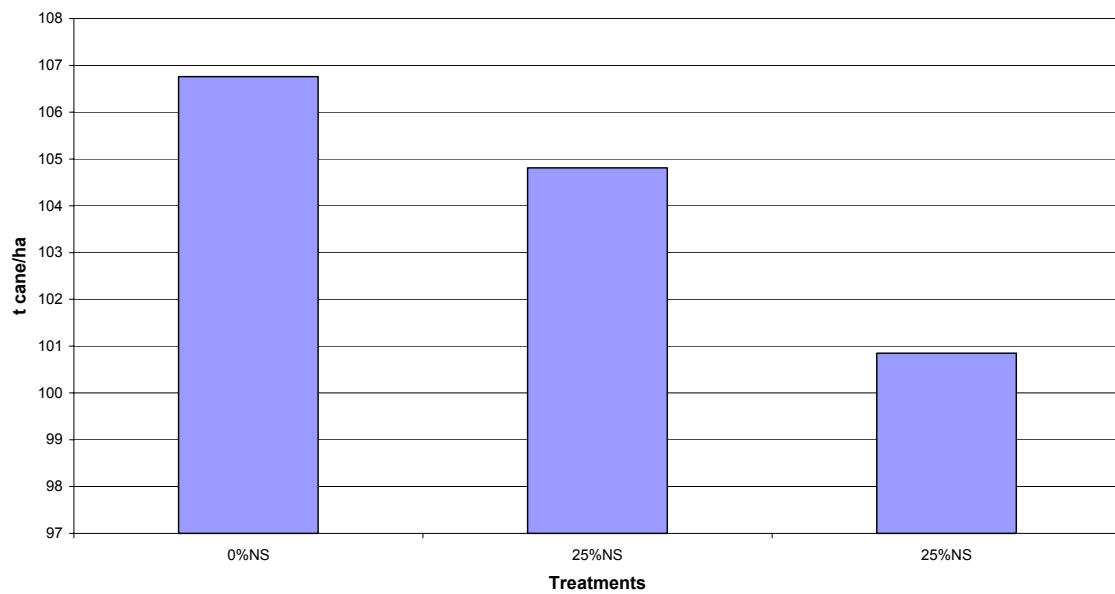


Fig. 5: Reinaudo yield results for treatments

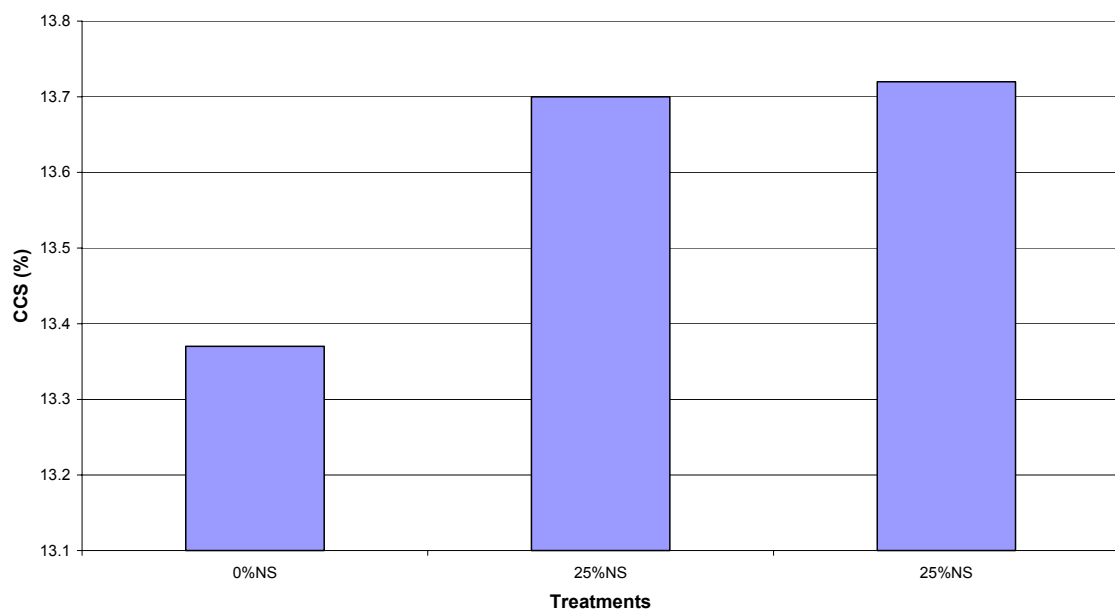


Fig. 6: Reinaudo CCS results for treatments

5.4 Yield and CCS comparison between trials

Complete harvest results have been presented for both trial sites in Appendix 4. Treatment means are presented below in Table 17.

Table17: NutriSmart trial yield mean analysis.

					Price cane (\$/t cane)	Gross margin (\$/ha)
Site	Treat	TCHA	CCS	TSHA	PC	GM
Russo	0%NS	118.68	14.7	17.45	31.39	2942.47
	25%NS	113.13	14.97	16.92	32.16	2888.48
	50%NS	111.75	14.86	16.59	31.87	2818.3
Reinaudo	0%NS	106.75	13.37	14.26	27.55	2232.65
	25%NS	105.66	13.7	14.47	28.52	2312.67
	50%NS	97.20	13.72	13.33	28.56	2133.95

Statistical analysis results (Appendix 5) indicate significant differences due to treatment on CCS, t cane/ha, t sugar/ha and gross margin (\$/ha). The most important results have been outlined below:

- ♦ CCS – There was a significant positive effect from both NS treatments on sucrose content. The 25%NS treatment resulted in 0.3 units more CCS than 0%NS ($P<0.05$) and the 50% NS treatment had 0.259 units more ccs than 0% NS ($P<0.05$) (Table 18).

Table 18: Treatment effect on CCS (%) for both sites.

TREATMENT	Mean
25%NS	14.333 ^a
50%NS	14.292 ^a
0%NS	14.033 ^b

Note: Mean values followed by the same superscript letter are not significantly different ($P<0.05$).

- ♦ Tonnes cane per hectare – Where the 50%NS treatment was applied there was significantly less cane yield than where 0%NS and 25%NS had been applied ($P<0.05$). However, there was no

significant difference between 25%NS and 0%NS ($P < 0.05$), although the trend was for 25%NS to yield less than 0%NS. (Table 19)

Table 19: Treatment effects on tonnes cane/ha for both sites.

TREATMENT	Mean
0%NS	112.72 ^a
25%NS	109.40 ^{ab}
50%NS	104.48 ^b

Note: Mean values followed by the same superscript letter are not significantly different ($P < 0.05$).

- ♦ Tonnes sugar per hectare – There was significantly less sugar yield from the 50%NS treatment than from the 0%NS plots ($P < 0.05$). There was no significant difference between 0%NS and 25%NS, however there was a trend for 25%NS to yield less than 0%NS. Table 20).

Table 20: Treatment effects on tonnes sugar/ha for both sites.

TREATMENT	Mean
0%NS	15.857 ^a
25%NS	15.697 ^a
50%NS	14.965 ^b

Note: Mean values followed by the same superscript letter are not significantly different ($P < 0.05$).

- ♦ Gross Margin – Was calculated using an expected sugar price of \$320/t (January 2006). There was no significant difference in gross margin between treatments (Appendix 5). However, there was a trend for gross margin yield from the three treatments to lie in the order, 25%NS > 0%NS > 50%NS. The difference of \$13/ha gross margin between 25%NS and 0%NS is very small (0.5%) and has not been detected as significant (Table 21). These results show similar financial returns from full fertiliser application and applied fertiliser containing 25 or 50%NS.

Table 21: Treatment effects on gross margins (\$/ha) for both sites.

SITE	Treatment	Mean
Russo	0%NS	2942.5
Russo	25%NS	2888.5
Russo	50%NS	2818.3
Reinaudo	25%NS	2312.7
Reinaudo	0%NS	2232.7
Reinaudo	50%NS	2134.0

6.0 Conclusions/Outcomes

NutriSmart has depressed cane yield, however it has had a positive effect on CCS levels. Results from the gross margin analysis show that the application of 25%NS gave returns equal to that from the standard fertiliser application.

These trials also indicate that the more appropriate mixing ratio for standard fertiliser and NS fertiliser is 1:3 (25%NS) rather than 1:1 (50%NS). This finding has been confirmed by CCS, t cane/ha, t sugar/ha and gross margin results.

