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SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

Code : NK 7/82/R1/Sw SIM Ron

Cat. No.: 1392

TITLE: Rates of nitrogen and potassium for ratoon cane grown on a Rondspring series soil.

1. Particulars of project

This crop : 1st ratoon

Site : Simunye Sugar Estate
Field 914

Region : Northern Irrigated
(Swaziland)

Soil set/series: R/Rondspring

Design : 6 x 3 factorial,
2 reps

Variety : NCo 376

Fertilizer : See treatments

Soil Analysis: Date 5/11/1982

pH	OM%	Clay %	PDI
6,2	-	> 30	-

ppm

P	K	Ca	Mg	S	Zn
16	345	1239	> 220	21	0,8

Age : 11,2 months

Date : 4/11/82-11/10/83

Irrigation: 728 mm (gross)

Rainfall : 750 mm (gross)

Total : 1478 mm

2. Objectives:

2.1 To determine optimum rates of nitrogen and potassium for ratoon cane grown in a Rondspring series soil and to compare results from a previous trial on a similar soil.

2.2 To test the availability of exchangeable potassium

2.3 To determine the ripening effect of Polado particularly for cane that received high rates of nitrogen.

3. Treatments

N kg/ha		K kg/ha	
N0	= Nil	K0	= Nil
N1	= 80	K1	= 150
N2	= 120	K2	= 300
N3	= 160		
N4	= 200		
N5	= 240		

Notes on treatments

- Nitrogen as Urea (46%N) and potassium as muriate of potash (50%K)
- Phosphorus applied at 40 kg P/ha as single superphosphate (10,5%P) to all plots.
- N and K were applied by hand over the cane row as a single application.
- Polado was sprayed at a rate of 500/ha to half plots 13 weeks before harvesting.
- Sucrose samples were taken one week before harvesting. Each sample comprised twelve stalks taken at random from each half plot (4 stalks per site)

4. Results

4.1 Harvest data. Table 1 - Yield

Tons cane/ha

Treatment	N0	N1	N2	N3	N4	N5	Mean
K0	88	118	98	111	91	91	100
K1	94	95	104	93	93	96	96
K2	119	97	116	104	100	98	106
Mean	100	104	106	103	95	95	100

CV% 11,1%

LSD Treatment means (0,05) N: 13,6 K: 9,6

(0,01) N: 18,7 K:13,2

Sucrose % cane

Treatment	N0	N1	N2	N3	N4	N5	Mean
K0	14,4	13,0	12,6	12,8	13,0	13,3	13,2
K1	13,9	13,2	13,3	13,5	12,3	11,6	13,0
K2	12,8	12,9	12,7	13,1	12,9	13,7	13,0
Mean	13,7	13,0	12,9	13,1	12,7	12,8	13,0

CV% 4,3

LSD Treatment means (0,05) N: 0,7 K: 0,5

(0,01) N: 0,9 K: 0,7

Tons sucrose/ha

Treatment	N0	N1	N2	N3	N4	N5	Mean
K0	12,7	15,3	12,4	14,2	11,9	12,1	13,1
K1	13,1	12,4	13,8	12,5	11,5	11,2	12,4
K2	15,3	12,5	14,7	13,6	12,9	13,4	13,7
Mean	13,7	13,4	13,6	13,4	12,1	12,2	13,1

CV% 10,8
LSD Treatment means (0,05) N: 1,7 K: 1,2
(0,01) N: 2,4 K: 1,7

Tons cane/ha/month at the N1 level is 9,3
Tons cane/ha/100 mm (gross water) at the N1 level is 7,0
At this level the ratio of Kg N/ton cane produced is 0,77

4.2 Table II - Third leaf data, % dm. (N & K)

	Month and age at sampling		
	Jan (3,5 m)	Feb (4,3 m)	Mar (5,3 m)
Nitrogen % dm.			
N0	1,69	1,48	1,53
N1	2,08	1,58	1,61
N2	2,15	1,70	1,79
N3	2,24	1,71	1,71
N4	2,26	1,75	1,80
N5	2,29	1,70	1,85
Potassium % dm.			
K0	1,85	1,70	1,70
K1	1,91	1,75	1,74
K2	1,93	1,75	1,70

Third leaf data % dm (P)

	Month and age at sampling		
	Jan (3,5 m)	Feb (4,3 m)	Mar (5,3 m)
Nitrogen levels			
N0	0,18	0,20	0,19
N1	0,21	0,20	0,20
N2	0,21	0,22	0,22
N3	0,21	0,21	0,21
N4	0,22	0,21	0,22
N5	0,21	0,22	0,22

Treatment effects on crop growth measurements (cm to TVD) and populations (x1000/ha)

	Stalk heights (cm)		Populations (x1000/ha)	
	7,0 months	9,75 months	7,0 months	9,75 months
Treatment				
N0	194	228	143	120
N1	218	251	153	128
N2	220	250	163	127
N3	208	242	159	128
N4	216	243	158	130
N5	216	239	179	126
K0	215	244	159	126
K1	208	239	163	126
K2	211	244	156	127

5. Comments

5.1 Yields from this site were drastically reduced due to water shortages towards the end of the season. The prolonged dry-off period was during very hot conditions that caused tops of stalks to desiccate and to further reduce yields.

5.2 Nitrogen:

- There was a slight non-significant cane yield increase from the N0 to the N2 level. Yields decreased at the two highest rates of nitrogen with the response being curvilinear.
- Sucrose % cane generally decreased with increasing nitrogen rates, the differance being highly significant between the N0 and N4 levels.
- The No rate produced the highest sucrose yield confirming results from an earlier trial on a similar soil that indicated lower nitrogen levels for optimum sucrose yields.
- Third leaf N levels were below threshold (at all three samplings) in cane which received no nitrogen. At 4,3 months of age the N1 level was also below threshold but increased to above threshold for later samplings.
- Crop growth measurements taken at 7 and 9,7 months of age indicated that the best grown cane was from the N1 and N2 treated plots.

5.3 Potassium:

- The soil exchangeable K level was high and a response to applied potassium was not expected.
- There was a significant (P=0,05) increase in cane yield between the K1 and K2 rates but this effect is considered to be unrelated to treatment as there was a yield depression between the K0 and K1 levels and the treatment effect was not reflected in either cane growth measurements or leaf analyses.
- Cane quality was not effected by increasing K levels.
- Third leaf K values were well above threshold for all three samplings.

5.4 Phosphorus:

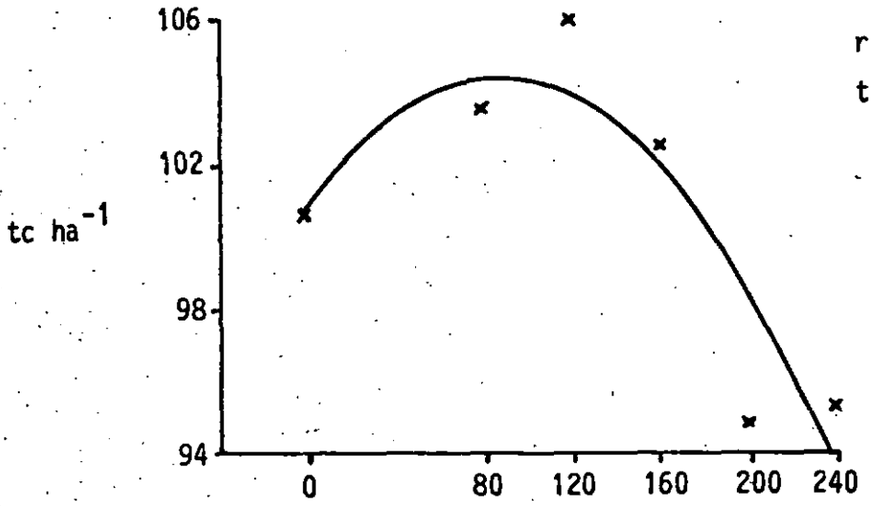
- Soil P values were adequate for a ratoon crop.
- Despite the application of 40 kg P/ha leaf P values were marginal where no N was applied.

5.5 Polado:

- Polado on average increased the sucrose % cane by 0,25 units
- Cane yield was not reduced by spraying and an overall increase of 0,25 tons of sucrose was obtained.

5.6 The trial is now in it's 2nd ratoon and the same fertilizer treatments as before have been applied.

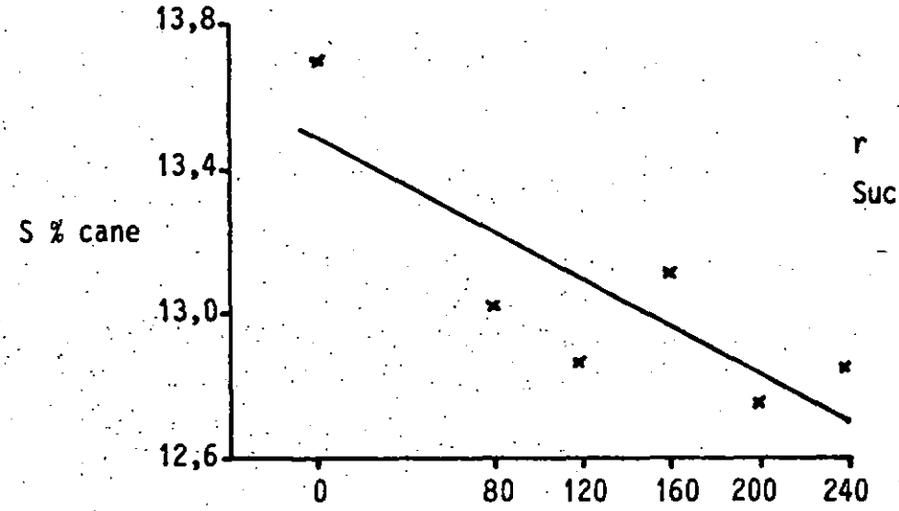
NBL/IS
4 January 1984



r = -0,5673

t cane = 100,5961 + 0,0832 N - 0,0005 N²

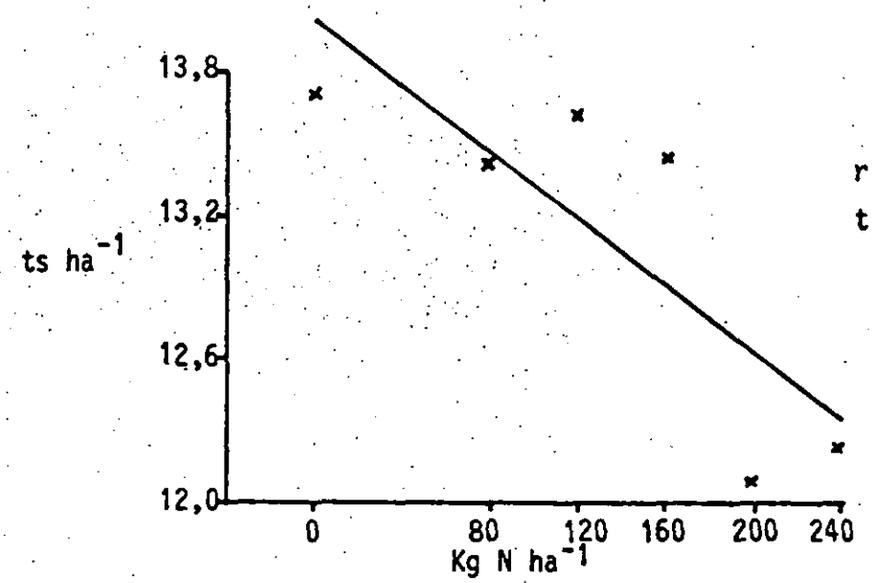
Fig. 1 : Response to Nitrogen (Tons cane ha^{-1})



r = -0,8263

Suc % = 13,4879 - 0,0033 N

Fig. 2 : Response to Nitrogen (Sucrose % cane)



r = -0,8180

t Suc = 14,0021 - 0,0069 N

Fig. 3 : Response to Nitrogen (Tons sucrose ha^{-1})

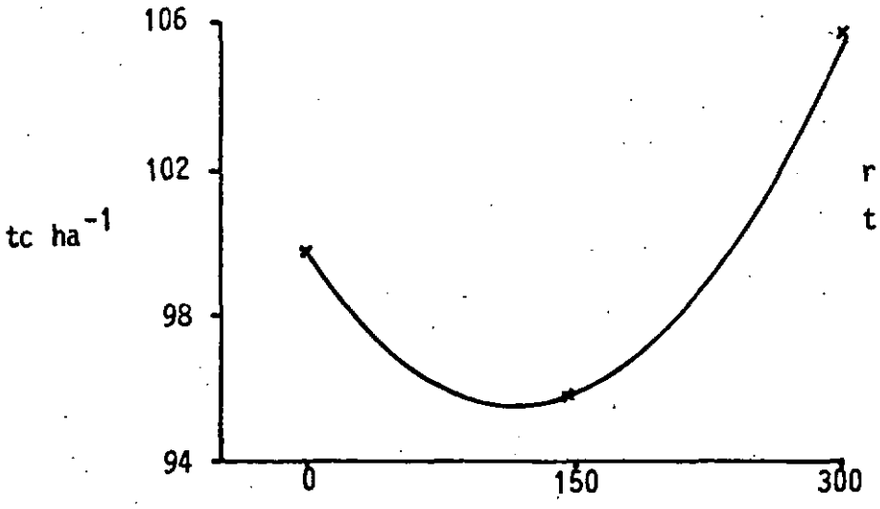


Fig 4 : Response to Potassium (Tons cane ha^{-1})

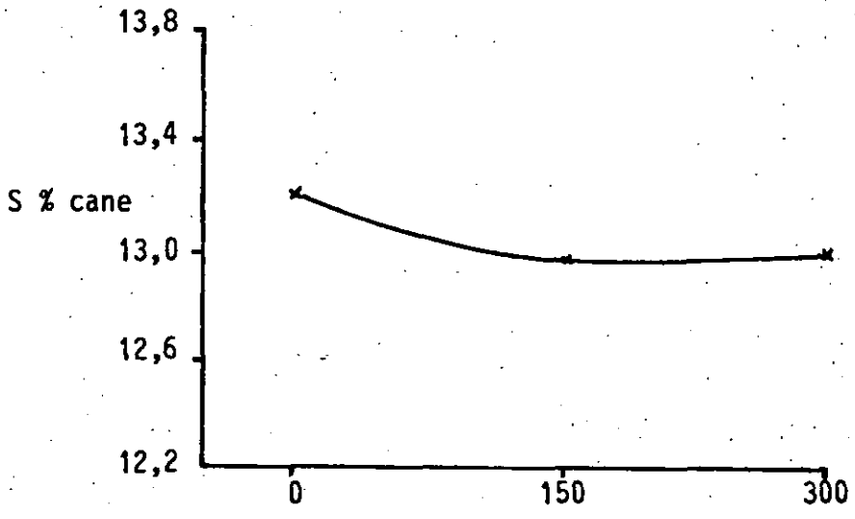


Fig 5 : Response to Potassium (Sucrose % cane)

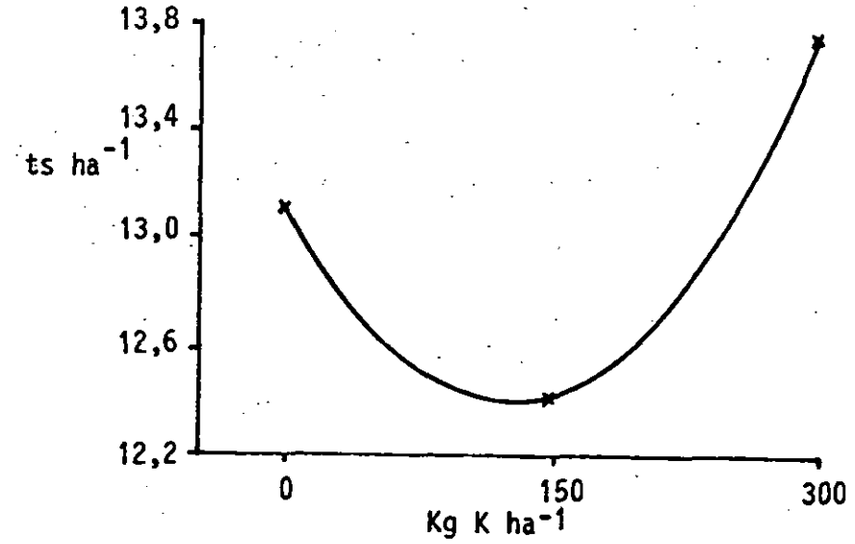


Fig 6 : Response to Potassium (Tons sucrose ha^{-1})

N1

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SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

CODE : NK7/82/R Sw SIM Rond

TITLE : RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE GROWN ON A RONDSPRING SERIES SOIL

1. PARTICULARS OF PROJECT

Cat. No. : 1392
This crop : 2nd Ratoon
Site : Simunye Sugar Estate
Field 914
Region : Northern Irrigated
Soil Set/Series : 'R'/Rondspring
Design : 6 x 3 factorial
2 replications
Variety : NCo 376
Fertilizer : See Treatments

Soil analysis : Date 11/11/83

pH	OM %	Clay %	P.D.I.
6.18	1.37	>30	-

ppm

P	K	Cu	Mg	S	Zn	
19	373	1287	>220	36	0,8	K0.339 K1.392 K2.387

Age : 12,8 months
Dates : 11/10/83 - 6/11/84
Irrigation : 728 mm
Rainfall : 1160 mm
Total Water : 1888 mm (Gross)

2. OBJECTIVES

2.1 To continue investigating optimum rates of nitrogen and potassium for ratoon cane on a Rondspring series soil.

2.2 To test the availability of exchangeable potassium.

2.3 To determine the ripening effect of Polado particularly in cane that received high nitrogen rates.

3. TREATMENTS

N kg/ha		K kg/ha	
N0	Nil	K0	Nil
N1	80	K1	150
N2	120	K2	300
N3	160		
N4	200		
N5	240		

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Notes on Treatments

* Nitrogen as Urea (46 % N) and potassium as muriate of potash (50 % K).
* Phosphorus applied at 40 kg P/ha as single superphosphate (10,5 % P) to all plots.
* N & K were applied by hand over the cane row as a single dressing 4,5 weeks after harvesting.
* P was applied over the cane row at 3 weeks after harvest.
* Lodging prevented Polado from being sprayed.
* Sucrose samples were taken 1 day before harvesting. Each sample comprised twelve stalks taken at random from each nett plot. (4 stalks/site).

4. RESULTS

4.1 Harvest Data

Table I - Tons cane/ha

TREATMENT	N0	N1	N2	N3	N4	N5	MEAN
K0	98	125	139	133	137	138	128
K1	118	121	119	137	123	134	125
K2	129	125	128	118	130	131	127
MEAN	115	123*	129	129	130	134	127

CV % 5.3

LSD Treatment means (0.05)* N : 8 K : 6
(0.01)** N : 11 K : 8

Table II - Sucrose % Cane

TREATMENT	N0	N1	N2	N3	N4	N5	MEAN
K0	14.5	14.6	14.4	14.1	14.6	14.3	14.4
K1	14.4	15.1	14.6	14.6	15.4	14.4	14.7
K2	14.5	14.4	14.2	14.4	13.3	14.7	14.2
MEAN	14.5	14.7	14.4	14.4	14.4	14.5	14.5

CV % 4.9

LSD Treatment means (0.05)* N : 0.9 K : 0.6
(0.01)** N : 1.2 K : 0.8

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Table III - Tons Sucrose/ha

TREATMENT	N0	N1	N2	N3	N4	N5	MEAN
K0	14.2	18.1	19.9	18.8	20.1	19.7	18.5
K1	16.9	18.2	17.4	20.0	18.9	19.3	18.4
K2	18.7	17.9	18.1	17.0	17.2	19.2	18.0
MEAN	16.6	18.1*	18.5	18.6	18.7	19.4	18.3

CV % 5.4

LSD treatment means (0.05)* N : 1.2 K : 0.9
(0.01)** N : 1.7 K : 1.2

Tons cane/ha/month the N1 level is 9.6

Tons cane/ha/100 mm water (gross) at the N1 level is 6.5

At this level the ratio of Kg N/ton cane produced is 0.65

4.2 Third Leaf Data

Table IV - Nitrogen and Potassium (% dm)

TREATMENT	AGE OF SAMPLING (MONTHS)				
	2.0	2.8	4.0	4.7	5.6
N0	2.28	1,74	1,62	1,67	1,39
N1	2,33	2,24	1,90	1,77	1,52
N2	2,41	2,27	2,04	1,93	1,63
N3	2,51	2,44	1,99	1,93	1,60
N4	2,59	2,44	2,10	1,90	1,65
N5	2,53	2,38	2,09	1,97	1,64
K0	1,53	1,69	1,68	1,62	1,52
K1	1,50	1,73	1,72	1,69	1,52
K2	1,54	1,78	1,81	1,72	1,55

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Table V - Sulphur (% dm)

	AGE AT SAMPLING (MONTHS)				
	2.0	2.1	4.0	4.7	5.6
Nitrogen Levels					
N0	0.18	0.18	-	0.15	0.12
N1	0.19	0.20	0.24	0.15	0.12
N2	-	-	-	-	0.13
N3	0.20	-	0.29	-	0.12
N4	0.21	-	0.22	0.16	0.13
N5	0.18	-	0.22	-	0.13

4.3 Crop Growth Data

Table VI - Crop growth measurements (cm to T.V.D.) and population (x 1000/ha)

TREATMENT	STALK HEIGHTS (cm)			POPULATIONS (x 1000/ha)	
	4.8m	6.9m	10m	4.8m	6.9m
N0	154	187	206	176	140
N1	167	212	236	178	136
N2	170	212	229	182	129
N3	167	216	239	184	136
N4	168	214	235	181	135
N5	170	217	236	187	140
K0	166	211	229	183	134
K1	164	205	227	181	138
K2	169	213	234	181	136

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4.4 Eldana Damage

Table VII- Assessment of damage 5 weeks after harvesting

TREATMENT *		TILLER POPULATIONS (x 1000/ha)	% DEAD HEARTS
Nitrogen	N0	297	8
	N1	243	9
	N2	233	15
	N3	208	14
	N4	220	15
	N5	209	16
Potassium	K0	282	12
	K1	196	13
	K2	226	13

*Assessment done before top dressing of Nitrogen and Potassium

5. COMMENTS

Yields were better than for the 1st ratoon as growing conditions were more favourable during the last season.

5.1 Nitrogen :

* There was a linear increase in cane yields with increasing N rates that were significant (P = 0.05) between N0 and N1, and highly significant from N1 to N5. As in the previous crop and other N and K trials on these soils, responses were generally small with acceptable yields being obtained from the lower nitrogen treatments.