These experiments have proved that NS when applied using over-the-row application method may be suitable for trash blanketed ratoons in the Ingham region. Future trial work is necessary to confirm these findings, however the results have increased the potential of this product in the Herbert River region.

This product has shown potential to achieve profitable results, however it seems apparent that more research into product application rates are required. Long-term performance and suitability of the product to industry practices are essential. Sustainable agriculture is vital for the sugar industry and it is through new innovations such as the use of NutriSmart that progress will be made.

7.0 Budget

Costs incurred through the duration of this project are outlined below:

ACTIVITY	INVOICE NO	AMOUNT (\$)	BALANCE (\$)
Grant allocated	30379 CR	-8580.00	-8580.00
Trial Fertiliser Pre Trial Soil Samples (6) Termodata Logger Kit Termodata Loggers	30385	3960.96	-4619.04
Tissue Samples Russo (9) Reinaudo (9)	36523	1710.00	-2909.04
Miscellaneous Trial pegs & flagging Ice for calibration Stationary Overalls Secators	36525	63.59	-2384.38
Russo Post Harvest Soil Samples (3)	49561	461.07	-2384.38
Reinaudo Post Harvest Soil Samples (3)	49737	461.07	-1923.31
Grower Meeting – Venue & Hire	52909	1121.05	-802.26
Grower Meeting – Food & Refreshments	52910	538.00	-264.26
Advertising Costs	52912	264.26	0
BALANCE			0

8.0 Dissemination

A press release about the project was distributed in October, and coverage was sighted in Rural Business (Nov/Dec 2004), Australian CANEGROWER (Oct 2004), Herbert River Express (9 Oct 2004) and NutriSmart NutriNews. The finding of this project have been presented in conjunction with Ingham Farm Centre annual grower information night held in Ingham on Thursday the 23 March 2006. Approximately 70 growers and industry representatives attended the meeting. The meeting was advertised prior to the night with a small editorial printed in the local paper the Herbert River Express on 16 March 2006 (Appendix 6), followed by a reminder notice on the 23 March 2006. A mail out of the meeting invitation and agenda (Appendix 7) was circulated through grower mailing lists. Our publicity ensured attendance by a wide cross section of the

sugar industry. Summaries of these findings have been circulated throughout the Ruralco stores so the knowledge gained from this project has been disseminated widely.

9.0 Acknowledgments

These trials would not have been possible without the generous \$8580.00 grant received from the Young Peoples Science and Innovations Award Grant from the Australian Government Department of Agriculture Fisheries and Forestry. The Sugar Research and Development Corporation was this projects sponsor and administrator. Appreciation also goes to Russo Family Trust and Reinaudo Farming Co for providing the trial sites, equipment required to undertake the trial and for their time and complete cooperation.

I also acknowledge John Reghenzani of FNQ NRM Ltd for his valuable technical support and guidance as my supervisor for this project. The assistance from the following people also contributed substantially to this research; Hilton Smith and Helen Pressdee of NutriSmart Australia and Sibby Di Giacomo of Ingham Farm Centre Pty Ltd. BSES Limited provided assistance during the early phase of this project.

10.0 References

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Vince Russo NutriSmart Trial Site

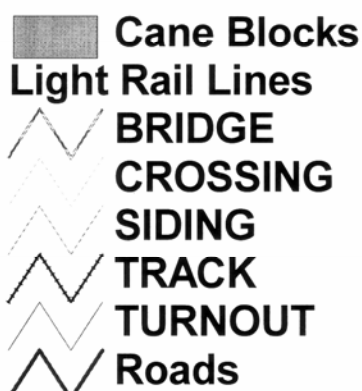
UTM UPS

55K 0402678
7940991



Scale 1:20,000

1000 0 1000 2000 Meters



Printed November 2004. This map is for site location purposes only. No liability is accepted for use below the data capture scale of 1:10,00. This map is not to be sold or remade as part of a commercial product.

Data Source

Cane block maps are from the Cane Block Mapping Project. They are current to May 2000 and are accurate to 1:1000. Tram lines are from CSR Herbert River Mills. They are current to August 2000 and are accurate to 1:50,00. Roads are from Hinchinbrook Shire Council. They are current to January 2002 and are accurate to 1:5,000.

Nelson Reinaudo NutriSmart Trial Site

UTM UPS

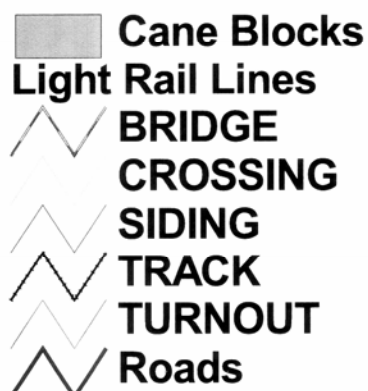
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Data Source

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Appendix 3: Tissue statistical analysis of variance and comparison tests

Statistix 8.0

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Foliar_NS, 15/04/2005,

NutriSmart Science & Innovation Study - Caroline Condon 3rd lvs 17-18
March 2005

Analysis of Variance Table for N Nitrogen Kjeldahl (%)

Source	DF	SS	MS	F	P
SITE	1	0.18000	0.18000	24.00	0.0012
TR	2	0.04000	0.02000	2.67	0.1296
SITE*REP	4	0.06667	0.01667	2.22	0.1563
SITE*TR	2	0.01333	0.00667	0.89	0.4481
Error	8	0.06000	0.00750		
Total	17	0.36000			

Grand Mean 1.4667 CV 5.90

Analysis of Variance Table for NIT Nitrate N (mg/kg)

Source	DF	SS	MS	F	P
SITE	1	0.889	0.8889	0.02	0.8804
TR	2	44.333	22.1667	0.60	0.5711
SITE*REP	4	132.444	33.1111	0.90	0.5079
SITE*TR	2	31.444	15.7222	0.43	0.6668
Error	8	294.889	36.8611		
Total	17	504.000			

Grand Mean 26.667 CV 22.77

Analysis of Variance Table for LOGNIT Log Nitrate N

Source	DF	SS	MS	F	P
SITE	1	0.00170	0.00170	0.24	0.6371
TR	2	0.00778	0.00389	0.55	0.5979
SITE*REP	4	0.02424	0.00606	0.86	0.5291
SITE*TR	2	0.00579	0.00290	0.41	0.6776
Error	8	0.05668	0.00708		
Total	17	0.09619			

Grand Mean 1.4192 CV 5.93

Analysis of Variance Table for S Sulfur (%)

Source	DF	SS	MS	F	P
SITE	1	0.00036	3.556E-04	11.64	0.0092
TR	2	0.00008	3.889E-05	1.27	0.3312
SITE*REP	4	0.00076	1.889E-04	6.18	0.0144
SITE*TR	2	0.00008	3.889E-05	1.27	0.3312
Error	8	0.00024	3.056E-05		
Total	17	0.00151			

Grand Mean 0.1322 CV 4.18

Analysis of Variance Table for P Phosphorus (%)

Source	DF	SS	MS	F	P
SITE	1	0.00222	0.00222	34.78	0.0004
TR	2	0.00018	0.00009	1.39	0.3030
SITE*REP	4	0.00062	0.00016	2.43	0.1322
SITE*TR	2	0.00018	0.00009	1.39	0.3030
Error	8	0.00051	0.00006		
Total	17	0.00371			

Grand Mean 0.2022 CV 3.95

Analysis of Variance Table for K Potassium (%)

Source	DF	SS	MS	F	P
SITE	1	0.00500	0.00500	4.50	0.0667
TR	2	0.00444	0.00222	2.00	0.1975
SITE*REP	4	0.01111	0.00278	2.50	0.1257
SITE*TR	2	0.01333	0.00667	6.00	0.0256
Error	8	0.00889	0.00111		
Total	17	0.04278			

Grand Mean 1.2389 CV 2.69

Analysis of Variance Table for Ca Calcium (%)

Source	DF	SS	MS	F	P
SITE	1	0.00001	0.00001	0.02	0.8910
TR	2	0.00043	0.00022	0.78	0.4904
SITE*REP	4	0.00418	0.00104	3.76	0.0525
SITE*TR	2	0.00081	0.00041	1.46	0.2881
Error	8	0.00222	0.00028		
Total	17	0.00765			

Grand Mean 0.1417 CV 11.76

Analysis of Variance Table for Mg Magnesium (%)

Source	DF	SS	MS	F	P
SITE	1	0.00001	5.556E-06	0.08	0.7885
TR	2	0.00031	1.556E-04	2.15	0.1785
SITE*REP	4	0.00116	2.889E-04	4.00	0.0453
SITE*TR	2	0.00018	8.889E-05	1.23	0.3420
Error	8	0.00058	7.222E-05		
Total	17	0.00223			

Grand Mean 0.1161 CV 7.32

Analysis of Variance Table for Na Sodium (%)

Source	DF	SS	MS	F	P
SITE	1	1.030E-36	1.030E-36	1.9E+32	0.0000
TR	2	7.884E-36	3.942E-36	7.2E+32	0.0000
SITE*REP	4	1.656E-35	4.141E-36	7.6E+32	0.0000
SITE*TR	2	6.216E-69	3.108E-69	0.57	0.5874
Error	8	4.369E-68	5.462E-69		
Total	17	2.548E-35			

Grand Mean 0.0100

WARNING: The total sum of squares is too small to continue.
The dependent variable may be nearly constant.

Analysis of Variance Table for Cl Chlorine (%)

Source	DF	SS	MS	F	P
SITE	1	0.00761	0.00761	18.50	0.0026
TR	2	0.00430	0.00215	5.23	0.0353
SITE*REP	4	0.00231	0.00058	1.41	0.3154
SITE*TR	2	0.00054	0.00027	0.66	0.5419
Error	8	0.00329	0.00041		
Total	17	0.01805			

Grand Mean 0.3683 CV 5.50

Analysis of Variance Table for Cu Copper (mg/kg)

Source	DF	SS	MS	F	P
SITE	1	13.0050	13.0050	64.67	0.0000
TR	2	1.2311	0.6156	3.06	0.1030
SITE*REP	4	3.2778	0.8194	4.07	0.0433
SITE*TR	2	1.8533	0.9267	4.61	0.0466
Error	8	1.6089	0.2011		
Total	17	20.9761			

Grand Mean 6.6278 CV 6.77

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NutriSmart Science & Innovation Study - Caroline Condon 3rd lvs 17-18
March 2005

Analysis of Variance Table for Zn Zinc (mg/kg)

Source	DF	SS	MS	F	P
SITE	1	10.8889	10.8889	28.00	0.0007
TR	2	3.1111	1.5556	4.00	0.0625
SITE*REP	4	2.2222	0.5556	1.43	0.3088
SITE*TR	2	1.7778	0.8889	2.29	0.1640
Error	8	3.1111	0.3889		
Total	17	21.1111			

Grand Mean 15.222 CV 4.10

Analysis of Variance Table for Mn Manganese (mg/kg)

Source	DF	SS	MS	F	P
SITE	1	760.50	760.50	12.10	0.0083
TR	2	354.11	177.06	2.82	0.1186
SITE*REP	4	4173.11	1043.28	16.60	0.0006
SITE*TR	2	1214.33	607.17	9.66	0.0074
Error	8	502.89	62.86		
Total	17	7004.94			

Grand Mean 96.944 CV 8.18

Analysis of Variance Table for Fe Iron (mg/kg)

Source	DF	SS	MS	F	P
SITE	1	1512.50	1512.50	62.30	0.0000
TR	2	44.78	22.39	0.92	0.4361
SITE*REP	4	239.78	59.94	2.47	0.1287
SITE*TR	2	72.33	36.17	1.49	0.2819
Error	8	194.22	24.28		
Total	17	2063.61			

Grand Mean 54.722 CV 9.00

Analysis of Variance Table for B Boron (mg/kg)

Source	DF	SS	MS	F	P
SITE	1	0.8450	0.84500	0.94	0.3595
TR	2	1.6844	0.84222	0.94	0.4293
SITE*REP	4	1.9778	0.49444	0.55	0.7031
SITE*TR	2	0.3600	0.18000	0.20	0.8217

Error	8	7.1556	0.89444
Total	17	12.0228	

Grand Mean 3.9389 CV 24.01

Analysis of Variance Table for Mo Molybdenum (mg/kg)

Source	DF	SS	MS	F	P
SITE	1	0.00347	0.00347	6.87	0.0306
TR	2	0.01108	0.00554	10.96	0.0051
SITE*REP	4	0.00996	0.00249	4.92	0.0268
SITE*TR	2	0.00021	0.00011	0.21	0.8159
Error	8	0.00404	0.00051		
Total	17	0.02876			

Grand Mean 0.1972 CV 11.40

Analysis of Variance Table for Co Cobalt (mg/kg)

Source	DF	SS	MS	F	P
SITE	1	0.12334	0.12334	92.70	0.0000
TR	2	0.01574	0.00787	5.92	0.0265
SITE*REP	4	0.01136	0.00284	2.13	0.1680
SITE*TR	2	0.00488	0.00244	1.83	0.2211
Error	8	0.01064	0.00133		
Total	17	0.16596			

Grand Mean 0.2128 CV 17.14

Analysis of Variance Table for Se Selenium (mg/kg)

Source	DF	SS	MS	F	P
SITE	1	3.719E-35	3.719E-35	9.4E+31	0.0000
TR	2	1.846E-33	9.229E-34	2.3E+33	0.0000
SITE*REP	4	1.489E-33	3.723E-34	9.4E+32	0.0000
SITE*TR	2	1.711E-67	8.554E-68	0.22	0.8098
Error	8	3.160E-66	3.950E-67		
Total	17	3.372E-33			

Grand Mean 0.1300

WARNING: The total sum of squares is too small to continue.
The dependent variable may be nearly constant.

Analysis of Variance Table for NSR N/S Ratio

Source	DF	SS	MS	F	P
SITE	1	2.00000	2.00000	10.29	0.0125
TR	2	0.44444	0.22222	1.14	0.3660
SITE*REP	4	2.44444	0.61111	3.14	0.0788
SITE*TR	2	1.33333	0.66667	3.43	0.0841
Error	8	1.55556	0.19444		
Total	17	7.77778			

Grand Mean 11.111 CV 3.97

Analysis of Variance Table for NPR N/P Ratio

Source	DF	SS	MS	F	P
SITE	1	0.16056	0.16056	1.17	0.3118
TR	2	0.25000	0.12500	0.91	0.4415
SITE*REP	4	0.91778	0.22944	1.67	0.2498
SITE*TR	2	0.05444	0.02722	0.20	0.8246
Error	8	1.10222	0.13778		

Total 17 2.48500

Grand Mean 7.2500 CV 5.12

Analysis of Variance Table for NKR N/K Ratio

Source	DF	SS	MS	F	P
SITE	1	0.04500	0.04500	6.75	0.0317
TR	2	0.01333	0.00667	1.00	0.4096
SITE*REP	4	0.05333	0.01333	2.00	0.1875
SITE*TR	2	0.04000	0.02000	3.00	0.1066
Error	8	0.05333	0.00667		
Total	17	0.20500			

Grand Mean 1.1833 CV 6.90

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NutriSmart Science & Innovation Study - Caroline Condon 3rd lvs 17-18
March 2005

LSD All-Pairwise Comparisons Test of N for TR

TR	Mean	Homogeneous Groups
zero NS	1.5333	A
25% NS	1.4333	A
50% NS	1.4333	A

Alpha 0.05 Standard Error for Comparison 0.0500

Critical T Value 2.306 Critical Value for Comparison 0.1153

Error term used: SITE*REP*TR, 8 DF

There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of N for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	zero NS	1.6000	A
Russo	50% NS	1.5667	A
Russo	25% NS	1.5333	A
Reinaudo	zero NS	1.4667	AB
Reinaudo	25% NS	1.3333	BC
Reinaudo	50% NS	1.3000	C

Alpha 0.05 Standard Error for Comparison 0.0707

Critical T Value 2.306 Critical Value for Comparison 0.1631

Error term used: SITE*REP*TR, 8 DF

There are 3 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of N for SITE

SITE	Mean	Homogeneous Groups
Russo	1.5667	A
Reinaudo	1.3667	B

Alpha 0.05 Standard Error for Comparison 0.0408

Critical T Value 2.306 Critical Value for Comparison 0.0941

Error term used: SITE*REP*TR, 8 DF

All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of N for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	2	1.6333	A
Russo	1	1.6000	AB
Russo	3	1.4667	BC
Reinaudo	1	1.4000	CD
Reinaudo	2	1.4000	CD
Reinaudo	3	1.3000	D