* Sucrose % cane was high and nitrogen appeared not to have had an influence on quality.

* Highest sucrose yields were from the N5 level but differences between successive N treatments were small and non-significant except between N0 and N1 levels (P = 0.05).

* Judging by past N responses on these soils, yield results from the N5 rate should be treated with caution as they appear abnormally high.

* Third leaf N % (dm) were below theshold in the N0 treatments from 4 months of age in February. The N1 level showed nitrogen deficiencies in the third leaf at 5,6 months of age in March.

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* Stalk populations were comparable for all N treatments but growth measurements showed a large increase between the N0 and N1 levels with minor differences thereafter.

5.2 Potassium :

* Soil exchangeable K levels are still very high including that for the K0 treatments.

* Although there was no overall cane yield response to applied K, there was an N * K interaction as potassium increased yields significantly (P = 0.01) only when applied in the absence of nitrogen.

* Sucrose % cane was non-significantly effected by increasing rates of K.

* There was a slight non-significant suppression of sucrose yields with increasing K levels. Potassium applied to ratoon cane on these soils would be uneconomical if soil K values are as high as recorded from this site.

* Third leaf K values were well above threshold for all 5 samplings and peaked during January and February.

* Stalk heights and populations showed no large response to applied K although there appeared to be slightly better cane growth from the K2 plots.

5.3 Sulphur :

* Despite adequate S levels in the soil (ave. 36 ppm), third leaf S values decreased rapidly after 4 months of age to become marginal to deficient in February and March at 4,7 and 5,6 months respectively. This may be attributed to leaching by cyclonic rain during January 1984.

5.4 Eldana :

* Eldana damage to the young 2nd ratoon was obvious 5 weeks after harvesting before top-dressing. Infestations favoured previously high nitrogen fertilized plots that had the highest percentage dead hearts and lowest tiller populations. A nitrogen residual effect may have made cane tillers from previously high N treated plots more palatable to the pest.

5.5 This trial has been top-dressed with the same N and K levels as before and will be harvested during September 1985.

NBL/gj
12.4.85

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SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

Code : NK7/82/Sw SIM Rond
Cat No.: 1392

TITLE : RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON A 'R' SET SOIL

1. PARTICULARS OF PROJECT

This crop	:	3rd Ratoon
Site	:	Simunye Sugar Estate Field 914
Region	:	Northern Irrigated Swaziland
Soil Set/Series	:	'R'/Rondspring
Design	:	6 x 3 factorial 2 replications
Variety	:	NCo 376
Fertilizer	:	See Treatments

Soil analysis : Date 21/11/1984

pH	OM %	Clay %	PDI
6,24	1,72	730	-

PPM

P	K	Ca	Mg	S	Zn	
16	312	1361	>220	26	1,1	K0 274 K1 304 K2 358

Age	:	11,1 months
Dates	:	6/11/1984 - 9/10/198
Rainfall	:	530 mm (Net)
Irrigation	:	888 mm (Net)
Total	:	1418 mm

2. OBJECTIVES

2.1 To continue investigating optimum rates of nitrogen and potassium for older ratoons on a Rondspring series soil.

2.2 To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on these soils.

2.3 To determine the ripening effect of Round-up particularly on cane that received high nitrogen rates.

3. TREATMENTS

N kg/ha		K kg/ha	
N0	= Nil	K0	= Nil
N1	= 80	K1	= 150
N2	= 120	K2	= 300
N3	= 160		
N4	= 200		
N5	= 240		

/2.....

Notes on Treatments

* Nitrogen as Urea (46 % N) and Potassium as muriate of potash (50 % K) applied as a single top-dressing 4,5 weeks after harvesting.

* Phophorus applied at 40 kg P/ha as single superphosphate (10,5 % P) 3 weeks after harvesting.

* Sucrose samples were taken one day before harvesting and comprised 12 stalks taken at random from each net plot.

* Ripener was not sprayed due to lodging.

4. RESULTS

4.1 Harvest data

Table I Tons cane/ha

TREATMENT	N0	N1	N2	N3	N4	N5	MEAN
K0	95	102	101	95	104	96	99
K1	98	101	108	111	99	96	103
K2	107	100	92	97	99	106	100
MEAN	100	101	100	101	101	99	100

CV % 5,8

LSD Treatment means (0,05)* N : 7 K : 5
(0,01)** N : 10 K : 7

Table II Sucrose % cane

TREATMENT	N0	N1	N2	N3	N4	N5	MEAN
K0	15,2	14,9	14,6	14,0	14,6	14,7	14,7
K1	14,5	14,6	14,4	14,2	13,9	13,8	14,2
K2	13,7	14,3	14,0	13,8	14,1	14,5	14,1
MEAN	14,5	14,6	14,3	14,0	14,2	14,3	14,3

CV % 4,9

LSD Treatment means (0,05)* N : 0,9 K : 0,6
(0,01)** N : 1,2 K : 0,8

/3.....

Table III Tons Sucrose/ha

TREATMENT	N0	N1	N2	N3	N4	N5	MEAN
K0	14,5	15,2	14,8	13,3	15,1	14,0	14,5
K1	14,3	14,7	15,6	15,7	13,7	13,3	14,6
K2	14,6	14,3	12,9	13,3	14,0	15,3	14,1
MEAN	14,5	14,7	14,4	14,1	14,3	14,2	14,4

CV % 8,1

LSD Treatment means (0,05)* N : 1,4 K : 1,0

(0,01)** N : 1,9 K : 1,4

Tons cane per hectare/month at the N1 level is 9,1

Tons cane per hectare/100 mm water at the N1 level is 7,1

At this level the ratio kg N per ton of cane produced is 0,8

4.2 Third leaf analysis

Table IV Third leaf N & K (% dm) values

TREATMENT	AGE IN MONTHS			
	JAN (2,3)	Feb (3,3)	MAR (4,2)	APR (5,2)
Nitrogen (% dm)				
N0	2,01	1,76	1,60	1,67
N1	2,23	1,78	1,65	1,75
N2	2,34	1,86	1,70	1,78
N3	2,31	1,91	1,77	1,88
N4	2,37	1,95	1,83	1,92
N5	2,38	1,94	1,81	1,87
Potassium (% dm)				
K0	1,53	1,31	1,43	1,34
K1	1,57	1,33	1,43	1,35
K2	1,56	1,33	1,47	1,35

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Table V Third leaf S (% dm) values

TREATMENT	AGE IN MONTHS			
	JAN (2,3)	FEB (3,3)	MAR (4,2)	APR (5,2)
Nitrogen (% dm)				
N0	0,13*	0,16	0,14*	0,13*
N1	0,16	0,15	0,15	0,13*
N2	0,17	0,16	0,14*	0,14*
N3	0,16	0,16	0,15	0,14*
N4	0,16	0,16	0,15	0,14*
N5	0,16	0,16	0,15	0,14*

* = marginal to low

5. COMMENTS

5.1 * Yield for the 3rd ratoon were inferior to the previous crop possibly due to poor growing conditions during early summer 1984.

* CV % for the trial were low.

5.2 Nitrogen

* There were no significant yield differences by increasing nitrogen rates although cane from the N0 plots indicated obvious N deficiency symptons throughout the growth cycle. The N0 treatments were the only plots that did not lodge during a storm in March 1985. This may account for the loss of yield in the remaining treatments and the lack of the previously recorded yield differences between N0 and N1.

* Applied nitrogen had no significant effect on cane quality.

* Tons sucrose yields were uneffected by increasing N rates.

* Third leaf N (% dm) values were in excess of the threshold from 2,3 months of age in January to 5,2 months of age in April. Increasing N levels produced a corresponding increase in third leaf N (% dm) values being lowest for N0 and highest at the N4/N5 rates.

* There is no doubt that had the trial not lodged, or had there been uniform lodging throughout the site, the N1 treatment would have been significantly greater in yield than the N0 plots. (SASA recommendations for up to 4th ratoon are 120 kg N/ha).

5.3 Potassium

* Soil K levels are still considered high for this soil group but continued croppings will enable more realistic thresholds to be derived.

* Potassium had no significant effect on cane or sucrose yields but appeared to suppress cane quality.

/5.....

* Third leaf K (% dm) values fluctuated somewhat but were above threshold for all samplings.

5.4 Sulphur

* Approximately 114 kg S/ha has been applied to this site in the form of single superphosphate (± 10 % S) since it's establishment in 1982. Soil S levels are above the tentative threshold of 20 ppm, but despite this, third leaf S (% dm) values became deficient at ± 4 months of age in March.

* Other sources have reported S related problems on similar "red" soils and investigatory work will be conducted in the future.

5.5 Ripener

Lodging prevented a ripener being applied.

5.6 This trial has been re-established.

NBL/gj

2.2.1986

50

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

Code:NK7/82/Sw SIM Rond
Cat. No: ~~1583~~ 1392

TITLE : RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON A 'R' SET SOIL

1. PARTICULARS OF PROJECT

This Crop	:	4th Ratoon
Site	:	Simunye Sugar Estate Field 914
Region	:	Northern Irrigated (Swaziland)
Soil Set/Series	:	'R'/Rondspring
Design	:	6 x 3 Factorial 2 Replciations
Variety	:	NCo 376
Fertilizer	:	See treatments

Soil Analysis : Date

pH	OM%	Clay %	PDI
6,56	1,70	> 30	0,62

ppm

P	K	Cu	Mg	S	Zn	Ko 270
16	312	1187	481	19	1,1	K1 276
						K2 369

Age	:	12,5 months
Dates	:	9/10/85-24/10/86
Rainfall	:	450 mm
Irrigation	:	784 mm
Total	:	1234 mm

2. OBJECTIVES

2.1 To continue investigating optimum rates of nitrogen and potassium for older ratoons on 'R' set soils.

2.2 To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on these soils.

3. TREATMENTS

N Kg/ha			K kg/ha	
N0	= Nil	0	K0	= Nil
N1	= 80	66 74	K1	= 150
N2	= 120	83 102	K2	= 300
N3	= 160	92 124		
N4	= 200	95 139		
N5	= 240	94 149		

/2.....

Notes on Treatments

* Nitrogen as ammonium sulphate (21% N, 24% S) was applied over the cane row as a split dressing at 4 and 8 weeks after harvesting.

* Potassium as KCl (59% K) was banded over the cane row at 4 weeks after cutting.

* Ethrel at 1,35 L/ha and Fusilade Super at 0,42 L/ha was sprayed over the whole trial 7,2 and 2,7 months before cutting.

* Sucrose samples were taken two days before harvesting and consisted of 12 stalks taken at random from each nett plot.

4. RESULTS

4.1 Table 1 Harvest Data

TREATMENT	CANE YIELD T/HA	SUCROSE % CANE	SUCROSE YIELD T/HA
NITROGEN (N)			
N0	94	17,5	16,5
N1	124	17,3	21,5
N2	135	17,3	23,4
N3	141	16,8	23,7
N4	144	16,7	23,9
N5	139	16,8	23,4
LSD (0,05)*	9	0,5	1,9
(0,01)**	13	0,7	2,6
SIGNIFICANCE	**/*	*	**
POTASSIUM (K)			
K0	129	17,3	22,3
K1	131	17,1	22,3
K2	129	16,8	21,6
LSD (0,05)*	7	0,4	1,3
(0,01)**	9	0,5	1,8
SIGNIFICANCE	N.S	N.S.	N.S
TRIAL MEAN	130	17,1	22,1
S.E. SINGLE PLOT	7,6	0,4	1,5
CV %	5,9	2,6	7,0

Tons cane/ha/month at the N3 level is 11.3

Tons cane/ha/100 mm at the N3 level is 11.4

At this level the ratio of kg N per ton cane produced is 1.1

/3.....

4.2 Table II Treatment effects on stalk heights and populations at 4.6 and 8.0 months of age.

	STALK HEIGHTS (MM TO TVD)		STALK POPULATIONS X 1000/HA	
TREATMENT	4,6 m	8,0 m	4,6 m	8,0 m
NITROGEN				
N0	1260	2080	156	125
N1	1540	2450	149	142
N2	1690	2640	155	148
N3	1740	2670	160	148
N4	1760	2760	160	146
N5	1700	2710	162	146
POTASSIUM				
K0	1610	2580	156	144
K1	1630	2500	151	141
K2	1600	2620	154	145

4.3 Table III Third Leaf Analysis - Nitrogen and Potassium (% dm) Values

	AGE AT SAMPLING			
TREATMENT	2,0m Dec	3,2m Jan	4,0m Feb	4,8m Mar
NITROGEN				
N0	1,68**	1,49**	1,45**	1,46**
N1	2,17	1,76*	1,61**	1,65*
N2	2,36	1,99	1,76*	1,74
N3	2,38	2,00	1,82	1,89
N4	2,41	2,04	1,81	1,92
N5	2,46	2,05	1,87	1,97
POTASSIUM				
K0	1,31	1,39	1,39	1,33
K1	1,37	1,44	1,37	1,30
K2	1,40	1,44	1,45	1,35

* = Marginal)
** = Low) S.S.A. Thresholds

/4.....

4.4 Table IV Third Leaf Analysis - P % (dm) Values

	AGE AT SAMPLING			
TREATMENT	2,0M DEC	3,2M JAN	4,0M FEB	4,8M MAR
NITROGEN				
N0	0,21	0,18**	0,18**	0,19*
N1	0,22	0,20	0,19*	0,19*
N2	0,23	0,20	0,21	0,20
N3	0,23	0,20	0,20	0,20
N4	0,22	0,20	0,20	0,20
N5	0,22	0,19*	0,20	0,21

* = Marginal

** = Low

4.5 Table V Third Leaf Analysis - S % (dm) Values

	AGE AT SAMPLING			
TREATMENT	2,0M DEC	3,2M JAN	4,0M FEB	4,8M MAR
NITROGEN				
N0	0,15	0,15	0,13*	0,11**
N1	0,20	0,17	0,14	0,14
N2	0,21	0,19	0,15	0,13*
N3	0,23	0,19	0,16	0,14
N4	0,24	0,18	0,15	0,15
N5	0,24	0,19	0,17	0,16

* = Marginal

** = Low

/5.....

5. COMMENTS

5.1 Yields for this crop were better than that of the previous year as little lodging occurred in the 4th ratoon. CV % were low.

5.2 Nitrogen

- The large cane yield response from N0 to N1 suggests a decline in N mineralization potential in the zero N plots. This response supports the recommendations for higher N levels for older ratoons on these soils.
- Cane quality generally decreased with increasing N levels.
- Sucrose yields increased significantly at N1 and N2 and although there were higher yields obtained from the N3 and N4 treatments, the differences were not significant.
- Best cane growth was from the high N plots but differences were small for rates exceeding N1. Population densities were similar at 4,6 months of age but thereafter stalk mortality was greater in the N0 treatments.
- Third leaf N % (dm) values were low at some stage for all treatments below N3. The recommended rate of 140 kg N/ha would have undoubtedly maintained above threshold N % (dm) values as well as prevented deficiencies in third leaf P & S % (dm) values which are usually associated with inadequate nitrogen (See Table IV and V).
- From these results the current recommended N rate of 140 kg N/ha for older ratoons would have produced acceptable yields on these shallow 'R' set soils.

5.3 Potassium

- Soil K levels from samples taken before top-dressing show the nutrient to be in excess of the threshold (150 ppm) for all treatments including K0.
- On account of the high soil K levels neither cane yields, cane quality or sucrose yields were effected by additional potassium.
- Cane growth and stalk populations were fairly uniform for all K treatments.
- Third leaf K % (dm) values were extremely high at all sampling ages and imply that the nutrient is readily available at this site.
- Potassium responses are only envisaged once the K0 treatments have been depleted to below ±150 ppm. For this reason the trial is to continue beyond the normal three ratoons so that the K threshold may be more accurately ascertained.

/6.....

5.4 Phosphorus

* Soil P levels were above the threshold for ratoon cane but third leaf P % (dm) values were reduced with age and became marginal to low in the low N treatments. PDI values show this soil to be weakly P fixing.

5.5 Sulphur

* Third leaf S % (dm) values also diminished with age, becomming marginal to deficient in the low N plots.

5.6 Ripeners

* The whole trial was chemically ripened with Ethrel oversprayed with Fusilade Super and no comparisons with unripened cane were made.

5.7 * This trial has been re-established and is now in its 5th ratoon.

NBL/gj

23.04.1987

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

EXPERIMENT RESULT

CODE : NK 7/82/R SW SIM 'R'
CAT. NO.: 1392

TITLE : RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON A 'R' SET SOIL

1. PARTICULARS OF PROJECT

This crop	:	5th Ratoon
Site	:	Simunye Sugar Estate - Field 914
Region	:	Northern Irrigated (Swaziland)
Soil Set	:	'R'
Design	:	6 x 3 factorial 2 replications
Variety	:	NCo 376
Fertilizers	:	See Treatments

Soil Analysis : Date 25/11/86

pH	OM %	Clay %	PDI
6,45	-	>30	0,61

ppm

P	K	Ca	Mg	S
12	323	1226	477	23

K0 275
K1 306
K2 388

Age : 12,7 months

Date : 24/10/86 - 14/11/87

Irrigation 932 mm
Rainfall 646 mm
Total 1578 mm

2. OBJECTIVES

* To continue the investigation for optimum rates of nitrogen and potassium for older NCo 376 ratoons on 'R' set soils.

* To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on this soil set.

3. TREATMENTS

N (kg/ha)			K (kg/ha)		
N0	=	Nil	K0	=	Nil
N1	=	80	K1	=	150
N2	=	120	K2	=	300
N3	=	160			
N4	=	200			
N5	=	240			

Notes on Treatments

* Nitrogen as urea (46%N) was applied over the cane row as a single dressing ± 4 weeks after harvesting.

* Potassium as KCL (50%K) was applied over the cane row as a single dressing ± 4 weeks after harvesting.

* Phosphate was not applied to this crop.

* Ripener was not sprayed on this crop due to lodging.

* Sucrose samples were taken at harvest and consisted of 16 stalks taken at random from the cut bundles of each plot.

4. RESULTS

4.1 Crop growth measurements.

Table I. Treatment effects on stalk heights and populations at 2 and 4,5 months of age.

	STALK HEIGHTS (MM TO TVD)	STALK POPULATIONS x 1000/ha	
TREATMENT	4,5 mnths	2,0 mnths	4,5 mnths
Nitrogen			
N0	1590	244	194
N1	1610	264	203
N2	1500	272	196
N3	1600	264	200
N4	1550	244	189
N5	1490	219	189
Potassium			
K0	1550	270	198
K1	1560	240	192
K2	1550	243	195

4.2 Harvest results.

Table II. Treatment effects on cane yield, sucrose % cane and sucrose yield.

TREATMENT	CANE YIELD T/HA	SUCROSE % CANE	SUCROSE YIELD T/HA
Nitrogen (N)			
NO	130	15,6	20,4
N1	131	15,3	20,1
N2	126	15,7	19,8
N3	127	15,0	19,0
N4	129	15,4	19,8
N5	124	15,4	19,1
LSD (0,05)*	7	0,7	1,2
(0,01)**	9	0.9	1,6
Significance	*	*	*
Potassium (K)			
KO	127	16,0	20,2
K1	130	15,0	19,5
K2	127	15,2	19,3
LSD (0,05)*	5	0,5	0,8
(0,01)**	7	0,7	1,1
Significance	N.S	**	*
Trial Mean	128	15,4	19,7
S.E. Single Plot	5,6	0,5	1,0
CV %	4,4	3,6	4,8

4.3 Foliar Analysis.

Table III. Third leaf analysis - Nitrogen & Potassium (%dm).

	AGE AT SAMPLING			
TREATMENTS	2,4m (Jan)	3,3m (Feb)	4,4m (Mar)	5,3m(Apr)
Nitrogen (N)				
N0	2,60	1,97	1,72	1,67
N1	2,68	2,21	1,86	1,79
N2	2,70	2,21	1,87	1,83
N3	2,66	2,18	1,91	1,89
N4	2,66	2,17	1,91	1,84
N5	2,67	2,21	1,94	1,84
Potassium (K)				
K0	1,48	1,47	1,44	1,41
K1	1,55	1,56	1,46	1,40
K2	1,55	1,57	1,49	1,42

Table IV. Third leaf analysis - Sulphur (%dm) & Nitrogen-Sulphur ratios.

	AGE AT SAMPLING							
TREATMENTS	2,4m (Jan)		3,3m (Feb)		4,4m (Mar)		5,3m (Apr)	
Nitrogen (N)	S(%dm)	N/S	S(%dm)	N/S	S(%dm)	N/S	S(%dm)	N/S
N0	0,15	18	0,12*	16	0,11*	16	0,12*	14
N1	0,16	17	0,15	15	0,12*	15	0,13	13
N2	0,17	16	0,16	14	0,12*	15	0,14	13
N3	0,17	16	0,15	14	0,13	15	0,14	14
N4	0,18	15	0,16	14	0,13	15	0,14	13
N5	0,18	15	0,16	14	0,13	15	0,15	12

5. COMMENTS

5.1 Sufficient lodging took place to have an effect on yields.

5.2 Nitrogen.

* Stalk growth measurements and population counts showed insignificant differences between nitrogen treatments (Table I).

* Although there was visual evidence of N deficiency in the N0 and N1 plots throughout the growing cycle, cane yields were surprisingly high for these treatments. Differences between cane yields were negligible, and high nitrogen rates were possibly counter productive due to lodging.

* There was a varied effect on cane quality by increasing nitrogen but slightly higher sucrose % cane values were recorded from the lower N treatments.

* Sucrose yields were generally high due to good cane quality particularly in the low N treatments.

* The expected cane yield response to nitrogen did not occur owing to the different degrees of lodging that took place during late summer. Excessive growth of the high N plots during summer caused them to be more susceptible to lodging losses than the lower N treatment, which being erect at the end of summer, made full use of this soil's potential for the remainder of the season. This could be further reason to reduce N rates slightly on these high potential soils.

5.3 Potassium

* The soil K status for those plots which have not received potash for 5 years was still high at 275 ppm.

* Crop growth measurements and populations taken at 4,5 months of age showed no differences between potassium treatments.

* Cane yields were uneffected by the rates of K applied.

* The cane quality for the K0 treatments was significantly higher than where potassium had been applied.

* Sucrose yield differences were significant and followed similar trends to cane quality. Soil K levels will eventually be reduced to the point where crop will respond to fertilizer K. This may help to decide on a more meaningful K threshold for this soil.