Alpha 0.05 Standard Error for Comparison 0.0707
Critical T Value 2.306 Critical Value for Comparison 0.1631
Error term used: SITE*REP*TR, 8 DF
There are 4 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of NIT for TR

TR	Mean	Homogeneous Groups
50% NS	28.500	A
25% NS	26.833	A
zero NS	24.667	A

Alpha 0.05 Standard Error for Comparison 3.5053
Critical T Value 2.306 Critical Value for Comparison 8.0832
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of NIT for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	50% NS	29.667	A
Reinaudo	50% NS	27.333	A
Russo	25% NS	27.000	A
Reinaudo	25% NS	26.667	A
Reinaudo	zero NS	26.667	A
Russo	zero NS	22.667	A

Alpha 0.05 Standard Error for Comparison 4.9572
Critical T Value 2.306 Critical Value for Comparison 11.431
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of NIT for SITE

SITE	Mean	Homogeneous Groups
Reinaudo	26.889	A
Russo	26.444	A

Alpha 0.05 Standard Error for Comparison 2.8621
Critical T Value 2.306 Critical Value for Comparison 6.5999
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of NIT for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	3	31.667	A
Reinaudo	3	28.333	A
Reinaudo	1	26.333	A
Reinaudo	2	26.000	A
Russo	1	24.000	A
Russo	2	23.667	A

Alpha 0.05 Standard Error for Comparison 4.9572
Critical T Value 2.306 Critical Value for Comparison 11.431

Error term used: SITE*REP*TR, 8 DF

There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of LOGNIT for TR

TR	Mean	Homogeneous Groups
50% NS	1.4388	A
25% NS	1.4283	A
zero NS	1.3904	A

Alpha 0.05 Standard Error for Comparison 0.0486

Critical T Value 2.306 Critical Value for Comparison 0.1121

Error term used: SITE*REP*TR, 8 DF

There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of LOGNIT for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	50% NS	1.4418	A
Reinaudo	50% NS	1.4357	A
Russo	25% NS	1.4312	A
Reinaudo	zero NS	1.4255	A
Reinaudo	25% NS	1.4255	A
Russo	zero NS	1.3553	A

Alpha 0.05 Standard Error for Comparison 0.0687

Critical T Value 2.306 Critical Value for Comparison 0.1585

Error term used: SITE*REP*TR, 8 DF

There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of LOGNIT for SITE

SITE	Mean	Homogeneous Groups
Reinaudo	1.4289	A
Russo	1.4094	A

Alpha 0.05 Standard Error for Comparison 0.0397

Critical T Value 2.306 Critical Value for Comparison 0.0915

Error term used: SITE*REP*TR, 8 DF

There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of LOGNIT for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	3	1.4788	A
Reinaudo	3	1.4519	A
Reinaudo	1	1.4200	A
Reinaudo	2	1.4148	A
Russo	1	1.3795	A
Russo	2	1.3700	A

Alpha 0.05 Standard Error for Comparison 0.0687

Critical T Value 2.306 Critical Value for Comparison 0.1585

Error term used: SITE*REP*TR, 8 DF

There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of S for TR

TR	Mean	Homogeneous Groups
zero NS	0.1350	A
50% NS	0.1317	A
25% NS	0.1300	A

Alpha 0.05 Standard Error for Comparison 3.191E-03

Critical T Value 2.306 Critical Value for Comparison 7.359E-03
 Error term used: SITE*REP*TR, 8 DF
 There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of S for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	25% NS	0.1367	A
Russo	50% NS	0.1367	A
Russo	zero NS	0.1367	A
Reinaudo	zero NS	0.1333	AB
Reinaudo	50% NS	0.1267	AB
Reinaudo	25% NS	0.1233	B

Alpha 0.05 Standard Error for Comparison 4.513E-03
 Critical T Value 2.306 Critical Value for Comparison 0.0104
 Error term used: SITE*REP*TR, 8 DF
 There are 2 groups (A and B) in which the means
 are not significantly different from one another.

LSD All-Pairwise Comparisons Test of S for SITE

SITE	Mean	Homogeneous Groups
Russo	0.1367	A
Reinaudo	0.1278	B

Alpha 0.05 Standard Error for Comparison 2.606E-03
 Critical T Value 2.306 Critical Value for Comparison 6.009E-03
 Error term used: SITE*REP*TR, 8 DF
 All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of S for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	1	0.1467	A
Russo	2	0.1367	AB
Reinaudo	1	0.1333	BC
Reinaudo	2	0.1267	BC
Russo	3	0.1267	BC
Reinaudo	3	0.1233	C

Alpha 0.05 Standard Error for Comparison 4.513E-03
 Critical T Value 2.306 Critical Value for Comparison 0.0104
 Error term used: SITE*REP*TR, 8 DF
 There are 3 groups (A, B, etc.) in which the means
 are not significantly different from one another.

LSD All-Pairwise Comparisons Test of P for TR

TR	Mean	Homogeneous Groups
zero NS	0.2067	A
25% NS	0.2000	A
50% NS	0.2000	A

Alpha 0.05 Standard Error for Comparison 4.615E-03
 Critical T Value 2.306 Critical Value for Comparison 0.0106
 Error term used: SITE*REP*TR, 8 DF
 There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of P for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	50% NS	0.2133	A
Russo	25% NS	0.2133	A

Russo	zero NS	0.2133	A
Reinaudo	zero NS	0.2000	AB
Reinaudo	25% NS	0.1867	B
Reinaudo	50% NS	0.1867	B

Alpha 0.05 Standard Error for Comparison 6.526E-03
Critical T Value 2.306 Critical Value for Comparison 0.0150
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of P for SITE

SITE	Mean	Homogeneous Groups
Russo	0.2133	A
Reinaudo	0.1911	B

Alpha 0.05 Standard Error for Comparison 3.768E-03
Critical T Value 2.306 Critical Value for Comparison 8.689E-03
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of P for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	2	0.2200	A
Russo	1	0.2133	AB
Russo	3	0.2067	AB
Reinaudo	1	0.2000	BC
Reinaudo	2	0.1867	C
Reinaudo	3	0.1867	C

Alpha 0.05 Standard Error for Comparison 6.526E-03
Critical T Value 2.306 Critical Value for Comparison 0.0150
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of K for TR

TR	Mean	Homogeneous Groups
25% NS	1.2500	A
zero NS	1.2500	A
50% NS	1.2167	A

Alpha 0.05 Standard Error for Comparison 0.0192
Critical T Value 2.306 Critical Value for Comparison 0.0444
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of K for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	zero NS	1.3000	A
Reinaudo	25% NS	1.2667	AB
Russo	25% NS	1.2333	BC
Russo	50% NS	1.2333	BC
Reinaudo	50% NS	1.2000	C
Reinaudo	zero NS	1.2000	C

Alpha 0.05 Standard Error for Comparison 0.0272
Critical T Value 2.306 Critical Value for Comparison 0.0628
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means

are not significantly different from one another.

LSD All-Pairwise Comparisons Test of K for SITE

SITE	Mean	Homogeneous Groups
Russo	1.2556	A
Reinaudo	1.2222	A

Alpha 0.05 Standard Error for Comparison 0.0157
Critical T Value 2.306 Critical Value for Comparison 0.0362
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of K for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	3	1.3000	A
Reinaudo	1	1.2333	B
Reinaudo	2	1.2333	B
Russo	1	1.2333	B
Russo	2	1.2333	B
Reinaudo	3	1.2000	B

Alpha 0.05 Standard Error for Comparison 0.0272
Critical T Value 2.306 Critical Value for Comparison 0.0628
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Ca for TR

TR	Mean	Homogeneous Groups
50% NS	0.1467	A
zero NS	0.1433	A
25% NS	0.1350	A

Alpha 0.05 Standard Error for Comparison 9.623E-03
Critical T Value 2.306 Critical Value for Comparison 0.0222
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of Ca for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Reinaudo	zero NS	0.1533	A
Russo	50% NS	0.1500	A
Reinaudo	50% NS	0.1433	A
Russo	25% NS	0.1400	A
Russo	zero NS	0.1333	A
Reinaudo	25% NS	0.1300	A

Alpha 0.05 Standard Error for Comparison 0.0136
Critical T Value 2.306 Critical Value for Comparison 0.0314
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of Ca for SITE