* All the leaf sampling was carried out well into summer with the result that K(%dm) values were high.

5.4 Sulphur.

* Although S was well supplied in the soil, some low S(%dm) values were recorded from the lower N treatments. Nitrogen/Sulphur ratios were excessive for the low N treatments during January at 2,4 months of age.

5.5 This trial has been re-established and is to be harvested for the sixth time in October 1988. At this stage growth comparisons have shown little difference between any of the treatments.

NBL/cg

30/3/1988

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

EXPERIMENT RESULT

CODE: NK 7/82/R Sw SIM 'R'
CAT. NO. 1392

TITLE: RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON A 'R' SET SOIL

PARTICULARS OF PROJECT

This crop : 6th Ratoon
Site : Simunye Sugar Estate Field 914
Region : Northern Irrigated (Swaziland)
Soil Set : 'R'
Design : 6 x 3 factorial 2 replications
Variety : NCo376
Fertilizers : See treatments

Soil Analysis: Date 30/11/87

pH	OM%	Clay %	PDI
6,08	-	30	-

ppm

P	K	Ca	Mg	Zn	Fe	
17	352	1094	353	1,2	5,2	K0-269 K1-352 K2-435

Age : 9.6 months
Dates : 14/11/87 - 31/8/88
Irrigation :
Rainfall :
Total :

2. OBJECTIVES

2.1 To continue the investigation for optimum rates of nitrogen and potassium for older ratoons on 'R' set soils.

2.2 To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on this soil set.

3. TREATMENTS

N (kg/ha)		K (kg/ha)	
N0	= Nil	K0	= Nil
N1	= 80	K1	= 150
N2	= 120	K2	= 300
N3	= 160		
N4	= 200		
N5	= 240		

Notes on Treatments

* Nitrogen as urea (46%N) was applied over the cane row as a single dressing 3 weeks after harvesting.

* 40 Kg P/ha as single superphosphate (10,5 %P) was top-dressed over the entire trial 4 weeks after cutting.

* All potassium as KCL (50 %K) was top-dressed 3 weeks after harvesting.

* A ripener was not applied to this crop.

* Sucrose samples at harvest consisted of 20 stalks taken at random from the net plots.

4. RESULTS

4.1 Crop Growth measurements.

Table 1. Treatment effects on stalk heights and populations at 7 months of age.

TREATMENTS		STALK HEIGHTS (mm to TVD)	STALK POPULATIONS (x 1000/ha)
Nitrogen	N0	1900	149
	N1	2160	150
	N2	2190	159
	N3	2340	161
	N4	2290*	168
	N5	2240*	159
Potassium			
	K0	2150	157
	K1	2190	158
	K2	2200	158

* = some lodging in these treatments.

4.2 Harvest Results

Table 2. Treatment effects on cane yield, sucrose % and sucrose yield.

TREATMENT	CANE YIELD T/HA	SUCROSE % CANE	SUCROSE YIELD T/HA
Nitrogen (N)			
N0	76	14,8	11,2
N1	101	14,7	14,8**
N2	106	14,6	15,5
N3	112	14,3	16,1
N4	117	14,2	16,6
N5	111	14,1	15,6
LSD Nitrogen Means (0,05)*	9	0,5	1,4
(0,01)**	13	0,6	1,9
Significance	**	**	**
Potassium (K)			
K0	100	14,5	14,5
K1	105	14,5	15,2
K2	106	14,3	15,2
LSD Potassium Means (0,05)*	7	0,3	1,0
(0,01)**	9	0,4	1,4
Significance	N.S	N.S	N.S
Trial mean	104	14,4	15,0
S.E. Mean	7,6	0,4	1,2
CV %	7,3	2,6	7,8

4.3 Foliar Analysis

Table 3. Third leaf analysis - Nitrogen and Potassium (%dm)

	AGE AT SAMPLING		
TREATMENT	1,8m (Jan)	2,7m (Feb)	3,8m (Mar)
Nitrogen (N)			
N0	1,89	1,66*	1,53*
N1	2,19	1,91	1,59*
N2	2,34	2,02	1,76
N3	2,46	2,09	1,81
N4	2,40	2,12	1,90
N5	2,38	2,09	1,89
Potassium (K)			
K0	1,46	1,33	1,35
K1	1,57	1,37	1,38
K2	1,57	1,43	1,43

* = marginal to low.

Table 4. Third leaf analysis - Zinc (Zn) and Iron (Fe) (ppm) at 2,7 months of age.

TREATMENT	Zn (ppm)	Fe (ppm)
Nitrogen (N)		
N0	13,3*	129,7
N1	16,6	119,5
N2	18,0	123,7
N3	18,3	125,2
N4	18,2	127,7
N5	18,3	124,7

* = deficient

5. COMMENTS

5.1 Yields for this season were low due to the young cutting age. The N0 treatments are starting to produce the expected poor crop after 6 years with no fertilizer N applied.

5.2 Nitrogen

* Although cane yield differences were non-significant between adjacent treatments beyound N0, there did appear to be a general increase up to N4. But judging from the results of the N5 rate (Table 2) and growth measurement differences between treatments (Table 1) the optimum level would be around N3. This rate has been found to be close to optimum for older ratoons on these soils and nitrogen recommendations are being adjusted accordingly. However, in highly productive years yield benefits could be nullified due to heavy lodging losses on these productive soils.

* There was a significant linear decline in cane quality with increasing rates of nitrogen.

* As for cane yields, sucrose yields for the N1 rate were significantly higher than N0 but differences, although increasing for higher rates were not significant between treatments.

* Third leaf N (%dm) values were above the threshold only for rates above N1, at 3,8 months of age in November (Table 3).

5.3 Potassium

* The soil K status for these plots not having received potash for the last 6 years was still high at 269 ppm.

* Crop growth measurements at 7 months of age indicated slightly better growth from the K2 treatments (Table 1).

* There seemed to be a linear cane yield response to applied K which approached significance at both levels.

* Cane quality differences between treatments were non-significant.

* Sucrose yields were higher where K had been applied but differences were non-significant.

* Third leaf K (%dm) calues followed a similar trend to cane yields but at no stage were they below the threshold of 1,05 (%dm).

* This trial is to be maintained until soil potassium levels are depleted enough to cause significant K yield responses so that soil potassium threshold can be checked.

5.4 Zinc (Zn) and Iron (Fe)

* These nutrients were checked in the third leaf as some ratoon chlorosis was evident in the young 6th ratoon crop. Table 4 shows the Zn and Fe status in the third leaf at 2,7 months of age, when Fe (ppm) values were well in excess of the threshold (± 70 ppm) despite low soil levels while Zn (ppm) were low in treatments having received little or no nitrogen.

* The following crop has had half plots treated with a 1% micro-nutrient solution of zinc and manganese sulphate to determine response and possible interactions with N and K.

5.5 This trial has been re-established and is now in it's 7th ratoon.

NBL/cg
Feb. 1989.

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

EXPERIMENT RESULT

Code: NK7/82/Sw SIM 'R'

CAT.NO.: 1392

TITLE: RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON A 'R' SET SOIL

1. PARTICULARS OF PROJECT

This crop	: 7th ratoon
Site	: Simunye Sugar Estate Field 914
Region	: Northern Irrigated [Swaziland]
Soil Set/Series	: 'R '/ Rondspring
Design	: 6 * 3 factorial 2 replications with split plots
Variety	: NCo376
Fertilizer	: See treatments

Soil Analysis: Date 28/10/1988

pH	OM %	Clay %	P.D.I.
6.48	-	29	-

ppm

P	Ca	Mg	S	Zn	
19	1381	468	-	-	K0 = 230
					K1 = 333
					K2 = 413

Age : 13 months

Dates : 31/8/88 - 3/10/89

Rainfall :

Irrigation :

Total :

2. OBJECTIVES

2.1 To determine the optimum levels of N and K for older ratoon cane on a deep 'R' set soil

2.2 To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on this soil set

2.3 To test the response of cane to a 1% micronutrient solution of zinc and manganese sulphate and determine possible interactions with N and K

3. TREATMENTS

Whole Plots

N (kg/ha)				K (kg/ha)
N0	- Nil	N3	- 160	K0 - Nil
N1	- 80	N4	- 200	K1 - 150
N2	- 120	N5	- 240	K2 - 300

Sub-Plots

Zn + Mn 0 - Nil
Zn + Mn 1 - 1% solution

Notes on Treatments

* Nitrogen was applied as urea (46% N) in a single top dressing approximately 4 weeks after harvest.
* Phosphate as single supers (10.5% P)@ 40kg P/ha was applied 6 weeks after harvesting.
* Potassium as muriate of potash (50% K) was applied 6 weeks after harvest.
* Zinc and manganese sulphate were applied separately in a 1 % solution using a knapsack. (16 kg Zn/ha and 14 kg Mn/ha respectively)

* All fertilizer was banded by hand over the cane row.

4. RESULTS

4.1 Growth Data

Table 1: Treatment Effects on Stalk Heights and Population at 6 and 7.5 Months of Age

Treatments	Stalk Height (cm to TVD) 6 m	7.5 m	Population (X 1000/Ha) 6 m
No 0 kg N/Ha	80	171	223
N_1 80 kg N/Ha	114	226	217
N_2 120 kg N/Ha	123	238	232
N_3 160 kg N/Ha	129	257	226
N_4 200 kg N/Ha	136	269	238
N_5 240 kg N/Ha	132	262	234
Ko 0 kg K/Ha	117	232	227
K_1 150 kg K/Ha	120	243	234
K_2 300 kg K/Ha	120	236	226