SITE	Mean	Homogeneous Groups
Reinaudo	0.1422	A
Russo	0.1411	A

Alpha 0.05 Standard Error for Comparison 7.857E-03
Critical T Value 2.306 Critical Value for Comparison 0.0181

Error term used: SITE*REP*TR, 8 DF
 There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of Ca for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	1	0.1600	A
Reinaudo	2	0.1533	A
Russo	2	0.1500	A
Reinaudo	3	0.1367	AB
Reinaudo	1	0.1367	AB
Russo	3	0.1133	B

Alpha 0.05 Standard Error for Comparison 0.0136
 Critical T Value 2.306 Critical Value for Comparison 0.0314
 Error term used: SITE*REP*TR, 8 DF
 There are 2 groups (A and B) in which the means
 are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Mg for TR

TR	Mean	Homogeneous Groups
zero NS	0.1217	A
50% NS	0.1150	A
25% NS	0.1117	A

Alpha 0.05 Standard Error for Comparison 4.907E-03
 Critical T Value 2.306 Critical Value for Comparison 0.0113
 Error term used: SITE*REP*TR, 8 DF
 There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of Mg for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Reinaudo	zero NS	0.1233	A
Russo	50% NS	0.1200	A
Russo	zero NS	0.1200	A
Reinaudo	25% NS	0.1133	A
Reinaudo	50% NS	0.1100	A
Russo	25% NS	0.1100	A

Alpha 0.05 Standard Error for Comparison 6.939E-03
 Critical T Value 2.306 Critical Value for Comparison 0.0160
 Error term used: SITE*REP*TR, 8 DF
 There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of Mg for SITE

SITE	Mean	Homogeneous Groups
Russo	0.1167	A
Reinaudo	0.1156	A

Alpha 0.05 Standard Error for Comparison 4.006E-03
 Critical T Value 2.306 Critical Value for Comparison 9.238E-03
 Error term used: SITE*REP*TR, 8 DF
 There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of Mg for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	1	0.1300	A
Reinaudo	3	0.1200	AB
Russo	2	0.1167	ABC
Reinaudo	1	0.1133	BC

Reinaudo	2	0.1133	BC
Russo	3	0.1033	C

Alpha 0.05 Standard Error for Comparison 6.939E-03
Critical T Value 2.306 Critical Value for Comparison 0.0160
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of CI for TR

TR	Mean	Homogeneous Groups
25% NS	0.3900	A
zero NS	0.3600	B
50% NS	0.3550	B

Alpha 0.05 Standard Error for Comparison 0.0117
Critical T Value 2.306 Critical Value for Comparison 0.0270
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of CI for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Reinaudo	25% NS	0.4067	A
Reinaudo	50% NS	0.3833	A
Reinaudo	zero NS	0.3767	AB
Russo	25% NS	0.3733	AB
Russo	zero NS	0.3433	BC
Russo	50% NS	0.3267	C

Alpha 0.05 Standard Error for Comparison 0.0166
Critical T Value 2.306 Critical Value for Comparison 0.0382
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of CI for SITE

SITE	Mean	Homogeneous Groups
Reinaudo	0.3889	A
Russo	0.3478	B

Alpha 0.05 Standard Error for Comparison 9.558E-03
Critical T Value 2.306 Critical Value for Comparison 0.0220
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of CI for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Reinaudo	1	0.3900	A
Reinaudo	3	0.3900	A
Reinaudo	2	0.3867	A
Russo	3	0.3700	AB
Russo	2	0.3400	B
Russo	1	0.3333	B

Alpha 0.05 Standard Error for Comparison 0.0166
Critical T Value 2.306 Critical Value for Comparison 0.0382
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Cu for TR

TR	Mean	Homogeneous Groups
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zero NS	6.9167	A
50% NS	6.6833	AB
25% NS	6.2833	B

Alpha 0.05 Standard Error for Comparison 0.2589
Critical T Value 2.306 Critical Value for Comparison 0.5971
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Cu for SITE*TR

SITE	TR	Mean	Homogeneous Groups
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Russo	50% NS	7.8667	A
Russo	zero NS	7.3333	AB
Russo	25% NS	7.2333	AB
Reinaudo	zero NS	6.5000	B
Reinaudo	50% NS	5.5000	C
Reinaudo	25% NS	5.3333	C

Alpha 0.05 Standard Error for Comparison 0.3662
Critical T Value 2.306 Critical Value for Comparison 0.8444
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Cu for SITE

SITE	Mean	Homogeneous Groups
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Russo	7.4778	A
Reinaudo	5.7778	B

Alpha 0.05 Standard Error for Comparison 0.2114
Critical T Value 2.306 Critical Value for Comparison 0.4875
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of Cu for SITE*REP

SITE	REP	Mean	Homogeneous Groups
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Russo	2	7.8000	A
Russo	1	7.7333	AB
Russo	3	6.9000	BC
Reinaudo	2	6.4000	C
Reinaudo	1	5.5333	D
Reinaudo	3	5.4000	D

Alpha 0.05 Standard Error for Comparison 0.3662
Critical T Value 2.306 Critical Value for Comparison 0.8444
Error term used: SITE*REP*TR, 8 DF
There are 4 groups (A, B, etc.) in which the means are not significantly different from one another.

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NutriSmart Science & Innovation Study - Caroline Condon 3rd lvs 17-18
March 2005

Foliar_NS, 15/04/2005,

LSD All-Pairwise Comparisons Test of Zn for TR

TR	Mean	Homogeneous Groups
25% NS	15.667	A
zero NS	15.333	AB
50% NS	14.667	B

Alpha 0.05 Standard Error for Comparison 0.3600
Critical T Value 2.306 Critical Value for Comparison 0.8303
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Zn for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	25% NS	16.667	A
Russo	50% NS	15.667	AB
Russo	zero NS	15.667	AB
Reinaudo	zero NS	15.000	B
Reinaudo	25% NS	14.667	BC
Reinaudo	50% NS	13.667	C

Alpha 0.05 Standard Error for Comparison 0.5092
Critical T Value 2.306 Critical Value for Comparison 1.1742
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Zn for SITE

SITE	Mean	Homogeneous Groups
Russo	16.000	A
Reinaudo	14.444	B

Alpha 0.05 Standard Error for Comparison 0.2940
Critical T Value 2.306 Critical Value for Comparison 0.6779
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of Zn for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	1	16.333	A
Russo	2	16.333	A
Russo	3	15.333	AB
Reinaudo	1	14.667	B
Reinaudo	2	14.333	B
Reinaudo	3	14.333	B

Alpha 0.05 Standard Error for Comparison 0.5092
Critical T Value 2.306 Critical Value for Comparison 1.1742
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Mn for TR

TR	Mean	Homogeneous Groups
zero NS	103.00	A
50% NS	95.33	A
25% NS	92.50	A

Alpha 0.05 Standard Error for Comparison 4.5775

Critical T Value 2.306 Critical Value for Comparison 10.556
 Error term used: SITE*REP*TR, 8 DF
 There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of Mn for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Reinaudo	zero NS	121.00	A
Russo	50% NS	96.00	B
Reinaudo	25% NS	94.67	B
Reinaudo	50% NS	94.67	B
Russo	25% NS	90.33	B
Russo	zero NS	85.00	B

Alpha 0.05 Standard Error for Comparison 6.4736
 Critical T Value 2.306 Critical Value for Comparison 14.928
 Error term used: SITE*REP*TR, 8 DF
 There are 2 groups (A and B) in which the means
 are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Mn for SITE

SITE	Mean	Homogeneous Groups
Reinaudo	103.44	A
Russo	90.44	B

Alpha 0.05 Standard Error for Comparison 3.7375
 Critical T Value 2.306 Critical Value for Comparison 8.6188
 Error term used: SITE*REP*TR, 8 DF
 All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of Mn for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Reinaudo	1	130.00	A
Russo	1	103.33	B
Reinaudo	2	94.67	BC
Russo	2	88.67	BCD
Reinaudo	3	85.67	CD
Russo	3	79.33	D

Alpha 0.05 Standard Error for Comparison 6.4736
 Critical T Value 2.306 Critical Value for Comparison 14.928
 Error term used: SITE*REP*TR, 8 DF
 There are 4 groups (A, B, etc.) in which the means
 are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Fe for TR

TR	Mean	Homogeneous Groups
50% NS	56.000	A
zero NS	55.667	A
25% NS	52.500	A

Alpha 0.05 Standard Error for Comparison 2.8447
 Critical T Value 2.306 Critical Value for Comparison 6.5600
 Error term used: SITE*REP*TR, 8 DF
 There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of Fe for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	50% NS	66.667	A
Russo	25% NS	63.000	A

Russo	zero NS	62.000	A
Reinaudo	zero NS	49.333	B
Reinaudo	50% NS	45.333	B
Reinaudo	25% NS	42.000	B

Alpha 0.05 Standard Error for Comparison 4.0231
Critical T Value 2.306 Critical Value for Comparison 9.2772
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Fe for SITE

SITE	Mean	Homogeneous Groups
Russo	63.889	A
Reinaudo	45.556	B

Alpha 0.05 Standard Error for Comparison 2.3227
Critical T Value 2.306 Critical Value for Comparison 5.3562
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of Fe for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	1	67.667	A
Russo	2	66.333	AB
Russo	3	57.667	B
Reinaudo	2	48.333	C
Reinaudo	1	46.333	C
Reinaudo	3	42.000	C

Alpha 0.05 Standard Error for Comparison 4.0231
Critical T Value 2.306 Critical Value for Comparison 9.2772
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of B for TR

TR	Mean	Homogeneous Groups
50% NS	4.3500	A
25% NS	3.8500	A
zero NS	3.6167	A

Alpha 0.05 Standard Error for Comparison 0.5460
Critical T Value 2.306 Critical Value for Comparison 1.2591
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of B for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Reinaudo	50% NS	4.7667	A
Reinaudo	25% NS	3.9667	A
Russo	50% NS	3.9333	A
Reinaudo	zero NS	3.7333	A
Russo	25% NS	3.7333	A
Russo	zero NS	3.5000	A

Alpha 0.05 Standard Error for Comparison 0.7722
Critical T Value 2.306 Critical Value for Comparison 1.7807
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of B for SITE

SITE	Mean	Homogeneous Groups
Reinaudo	4.1556	A
Russo	3.7222	A

Alpha 0.05 Standard Error for Comparison 0.4458
Critical T Value 2.306 Critical Value for Comparison 1.0281
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of B for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Reinaudo	3	4.6333	A
Russo	1	4.0667	A
Reinaudo	2	4.0000	A
Reinaudo	1	3.8333	A
Russo	2	3.8000	A
Russo	3	3.3000	A

Alpha 0.05 Standard Error for Comparison 0.7722
Critical T Value 2.306 Critical Value for Comparison 1.7807
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of Mo for TR

TR	Mean	Homogeneous Groups
50% NS	0.2300	A
25% NS	0.1917	B
zero NS	0.1700	B

Alpha 0.05 Standard Error for Comparison 0.0130
Critical T Value 2.306 Critical Value for Comparison 0.0299
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Mo for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	50% NS	0.2400	A
Reinaudo	50% NS	0.2200	AB
Russo	25% NS	0.2100	ABC
Russo	zero NS	0.1833	BCD
Reinaudo	25% NS	0.1733	CD
Reinaudo	zero NS	0.1567	D

Alpha 0.05 Standard Error for Comparison 0.0184
Critical T Value 2.306 Critical Value for Comparison 0.0423
Error term used: SITE*REP*TR, 8 DF
There are 4 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Mo for SITE

SITE	Mean	Homogeneous Groups
Russo	0.2111	A
Reinaudo	0.1833	B

Alpha 0.05 Standard Error for Comparison 0.0106
Critical T Value 2.306 Critical Value for Comparison 0.0244

Error term used: SITE*REP*TR, 8 DF
 All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of Mo for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	3	0.2467	A
Reinaudo	3	0.2133	AB
Russo	1	0.1967	BC
Russo	2	0.1900	BC
Reinaudo	2	0.1733	BC
Reinaudo	1	0.1633	C

Alpha 0.05 Standard Error for Comparison 0.0184
 Critical T Value 2.306 Critical Value for Comparison 0.0423
 Error term used: SITE*REP*TR, 8 DF
 There are 3 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Co for TR

TR	Mean	Homogeneous Groups
50% NS	0.2517	A
zero NS	0.2067	AB
25% NS	0.1800	B

Alpha 0.05 Standard Error for Comparison 0.0211
 Critical T Value 2.306 Critical Value for Comparison 0.0486
 Error term used: SITE*REP*TR, 8 DF
 There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Co for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	50% NS	0.3500	A
Russo	25% NS	0.2700	B
Russo	zero NS	0.2667	B
Reinaudo	50% NS	0.1533	C
Reinaudo	zero NS	0.1467	C
Reinaudo	25% NS	0.0900	C

Alpha 0.05 Standard Error for Comparison 0.0298
 Critical T Value 2.306 Critical Value for Comparison 0.0687
 Error term used: SITE*REP*TR, 8 DF
 There are 3 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of Co for SITE

SITE	Mean	Homogeneous Groups
Russo	0.2956	A
Reinaudo	0.1300	B

Alpha 0.05 Standard Error for Comparison 0.0172
 Critical T Value 2.306 Critical Value for Comparison 0.0397
 Error term used: SITE*REP*TR, 8 DF
 All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of Co for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	1	0.3233	A
Russo	2	0.3133	AB

Russo	3	0.2500	B
Reinaudo	2	0.1500	C
Reinaudo	1	0.1233	C
Reinaudo	3	0.1167	C

Alpha 0.05 Standard Error for Comparison 0.0298
Critical T Value 2.306 Critical Value for Comparison 0.0687
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of NSR for TR

TR	Mean	Homogeneous Groups
zero NS	11.333	A
25% NS	11.000	A
50% NS	11.000	A

Alpha 0.05 Standard Error for Comparison 0.2546
Critical T Value 2.306 Critical Value for Comparison 0.5871
Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of NSR for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	50% NS	11.667	A
Russo	zero NS	11.667	A
Reinaudo	25% NS	11.000	AB
Reinaudo	zero NS	11.000	AB
Russo	25% NS	11.000	AB
Reinaudo	50% NS	10.333	B

Alpha 0.05 Standard Error for Comparison 0.3600
Critical T Value 2.306 Critical Value for Comparison 0.8303
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of NSR for SITE

SITE	Mean	Homogeneous Groups
Russo	11.444	A
Reinaudo	10.778	B

Alpha 0.05 Standard Error for Comparison 0.2079
Critical T Value 2.306 Critical Value for Comparison 0.4793
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of NSR for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	2	11.667	A
Russo	3	11.667	A
Reinaudo	2	11.333	AB
Russo	1	11.000	ABC
Reinaudo	3	10.667	BC
Reinaudo	1	10.333	C

Alpha 0.05 Standard Error for Comparison 0.3600
Critical T Value 2.306 Critical Value for Comparison 0.8303
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means

are not significantly different from one another.

LSD All-Pairwise Comparisons Test of NPR for TR

TR	Mean	Homogeneous Groups
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zero NS	7.4167	A
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50% NS	7.1667	A
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25% NS	7.1667	A
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Alpha 0.05 Standard Error for Comparison 0.2143

Critical T Value 2.306 Critical Value for Comparison 0.4942

Error term used: SITE*REP*TR, 8 DF

There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of NPR for SITE*TR

SITE	TR	Mean	Homogeneous Groups
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Russo	zero NS	7.5000	A
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Reinaudo	zero NS	7.3333	A
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Russo	50% NS	7.3333	A
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Russo	25% NS	7.2000	A
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Reinaudo	25% NS	7.1333	A
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Reinaudo	50% NS	7.0000	A
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Alpha 0.05 Standard Error for Comparison 0.3031

Critical T Value 2.306 Critical Value for Comparison 0.6989

Error term used: SITE*REP*TR, 8 DF

There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of NPR for SITE

SITE	Mean	Homogeneous Groups
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Russo	7.3444	A
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Reinaudo	7.1556	A
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Alpha 0.05 Standard Error for Comparison 0.1750

Critical T Value 2.306 Critical Value for Comparison 0.4035

Error term used: SITE*REP*TR, 8 DF

There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of NPR for SITE*REP

SITE	REP	Mean	Homogeneous Groups
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Reinaudo	2	7.5333	A
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Russo	1	7.5000	A
-------	---	--------	---

Russo	2	7.4333	A
-------	---	--------	---

Russo	3	7.1000	A
-------	---	--------	---

Reinaudo	1	6.9667	A
----------	---	--------	---

Reinaudo	3	6.9667	A
----------	---	--------	---

Alpha 0.05 Standard Error for Comparison 0.3031

Critical T Value 2.306 Critical Value for Comparison 0.6989

Error term used: SITE*REP*TR, 8 DF

There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of NKR for TR

TR	Mean	Homogeneous Groups
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zero NS	1.2167	A
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50% NS	1.1833	A
--------	--------	---

25% NS	1.1500	A
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Alpha 0.05 Standard Error for Comparison 0.0471

Critical T Value 2.306 Critical Value for Comparison 0.1087

Error term used: SITE*REP*TR, 8 DF
There are no significant pairwise differences among the means.