4.2 Harvest Data

Table 2: Cane Yield, Sucrose % Cane and Sucrose Yield

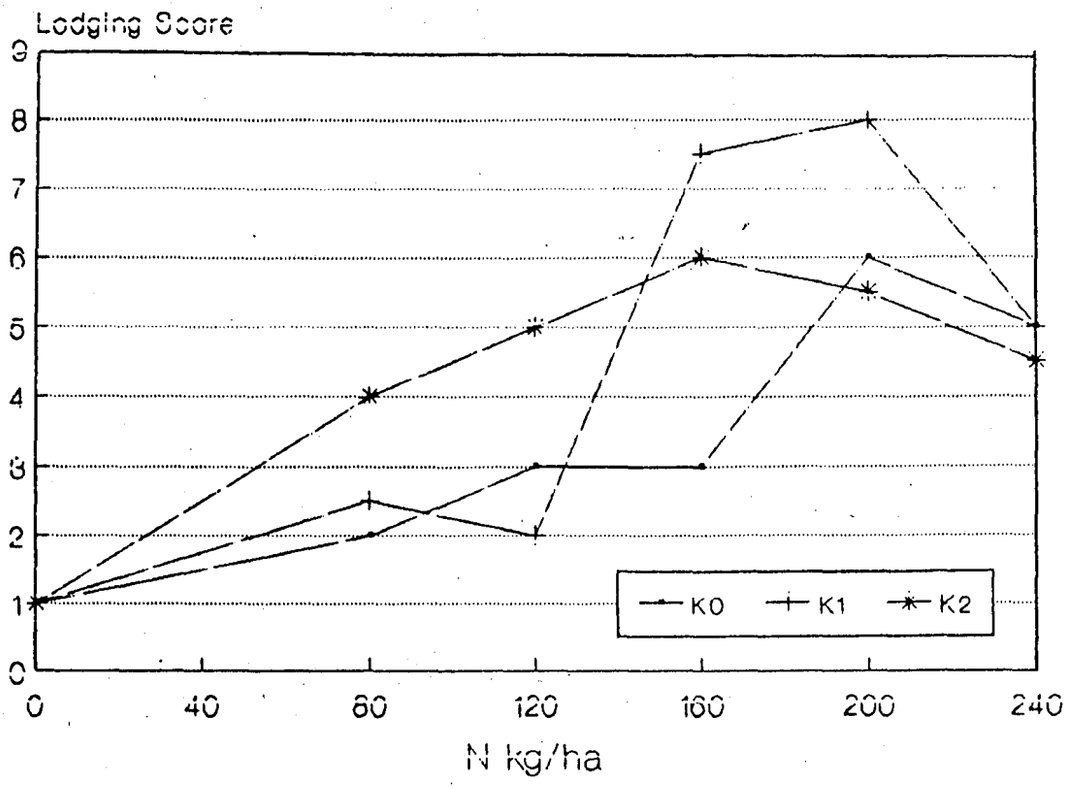
Treatments	T Cane/Ha	% Sucrose	T Suc/Ha
N_0 0 kg N/Ha	74	16.86	12.5
N_1 80 kg N/Ha	116	16.90	19.5
N_2 120 kg N/Ha	130	16.86	21.9
N_3 160 kg N/Ha	138	16.36	22.5
N_4 200 kg N/Ha	150	15.59	23.4
N_5 240 kg N/Ha	143	15.91	22.8
LSD N Means (0.05)*	9	0.61	1.6
(0.01)**	13	0.83	2.3
Significance	**	**	**
K_0 0 kg K/Ha	123	16.68	20.5
K_1 150 kg K/Ha	128	16.36	20.9
K_2 300 kg K/Ha	124	16.21	19.9
LSD K Means (0.05)*	6.5	0.43	1.2
(0.01)**	9	0.59	1.6
Significance	NS	NS	NS
Interaction N x K	NS	NS	NS
Zn + Mn - 0	126	16.48	20.6
Zn + Mn - 1	124	16.38	20.2
LSD Zn Means (0.05)*	3	0.33	0.5
(0.01)**	4	0.46	0.7
Interaction Zn * N * K	NS	NS	NS
Significance	NS	NS	NS
Mean Trial	125	16.41	20.4
SE	11	0.70	1.9
CV %	6	3.00	6.6

4.3 Foliar Analysis

Table 3: Third Leaf Analysis (% dm) at 4 Months of Age

TREATMENTS	N	K	P	S	Ca	Mg	Zn/ppm
N0 0 kg N/ha	1.35[D]	1.07	0.18[D]	0.14	0.20	0.16	14.7
N1 80 kg N/ha	1.54[D]	1.28	0.19[M]	0.16	0.20	0.15	15.5
N2 120 kg N/ha	1.63[D]	1.36	0.19[M]	0.16	0.20	0.16	17.3
N3 160 kg N/ha	1.73	1.49	0.20	0.17	0.19	0.16	16.5
N4 200 kg N/ha	1.78	1.54	0.19[M]	0.17	0.20	0.16	16.8
N5 240 kg N/ha	1.87	1.53	0.20	0.18	0.20	0.17	18.7
LSD Treatment							
(0.05)*	0.076	0.078	0.011	0.0078	0.015	0.013	1.6
(0.01)**	0.10	0.11	0.015	0.011	0.021	0.019	2.2
Significance	**	**	**	**	**	**	**
K0 0 kg K/ha	1.63	1.30	0.19	0.17	0.21	0.16	17.0
K1 150 kg K/ha	1.64	1.42	0.20	0.17	0.19	0.16	16.3
K2 300 kg K/ha	1.68	1.42	0.19	0.16	0.19	0.16	16.4
LSD Treatment							
(0.05)*	0.054	0.055	0.0080	0.0055	0.011	0.0096	1.6
(0.01)**	0.074	0.076	0.011	0.0076	0.015	0.013	2.3
Significance	NS	**	NS	NS	NS	NS	NS
Mean	1.65	1.38	0.19	0.17	0.20	0.16	16.6
S.E.	0.062	0.064	0.0092	0.0064	0.012	0.011	1.9
C.V. %	3.8	4.7	4.8	3.9	6.3	7.0	11.6

Figure 1: The Effect of Treatment on Cane Lodging



5. COMMENTS

5.1 General

* Cane yields at this site was on average very similar to those for the last three season.

* The interaction between N, K and micronutrients was not significant in this trial (Table 1). The effect of N and K can therefore be examined separately.

5.2 Nitrogen

5.2.1 Harvest data

* Cane Yield

The cane yield response to N was highly significant (Table 2) and resulted from increases in both stalk height and population (Table 1).

The highest response to N was achieved at a rate of 200 kg N/ha and cane yield was twice that of the control. The optimum rate appears to be closer to 160 kg N/ha than 200 kg N/ha as the difference in yield between these two rates was only just greater than the L.S.D. (P = 0.05).

* Quality

Sucrose % in this trial was high on average (16.4%) but rates equal or in excess of 160 kg N/ha resulted in a significant reduction in quality. This may have been due to the tendency of the cane to lodge with increasing levels of N (Fig 1).

* Sucrose yield

The effect of N treatment on sucrose yield was highly significant (table 2) and reflected the effect of N on cane yield. However, due to the negative effect of N on quality the increase in response from 120 kg N/ha to 200 kg N/ha was no longer significant. This confirms that a rate of 160 kg N/ha was closer to the economical optimum than 200 kg N/ha.

5.2.2 Foliar analysis

The N treatments were found to induce significant difference in the third leaf content of all nutrients, except that of Ca and Mg (Table 3). The uptake of N, K, S and Zn tended to increase with increasing rates of N whereas the uptake of P, although stimulated by N, was not sensitive to the actual rate of N. This is possibly because of the marginal status of P in this trial.

At four months of age in January, plots which had received no N or low rates of N showed the N content in the third leaf to be deficient. Leaf-N for rates associated with high yielding treatments (from 160 kg N/ha to 240 kg N/ha) was above threshold.

5.3 Potassium

5.3.1 Harvest data

* Cane yield

The overall effect of K fertilisation on cane yield was not significant (Table 2). There was a tendency however for the yield of cane to be higher were 150 kg K/ha had been applied. This was a reflection of the higher stalk heights and populations recorded in these treatments (Table 1).

* Quality

  The sucrose % tended to decrease with increasing rates of K and where 300 kg K/ha had been applied quality was significantly ($p = 0.05$) lower than in the control. This may have been due to the tendency of cane to lodge more with increasing rates of K (Fig 1).

* Sucrose yield

  The negative effect of K application on quality nullified any positive effect K might have had on cane yield and consequently there was no difference in sucrose yield between K treatments in this trial.

5.3.3 Foliar analysis

Except for K, the content of nutrients in third leaf were not sensitive to the addition of potash. Although leaf-K was increased by potash treatment, addition of K was ineffective in this trial since the K content in the control treatments was above threshold.

5.4 **Zinc and Manganese**

None of the variables, cane yield, sucrose % or sucrose yield responded to the micronutrient application.

6. CONCLUSION

The results of this trial suggested that in terms of sucrose yield, the optimum rate of N for an older ratoon crop growing on a 'R' set soil is 160 kg N/ha. This confirms that the current recommendations of 160 kg N/ha is adequate.

It was confirmed that for cane grown on a 'R' set soil and cut mid season, a level of exchangeable soil-K of 230 ppm, is sufficient to meet the potash requirement of the crop.

PCH/aw/ynm
30 May 1990

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

CODE: NK7/82/SW SIM 'R'

EXPERIMENT RESULT

CAT. NO: 1392

TITLE: RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON A 'R' SET SOIL

1. PARTICULARS OF PROJECT

This crop	: 8th ratoon
Site	: Simunye Sugar Estate Field 914
Region	: Northern Irrigated [Swaziland]
Soil Set/Series	: 'R' / Rondspring
Design	: 6 * 3 factorial 2 replications
Variety	: NCo376
Fertilizer	: N & K:See treatments P: 40 kg ha^{-1}

Soil Analysis: Date 17/10/1989

pH	OM%	Clay%	Silt%	Sand%
6.31	-	27	6	68

ppm

P	K	Ca	Mg	Mn	Zn
28	K0=242	1177	438	126	1.4
	K1=350	1095	398		
	K2=480	1092	380		

Age : 11.75 months

Dates : 3/10/89 - 27/09/90

Rainfall : 580 mm

Irrigation : 720 mm

Total : 1300 mm

2. OBJECTIVES

2.1 To determine the optimum levels of N and K for older ratoon cane on a deep 'R' set soil

2.2 To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on this soil set

3. TREATMENTS

Nitrogen (kg/ha)	Potassium (kg/ha)
N0 - Nil	K0 - Nil
N1 - 80	K1 - 150
N2 - 120	K2 - 300
N3 - 160	
N4 - 200	
N5 - 240	

Notes on Treatments

* Nitrogen as Urea (46 % N) and Potassium as muriate of potash (50 % K) were applied as a single top dressing on 30/10/1989.

* Phosphorous as Single Supers (10.5% P)@ 40kg P/ha was applied on 22/11/1989.

* All fertilizer was banded by hand over the cane row.

4. RESULTS

4.1 Harvest Data

Table 1: Cane Yield, Sucrose % Cane and Sucrose Yield

Treatment	Tons Cane/ha	Suc % Cane	Tons Suc/ha
N0 0kg N/ha	79	15.77	12.4
N1 80kg "	108	16.26	17.6
N2 120kg "	120	16.81	20.9
N3 160kg "	134	16.13	21.6
N4 200kg "	134	15.82	21.2
N5 240kg "	128	16.03	20.5
LSD N Means			
(0.05)	15	1.07	2.5
(0.01)	21	1.47	3.4
Significance	**	NS	**
K0 Control	119	16.19	19.2
K1 150kg K/ha	119	16.23	19.3
K2 300kg K/ha	114	15.99	18.2
LSD K Means			
(0.05)	11	0.76	1.8
(0.01)	15	1.04	2.4
Significance	NS	NS	NS
Interaction N x K	NS	NS	NS
Mean Trial	117	16.14	18.9
SE	12	0.89	2.0
CV %	10.5	5.5	10.8

4.2 Leaf Analysis

Table 2: Third Leaf Analysis (% dm) at 3 months of age in January

TREATMENTS	N	P	K	S	Ca	Mg	Zn(ppm)
N0 0 kg N/ha	1.37	0.19	1.02	0.16	0.20	0.14	12.7
N1 80 kg "	1.59	0.18	1.30	0.17	0.20	0.14	13.0
N2 120 kg "	1.79	0.19	1.45	0.18	0.21	0.16	15.2
N3 160 kg "	1.98	0.20	1.49	0.19	0.21	0.17	19.5
N4 200 kg "	2.02	0.20	1.52	0.19	0.21	0.16	20.0
N5 240 kg "	2.03	0.19	1.48	0.19	0.21	0.17	20.3
LSD N 0.05	0.11	0.011	0.14	0.009	0.025	0.017	2.4
0.01	0.15	0.015	0.19	0.012	0.035	0.023	3.3
Significance	**	*	**	**	NS	**	**
K0 0 kg K/ha	1.74	0.19	1.25	0.18	0.22	0.17	17.7
K1 150 kg K/ha	1.80	0.19	1.40	0.18	0.21	0.16	15.6
K2 300 kg K/ha	1.84	0.19	1.49	0.18	0.20	0.15	17.1
LSD K 0.05	0.078	0.0079	0.098	0.0061	0.018	0.012	1.7
0.01	0.11	0.011	0.13	0.0083	0.025	0.016	2.3
Significance	*	NS	**	NS	NS	**	*
Interaction	*	NS	NS	NS	NS	NS	NS
Mean	1.80	0.19	1.38	0.18	0.21	0.16	16.8
S.E. One Plot	0.092	0.0091	0.11	0.0072	0.021	0.014	2.0
CV %	5.1	4.8	8.2	4.0	10.2	8.6	11.7

Table 3: The effect of N x K on third leaf content of N (%dm)

Treatments	N_0	N_1	N_2	N_3	N_4	N_5
K_0	1.31	1.56	1.78	1.93	1.85	2.02
K_1	1.43	1.59	1.69	1.85	2.09	2.14
K_2	1.36	1.61	1.91	2.15	2.11	1.92

5. COMMENTS

5.1 General

The yield of cane in this trial was similar to the last four ratoons. The interaction between N and K in the harvest data was non significant (Table 1), allowing for the main effects of N to be examined separately from the effects of K.