LSD All-Pairwise Comparisons Test of NKR for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	50% NS	1.2667	A
Reinaudo	zero NS	1.2333	AB
Russo	25% NS	1.2333	AB
Russo	zero NS	1.2000	ABC
Reinaudo	50% NS	1.1000	BC
Reinaudo	25% NS	1.0667	C

Alpha 0.05 Standard Error for Comparison 0.0667
Critical T Value 2.306 Critical Value for Comparison 0.1537
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of NKR for SITE

SITE	Mean	Homogeneous Groups
Russo	1.2333	A
Reinaudo	1.1333	B

Alpha 0.05 Standard Error for Comparison 0.0385
Critical T Value 2.306 Critical Value for Comparison 0.0888
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of NKR for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	2	1.3000	A
Russo	1	1.2667	AB
Reinaudo	2	1.1667	ABC
Reinaudo	1	1.1333	BC
Russo	3	1.1333	BC
Reinaudo	3	1.1000	C

Alpha 0.05 Standard Error for Comparison 0.0667
Critical T Value 2.306 Critical Value for Comparison 0.1537
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means
are not significantly different from one another.

Appendix 4: NutriSmart trial harvest results

						Price cane (\$/t cane)	Gross margin (\$/ha)
Site	Treat	Rep	TCHA	CCS	TSHA	PC	GM
Russo	Zero% NS	1	120.72	14.70	17.75	31.39	2991.92
		2	116.04	14.40	16.71	30.53	2775.68
		3	119.30	15.00	17.90	32.26	3059.81
	25% NS	1	117.63	15.00	17.64	32.26	3016.97
		2	114.49	14.60	16.72	31.11	2804.55
		3	107.27	15.30	16.41	33.12	2843.94
	50% NS	1	112.07	15.10	16.92	32.55	2906.65
		2	119.38	14.40	17.19	30.53	2855.57
		3	103.82	15.10	15.68	32.55	2692.68
Reinaudo	Zero% NS	1	110.43	13.10	14.47	26.79	2228.04
		2	101.71	13.80	14.04	28.80	2257.15
		3	108.13	13.20	14.27	27.07	2212.77
	25% NS	1	106.83	13.40	14.32	27.65	2247.70
		2	102.28	14.10	14.42	29.67	2358.17
		3	107.89	13.60	14.67	28.23	2332.15
	50% NS	1	96.93	13.30	12.89	27.36	2011.49
		2	96.93	13.95	13.52	29.23	2192.94
		3	97.75	13.90	13.59	29.09	2197.42
<div>♦ Harvesting Costs (\$/t) = 6.35</div> <div>♦ Levies (\$/t) = 0.26</div> <div>♦ Harvesting Cost + Levies (\$/t) = 6.61</div> <div>♦ Sugar price (\$/t94NT) = 320</div>							

Appendix 5: Harvest results statistical analysis of variance and comparison test

Statistix 8.0

NS 2005 Harvest, 31/Jan/2006,

6:59:52 PM

NutriSmart Science & Innovation Study - Caroline Condon 2005 Harvest

Analysis of Variance Table for CCS Commercial Cane Sugar

Source	DF	SS	MS	F	P
SITE	1	7.03125	7.03125	361.61	0.0000
TR	2	0.31694	0.15847	8.15	0.0117
SITE*REP	4	1.40611	0.35153	18.08	0.0005
SITE*TR	2	0.02583	0.01292	0.66	0.5409
Error	8	0.15556	0.01944		
Total	17	8.93569			

Grand Mean 14.219 CV 0.98

Analysis of Variance Table for TCHA Tonnes cane per ha

Source	DF	SS	MS	F	P
SITE	1	576.19	576.188	37.37	0.0003
TR	2	206.32	103.160	6.69	0.0196
SITE*REP	4	124.88	31.219	2.02	0.1837
SITE*TR	2	38.55	19.275	1.25	0.3369
Error	8	123.35	15.418		
Total	17	1069.28			

Grand Mean 108.87 CV 3.61

Analysis of Variance Table for TSHA Tonnes sugar per ha

Source	DF	SS	MS	F	P
SITE	1	39.6941	39.6941	136.47	0.0000
TR	2	2.7120	1.3560	4.66	0.0455
SITE*REP	4	1.0834	0.2708	0.93	0.4922
SITE*TR	2	0.6043	0.3022	1.04	0.3971
Error	8	2.3269	0.2909		
Total	17	46.4206			

Grand Mean 15.506 CV 3.48

Analysis of Variance Table for GM Gross Margin (\$/ha) (Sugar \$320/t) (H&L)

Source	DF	SS	MS	F	P
SITE	1	1940411	1940411	235.85	0.0000
TR	2	56153	28077	3.41	0.0848
SITE*REP	4	58919	14730	1.79	0.2240
SITE*TR	2	15193	7596	0.92	0.4357
Error	8	65819	8227		
Total	17	2136495			

Grand Mean 2554.8 CV 3.55

Statistix 8.0

NS 2005 Harvest, 31/Jan/2006,

7:02:47 PM

NutriSmart Science & Innovation Study - Caroline Condon 2005 Harvest

LSD All-Pairwise Comparisons Test of CCS for SITE

SITE Mean Homogeneous Groups

Russo 14.844 A
Reinaudo 13.594 B

Alpha 0.05 Standard Error for Comparison 0.0657
Critical T Value 2.306 Critical Value for Comparison 0.1516
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of CCS for TR**TR Mean Homogeneous Groups**

25% NS 14.333 A
50% NS 14.292 A
Zero% NS 14.033 B

Alpha 0.05 Standard Error for Comparison 0.0805
Critical T Value 2.306 Critical Value for Comparison 0.1857
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of CCS for SITE*REP**SITE REP Mean Homogeneous Groups**

Russo 3 15.133 A
Russo 1 14.933 A
Russo 2 14.467 B
Reinaudo 2 13.950 C
Reinaudo 3 13.567 D
Reinaudo 1 13.267 E

Alpha 0.05 Standard Error for Comparison 0.1139
Critical T Value 2.306 Critical Value for Comparison 0.2626
Error term used: SITE*REP*TR, 8 DF
There are 5 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of CCS for SITE*TR**SITE TR Mean Homogeneous Groups**

Russo 25% NS 14.967 A
Russo 50% NS 14.867 AB
Russo Zero% NS 14.700 B
Reinaudo 50% NS 13.717 C
Reinaudo 25% NS 13.700 C
Reinaudo Zero% NS 13.367 D

Alpha 0.05 Standard Error for Comparison 0.1139
Critical T Value 2.306 Critical Value for Comparison 0.2626
Error term used: SITE*REP*TR, 8 DF
There are 4 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of TCHA for SITE**SITE Mean Homogeneous Groups**

Russo 114.52 A
Reinaudo 103.21 B

Alpha 0.05 Standard Error for Comparison 1.8510
Critical T Value 2.306 Critical Value for Comparison 4.2685
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of TCHA for TR

TR	Mean	Homogeneous Groups
Zero% NS	112.72	A
25% NS	109.40	AB
50% NS	104.48	B

Alpha 0.05 Standard Error for Comparison 2.2670
Critical T Value 2.306 Critical Value for Comparison 5.2278
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of TCHA for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	1	116.81	A
Russo	2	116.64	A
Russo	3	110.13	AB
Reinaudo	1	104.73	BC
Reinaudo	3	104.59	BC
Reinaudo	2	100.31	C

Alpha 0.05 Standard Error for Comparison 3.2061
Critical T Value 2.306 Critical Value for Comparison 7.3932
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of TCHA for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	Zero% NS	118.69	A
Russo	25% NS	113.13	AB
Russo	50% NS	111.76	ABC
Reinaudo	Zero% NS	106.76	BC
Reinaudo	25% NS	105.67	C
Reinaudo	50% NS	97.20	D

Alpha 0.05 Standard Error for Comparison 3.2061
Critical T Value 2.306 Critical Value for Comparison 7.3932
Error term used: SITE*REP*TR, 8 DF
There are 4 groups (A, B, etc.) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of TSHA for SITE

SITE	Mean	Homogeneous Groups
Russo	16.991	A
Reinaudo	14.021	B

Alpha 0.05 Standard Error for Comparison 0.2542
Critical T Value 2.306 Critical Value for Comparison 0.5863
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of TSHA for TR

TR	Mean	Homogeneous Groups
Zero% NS	15.857	A
25% NS	15.697	A
50% NS	14.965	B

Alpha 0.05 Standard Error for Comparison 0.3114
Critical T Value 2.306 Critical Value for Comparison 0.7180
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of TSHA for SITE*REP

SITE	REP	Mean	Homogeneous Groups
Russo	1	17.437	A
Russo	2	16.873	A
Russo	3	16.663	A
Reinaudo	3	14.177	B
Reinaudo	2	13.993	B
Reinaudo	1	13.893	B

Alpha 0.05 Standard Error for Comparison 0.4403
Critical T Value 2.306 Critical Value for Comparison 1.0154
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of TSHA for SITE*TR

SITE	TR	Mean	Homogeneous Groups
Russo	Zero% NS	17.453	A
Russo	25% NS	16.923	A
Russo	50% NS	16.597	A
Reinaudo	25% NS	14.470	B
Reinaudo	Zero% NS	14.260	BC
Reinaudo	50% NS	13.333	C

Alpha 0.05 Standard Error for Comparison 0.4403
Critical T Value 2.306 Critical Value for Comparison 1.0154
Error term used: SITE*REP*TR, 8 DF
There are 3 groups (A, B, etc.) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of GM for SITE

SITE	Mean	Homogeneous Groups
Russo	2883.1	A
Reinaudo	2226.4	B

Alpha 0.05 Standard Error for Comparison 42.759
Critical T Value 2.306 Critical Value for Comparison 98.602
Error term used: SITE*REP*TR, 8 DF
All 2 means are significantly different from one another.

LSD All-Pairwise Comparisons Test of GM for TR

TR	Mean	Homogeneous Groups
25% NS	2600.6	A
Zero% NS	2587.6	AB
50% NS	2476.1	B

Alpha 0.05 Standard Error for Comparison 52.369
Critical T Value 2.306 Critical Value for Comparison 120.76
Error term used: SITE*REP*TR, 8 DF
There are 2 groups (A and B) in which the means
are not significantly different from one another.

LSD All-Pairwise Comparisons Test of GM for SITE*REP

SITE	REP	Mean	Homogeneous Groups
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Russo	1	2971.8	A
Russo	3	2865.5	A
Russo	2	2811.9	A
Reinaudo	2	2269.4	B
Reinaudo	3	2247.4	B
Reinaudo	1	2162.4	B

Alpha 0.05 Standard Error for Comparison 74.060

Critical T Value 2.306 Critical Value for Comparison 170.78

Error term used: SITE*REP*TR, 8 DF

There are 2 groups (A and B) in which the means are not significantly different from one another.

LSD All-Pairwise Comparisons Test of GM for SITE*TR

SITE	TR	Mean	Homogeneous Groups
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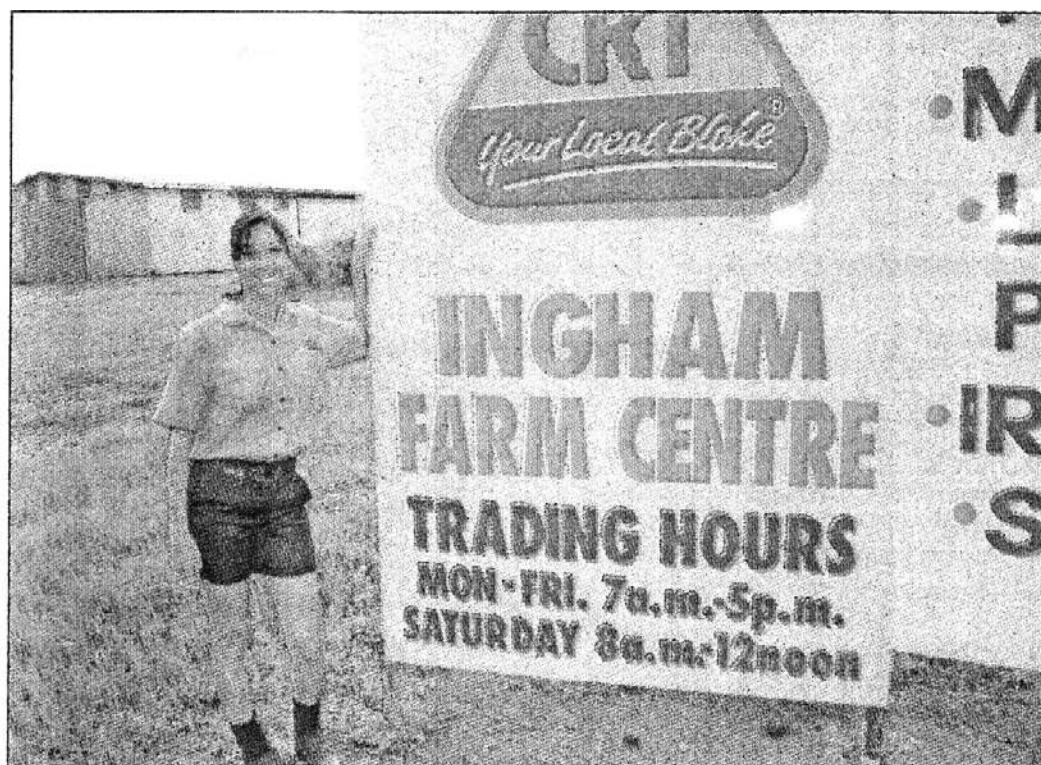
Russo	Zero% NS	2942.5	A
Russo	25% NS	2888.5	A
Russo	50% NS	2818.3	A
Reinaudo	25% NS	2312.7	B
Reinaudo	Zero% NS	2232.7	BC
Reinaudo	50% NS	2134.0	C

Alpha 0.05 Standard Error for Comparison 74.060

Critical T Value 2.306 Critical Value for Comparison 170.78

Error term used: SITE*REP*TR, 8 DF

There are 3 groups (A, B, etc.) in which the means are not significantly different from one another.



Caroline Crisp of Ingham Farm Centre will speak at the information meeting at the Royal Hotel next Thursday.

Ingham Farm Centre to share information

CANE growers across the district are invited to an information meeting hosted by Ingham Farm Centre to learn how to best handle the season ahead.

To be held at the Royal Hotel on Thursday March 23 at 5.30pm, the information session will give growers the opportunity to listen to speakers from Total Oils and Lubricants, Nutrismart Australia, Ingham Farm Centre, and Crop Care. (RSVP by March 21 to Ingham Farm Centre on 4776 1477.)

Ingham Farm Centre has been involved with Nutrismart for more than three years.

With the sugar industry pressures on future fertiliser usage, it has become increasingly important to find a product that would hold and

improve productivity and at the same time do the right thing by the environment.

Last year Ingham Farm Centre sold more than 1500 tonnes of blended Nutrismart product into the Herbert River district.

All the staff at the Ingham Farm Centre is behind the product, and like to be the market leader in new technology or products.

"Nutrismart Australia is a company committed to sustainable agriculture and we want to help them by blending and selling Nutrismart and also raising the awareness about sustainable agricultural practices," Caroline Crisp of Ingham Farm Centre said.

"Nutrismart has proven benefits — it is very easy and safe to apply, costs no more than conventional fertilisers and provides soil health improvements."

Appendix 7: Meeting Invitation and Agenda



GROWER INFORMATION MEETING INVITATION

You are cordially invited to attend an information meeting at
ROYAL HOTEL, INGHAM
Thursday 23 March 2006
5.15 PM Barbeque - 6.45 PM Meeting Start

Ingham Farm Centre takes this opportunity to present a very interesting and information evening, which will be of benefit to you in the season ahead. A variety of topics have been chosen. The meeting will comprise of the following speakers and their topics:

■ Grant Westlake	TOTAL OILS & LUBRICANTS
■ Barry Wilson	NUTRISMART AUSTRALIA
■ Caroline Crisp	INGHAM FARM CENTRE
■ Harry Townley	CROP CARE

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RSVP 21th March 2006

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