5.2 Nitrogen

5.2.1 Cane Yield

The effect of N on cane yield was highly significant (Table 1). Cane yield increased with increasing rates of N. The optimum rate of N appeared to be 160 kg ha^{-1} and yield tended to be reduced by the highest rate of N.

5.2.2 Cane Quality

The effects of N application on sucrose content were variable and non significant.

5.2.3 Sucrose Yield

The effect of N on sucrose yield was highly significant and reflected the effects on cane yield. The sucrose yield curve reached its maximum at 160 kg N ha^{-1} although the optimum rate appeared to be nearer 140 kg N ha^{-1}.

5.3 Potassium

5.3.1 Cane Yield

There were no statistically significant differences in cane yield between K treatments although yield tended to be lower at the high rate of K. The absence of response is not surprising as the soil-K status in the control was well in excess of F.A.S. threshold for these soils (150 ppm).

5.3.2 Cane Quality

The effects of K application on sucrose content were variable and non significant.

5.3.3 Sucrose Yield

Sucrose yield reflected the effect of K on cane yield and tended to be lower for the high rate of K application than for the control or intermediate level. The difference again was not significant (Table 1).

5.4 Leaf Analysis

The interaction between N and K was significant for the leaf content of N and the specific effects of the different N and K combinations are shown in Table 3.

Nitrogen uptake increased linearly with increasing rate of N at both K_0 and K_1 levels of Potassium. The difference in N uptake between the K_0 and K_1 were generally not significant.

At the high rate of K (K_2), N uptake increased until a maximum was reached at 160 kg N ha^{-1} and was depressed thereafter. It is clear that the high rate of K stimulated N uptake in the intermediate range of N application (120 - 200 kg N ha^{-1}).

The nitrogen treatments induced significant differences in the third leaf content of all other nutrients except for Calcium (Table 2). Uptake of nutrients generally tended to increase with increasing rates of N except for P where responses were variable. Nitrogen and Zn were found to be below threshold in the control and lowest rate of N.

The Potassium treatments significantly increased the uptake of N and K and reduced the uptake of Mg.

6. CONCLUSION

* Results of this 8th ratoon showed that the optimum rate of N for sucrose yield appeared to be approximately 140 kg N ha^{-1} which is slightly lower than current recommendation.

* Soil- Potassium status in the control plots of this soil after seven years of cropping have decreased from an initial level of 345 ppm to 242 ppm. At the current rate of depletion it is likely that another six to seven ratoons will be needed before response to K will become apparent.

* This trial has been continued and is now in its 9th ratoon.

PCH/AGK/fjs
15 May 1991

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

EXPERIMENT RESULT

CODE: NK7/82/SW SIM 'R'

CAT.NO.: 1392

TITLE: RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON AN 'R' SET SOIL

1. PARTICULARS OF PROJECT

This crop	: 9th ratoon
Site	: Simunye Sugar Estate Field 914
Region	: Northern Irrigated [Swaziland]
Soil Set/Series	: 'L' / Lesibovu
Design	: 6 * 3 factorial 2 replications
Variety	: NCo376
Fertilizer	: N & K:See treatments P: 0 kg ha^{-1}

Soil Analysis: Date 05/10/1990

pH	OM%	Clay%	Silt%	Sand%
6.18	1.75	27	6	68

ppm

P	K	Ca	Mg	(Ca+Mg)/K
42	K_0=217	1279	444	8
	K_1=330	1204	389	
	K_2=452	1126	373	

Age : 11.0 months

Dates : 27/09/90 - 22/08/91

Rainfall : ?

Irrigation : Full

Total :

2. OBJECTIVES

2.1 To determine the optimum levels of N and K for older ratoon cane on a deep 'L' set soil

2.2 To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on this soil set

3. TREATMENTS

Nitrogen (kg/ha)	Potassium (kg/ha)
N0 - Nil	K0 - Nil
N1 - 80	K1 - 150
N2 - 120	K2 - 300
N3 - 160	
N4 - 200	
N5 - 240	

Notes on Treatments

* Nitrogen as Urea (46 % N) and Potassium as muriate of potash (50 % K) were applied as a single top dressing on 11/10/1990, one week after harvest.

* Nitrogen was banded on the cane row while potassium was broadcast on the soil surface.

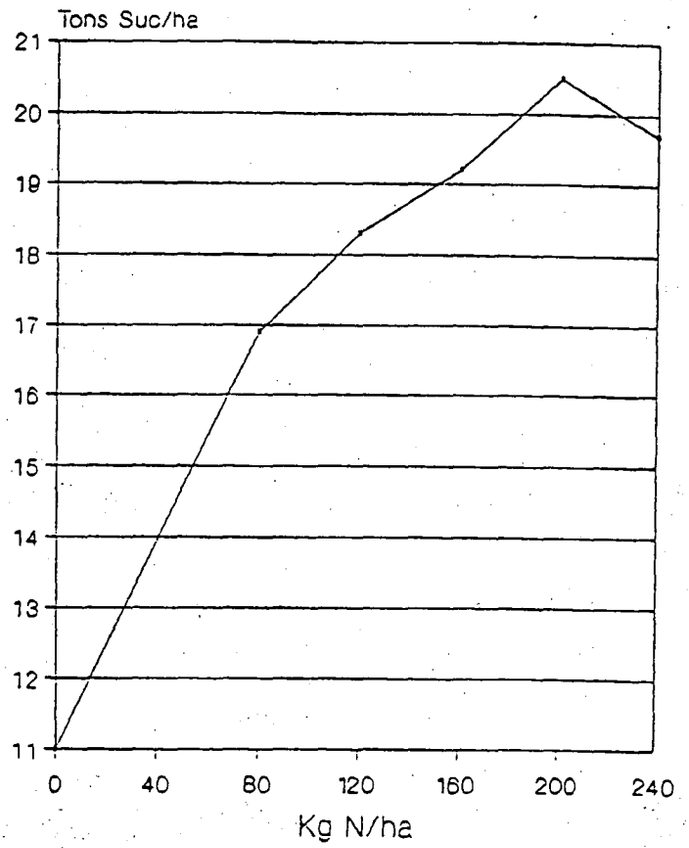
4. RESULTS

4.1 Harvest Data

Table 1: Cane Yield, Sucrose % Cane and Sucrose Yield

Treatment	Tons Cane/ha	Suc % Cane	Tons Suc/ha
N0 0kg N/ha	73	14.99	11.0
N1 80kg "	113	14.87	16.9
N2 120kg "	123	14.90	18.3
N3 160kg "	133	14.34	19.2
N4 200kg "	139	14.68	20.5
N5 240kg "	132	14.86	19.7
LSD N Means			
(0.05)	8	0.58	1.3
(0.01)	11	0.79	1.7
Significance	**	NS	**
K0 Control	117	14.99	17.5
K1 150kg K/ha	123	14.66	17.9
K2 300kg K/ha	118	14.67	17.3
LSD K Means			
(0.05)	6	0.41	0.9
(0.01)	8	0.56	1.2
Significance	NS	NS	NS
Interaction N x K	NS	NS	NS
Mean Trial	119	14.77	17.6
SE	7	0.47	1.0
CV %	6	3.2	5.9

Figure 1: Yield response to applied Nitrogen



4.2 Leaf Analysis

Table 2: Third Leaf Analysis (% dm) at 3.5 months in January

Treatments	N	P	K	S	Ca	Mg	Zn(ppm)
N_0 0 kg N/ha	1.32^D	0.18	1.01	0.16	0.21	0.14	12.0
N_1 80 kg "	1.41^D	0.19	1.22	0.17	0.21	0.15	12.8
N_2 120 kg "	1.56^D	0.20	1.34	0.18	0.22	0.15	13.0
N_3 160 kg "	1.61^D	0.20	1.39	0.19	0.22	0.15	14.7
N_4 200 kg "	1.76	0.22	1.46	0.19	0.22	0.17	15.8
N_5 240 kg "	1.82	0.21	1.49	0.19	0.21	0.16	16.5
LSD N (0.05)	0.089	0.019	0.12	0.013	0.018	0.015	1.8
(0.01)	0.12	0.026	0.17	0.018	0.025	0.021	2.5
Significance	**	**	**	**	NS	**	**
K_0 0 kg K/ha	1.57	0.21	1.22	0.19	0.23	0.16	14.6
K_1 150 kg K/ha	1.59	0.21	1.34	0.17	0.21	0.16	13.9
K_2 300 kg K/ha	1.57	0.19	1.41	0.18	0.20	0.14	13.9
LSD K (0.05)	0.063	0.013	0.087	0.009	0.013	0.011	1.3
(0.01)	0.086	0.018	0.12	0.012	0.018	0.015	1.8
Significance	NS	*	**	*	**	**	NS
Interaction	NS	NS	NS	NS	NS	NS	NS
Mean	1.58	0.20	1.32	0.18	0.21	0.15	14.4
S.E. One Plot	0.072	0.015	0.10	0.011	0.015	0.012	1.5
CV %	4.6	7.6	7.7	6.0	7.1	8.1	10.6

D: Deficient

Table 3: Third Leaf Analysis (% dm) at 5.0 months in February

Treatments	N	P	K	S	Ca	Mg	Zn(ppm)
N_0 0 kg N/ha	1.49^D	0.17	1.11	0.16	0.23	0.14	11.3
N_1 80 kg "	1.47^D	0.18	1.25	0.16	0.22	0.14	11.7
N_2 120 kg "	1.58^D	0.18	1.30	0.16	0.22	0.15	13.5
N_3 160 kg "	1.58^D	0.20	1.37	0.16	0.23	0.15	12.0
N_4 200 kg "	1.80	0.21	1.42	0.17	0.22	0.16	14.0
N_5 240 kg "	1.75	0.20	1.42	0.17	0.22	0.16	14.5
LSD N (0.05)	0.082	0.021	0.088	0.014	0.014	0.016	1.4
(0.01)	0.11	0.029	0.12	0.019	0.019	0.023	1.9
Significance	**	*	**	NS	NS	NS	**
K_0 0 kg K/ha	1.61	0.20	1.26	0.17	0.23	0.15	13.1
K_1 150 kg K/ha	1.64	0.19	1.33	0.16	0.22	0.15	12.8
K_2 300 kg K/ha	1.59	0.18	1.35	0.16	0.22	0.14	12.6
LSD K (0.05)	0.058	0.015	0.062	0.010	0.010	0.012	1.0
(0.01)	0.080	0.021	0.086	0.013	0.013	0.016	1.4
Significance	NS	NS	*	NS	NS	NS	NS
Interaction	NS	NS	NS	NS	NS	NS	NS
Mean	1.61	0.19	1.31	0.16	0.22	0.15	12.8
S.E. One Plot	0.068	0.017	0.072	0.011	0.011	0.013	1.17
CV %	4.2	9.2	5.5	7.0	5.1	9.1	9.1

D: Deficient

5. COMMENTS

5.1 General

The interaction between N and K in the harvest data was non-significant (Table 1), allowing for the effects of N to be examined separately from the effect of K.

5.2 Soil Analysis

Texture analysis showed the clay content of the soil to be low for a Rondspring. A visual assessment of the soil confirmed that the original classification was incorrect and the soil was an 'L' set.

Method of potassium fertilizer application in this ratoon was changed from top-dressing on the cane row to broadcasting. Soil sampling method was also changed and consisted of 40 cores taken from each plot at a ratio of 16 on the row to 24 interow (ie. 1:1.5 instead of 1:8).

Soil-K status in the control was higher than FAS threshold for soils with less than 30% clay and the (Ca + Mg)/K ratio was low indicating that responses to K fertilization were unlikely.

5.3 Nitrogen

5.3.1 Cane yield

The effect of N on cane yield was highly significant (Table 1). Cane yield increased with increasing rate of N up to 200 kg N ha^{-1} and thereafter tended to be reduced by the highest rate.

5.3.2 Cane Quality

The effect of N application on sucrose content were variable and non significant.

5.2.3 Sucrose Yield

The effect of N on sucrose yield was highly significant and reflected effects on cane yield. The sucrose yield curve reached a maximum at 200 kg N ha^{-1} (Fig. 1).

5.4 Potassium

5.4.1 Cane Yield

The low rate of K application (150 kg K ha^{-1}) appeared to have increased cane yield significantly (Table 1). This difference, however, might not be real in view of the fact that the high rate produced cane yield similar to the control.

5.4.2 Cane Quality

K application tended to reduce sucrose content but effects were not significant.

5.4.3 Sucrose Yield

The opposing effect of K on cane yield and sucrose content resulted in no statistically significant difference in sucrose yield between K treatments.

5.5 Leaf Analysis

N content in treatments N_0 to N_3 were deficient at 3 months of age. Increasing the rate of N produced significant increases in the uptake of all nutrients except Ca (Table 2 and 3).

K treatments significantly increased uptake of K and at 3.5 months reduced the uptake of all other nutrient except N.

6. CONCLUSION

* Results of this 9th ratoon showed the optimum rate of N to be 200 kg N ha^{-1}. This is higher than previously recorded at this site and is higher than the current recommendation of 160 kg N ha^{-1}.

* Soil potassium level in the control treatment was well above the current threshold value of 112 ppm for these soils and a response to K was not expected.

* This trial has been continued and is now in its 10th ratoon.

PCH/fkd
18.02.92

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

EXPERIMENT RESULT

CODE: NK7/82/SW SIM 'R'
CAT No: 1392

TITLE: RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON AN 'R' SET SOIL

1. PARTICULARS OF PROJECT

This crop	: 10th ratoon
Site	: Simunye Sugar Estate Field 914
Region	: Northern Irrigated (Swaziland)
Soil Set/Series	: 'L '/ Lesibovu
Design	: 6 * 3 factorial 2 replications
Variety	: NCo376
Fertilizer (total kg/ha)	: N & K See treatments P: 0 kg ha^{-1}

Soil Analysis: Date 18/02/1992

pH	OM%	Clay%	Silt%	Sand%
6.4	1.75	32	6	61

ppm

P	K	Ca	Mg	(Ca+Mg)/K
26	K_0=163	1376	497	11
	K_1=240			
	K_2=377			

Age : 11.9 months
Dates : 22/08/91 - 18/08/92

Rainfall : 339 mm
Irrigation : 1252 mm
Total : 1591 mm

2. OBJECTIVES

2.1 To determine the optimum levels of N and K for older ratoon cane on a deep 'L'/'R' set soil.

2.2 To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on this soil set

3. TREATMENTS

Nitrogen (kg/ha)	Potassium (kg/ha)
N0 - Nil	K0 - Nil
N1 - 80	K1 - 150 (residual)
N2 - 120	K2 - 300 (residual)
N3 - 160	
N4 - 200	
N5 - 240	

3.1 Notes on Treatments

* Nitrogen as Urea (46 % N) was banded in the cane row on 4/9/1991, two weeks after harvest.

* No potassium was applied in this crop, in order to observe the residual effect of previous applications.

3.2 Notes on Soil Sampling

Topsoil: 40 cores were taken in each plot at a ratio of 16 on row to 24 interow (ie. 1:1.5)

4. RESULTS

4.1 Soil Analysis

Table 1: K, Ca and Mg Status (ppm) of the Topsoil - February 1992

Treatment	K	Ca	Mg	(Ca+Mg)/K
	ppm			
K_0 Control	163	1376	497	12.4
K_1 150 kg K ha^{-1}	240	1303	470	8.0
K_2 300 kg K ha^{-1}	377	1268	405	5.5
LSD (0.05)	85	136	52	2.1
Significance	**	NS	**	**
Mean	260	1316	457	8.7
SE Difference	40.4	64.3	24.8	1.0
CV %	38.0	12.0	13.3	28.1

4.2 Leaf Analysis

Table 2: Third Leaf Analysis (% dm) at Various Ages

Treatments	November (3.1 months)					December (3.6 months)					January (4.5 months)				
	N	P	K	Ca	Mg	N	P	K	Ca	Mg	N	P	K	Ca	Mg
N_0 0 kg N ha^{-1}	2.04	0.26	1.19	0.28	0.16	1.79	0.21	1.16	0.20	0.17	1.76	0.22	1.41	0.25	0.18
N_1 80 kg "	2.19	0.25	1.32	0.27	0.17	1.82	0.21	1.24	0.25	0.18	1.70	0.20	1.12	0.25	0.17
N_2 120 kg "	2.43	0.26	1.42	0.29	0.19	2.02	0.21	1.38	0.21	0.19	1.73	0.22	1.17	0.26	0.18
N_3 160 kg "	2.37	0.25	1.38	0.28	0.19	2.15	0.21	1.27	0.23	0.22	1.81	0.21	1.26	0.24	0.20
N_4 200 kg "	2.36	0.25	1.36	0.30	0.19	2.18	0.21	1.37	0.22	0.21	1.76	0.20	1.26	0.29	0.20
N_5 240 kg "	2.45	0.25	1.37	0.31	0.19	2.19	0.20	1.41	0.24	0.20	1.75	0.20	1.24	0.28	0.20
LSD (0.05)	0.20	0.02	0.21	0.05	0.04	0.16	0.02	0.20	0.05	0.04	0.13	0.02	0.12	0.05	0.02
Significance	**	NS	NS	NS	NS	**	NS	NS	NS	*	NS	NS	**	NS	NS
SE Difference	0.09	0.01	0.10	0.03	0.02	0.08	0.01	0.10	0.03	0.02	0.06	0.01	0.05	0.03	0.01
K_0 0 kg K ha^{-1}	2.32	0.26	1.23	0.29	0.21	2.04	0.21	1.13	0.23	0.22	1.76	0.21	1.15	0.27	0.20
K_1 150 kg "	2.29	0.25	1.34	0.29	0.18	2.00	0.21	1.34	0.22	0.19	1.80	0.21	1.31	0.26	0.19
K_2 300 kg "	2.30	0.25	1.45	0.28	0.16	2.04	0.21	1.44	0.23	0.18	1.70	0.21	1.28	0.25	0.17
LSD (0.05)	0.14	0.01	0.15	0.04	0.03	0.12	0.01	0.14	0.04	0.03	0.09	0.02	0.08	0.04	0.02
Significance	NS	NS	*	NS	**	NS	NS	**	NS	**	NS	NS	**	NS	**
SE Difference	0.07	0.01	0.07	0.02	0.01	0.05	0.01	0.07	0.02	0.01	0.04	0.01	0.04	0.02	0.01
Interaction	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Mean	2.30	0.25	1.34	0.29	0.18	2.03	0.21	1.30	0.23	0.20	1.75	0.21	1.24	0.26	0.19
CV %	1.7	6.3	12.9	15.5	13.7	6.6	6.6	12.9	18.6	13.4	6.3	9.2	7.8	15.5	11.3

4.3 Harvest Data

Table 3: Cane Yield, Sucrose % Cane and Sucrose Yield

Treatment	Tons Cane/ha	Suc % Cane	Tons Suc/ha
N0 0kg N ha^{-1}	92	15.29	14.2
N1 80kg "	103	15.25	15.7
N2 120kg "	112	15.56	17.4
N3 160kg "	125	14.95	18.7
N4 200kg "	128	14.30	18.5
N5 240kg "	119	14.18	17.1
LSD (0.05)	22	1.30	4.1
Significance	*	NS	NS
SE Difference	10.5	0.62	1.9
K_0 Control	111	14.99	16.6
K_1 150kg K ha^{-1}	116	14.93	17.3
K_2 300kg K ha^{-1}	113	14.85	16.9
LSD (0.05)	16	0.92	2.9
Significance	NS	NS	NS
SE Difference	7.4	0.44	1.4
Interaction	NS	NS	NS
Mean	113	14.92	16.9
CV %	16.1	7.2	19.7

5. COMMENTS

5.1 General

No statistically significant interaction was observed between N and K in either the leaf or the harvest data (table 2 & 3). As result of this, the influence of N and K can be examined separately. Some plots in this trial were badly affected by the drought in 1992 and '93/94 harvest results would have to be looked at carefully.

5.2 Soil Analysis

As result of high levels of k measured in the soil in the previous season, it was decided not to apply any K fertilizer during this crop. K levels measured in the control plots were still higher than the FAS threshold of 150 ppm (32 % clay). As result of this, no yield response was expected (table 1). K levels in the treatments differed significantly (P = 0.05) Ca+Mg/K ratios were below the level of 26 proposed for summer cut cane, indicating that the uptake of K would not be inhibited by excessive amounts of Ca and Mg in the soil.

5.3 Leaf Analysis

Leaf analysis in November, December and January revealed that all nutrients were in adequate supply. Leaf N levels were significantly (P = 0.05) increased by treatments N2 to N5 in November and December, but this was not the case in January. Leaf K levels were significantly (P = 0.05) increased by the application of K at all sampling dates. The rate response was no longer consistent in January. Leaf Mg values were significantly (P = 0.05) increased by applications of N in December, while applications of K also increased the leaf Mg levels significantly in November and December (table 2).

5.4 Harvest Data

Cane yield was significantly (P = 0.05) improved by applications of N up to 200 kg N/ha. Applications of N up to the level however, had a negative effect on cane yield. Cane quality from all N treatments were lower than that of the control, except for the 120 kg N/ha treatment which produced cane with a marginally higher sucrose content than the control treatment. Cane quality steadily declined with applications above 120 kg/ha. Applications of N up to the level of 160 kg N/ha increased sucrose yields, but above this level sucrose yields were negatively effected (table 3; Appendix 1).

Previous applications of K to the soil did not have an apparent effect on either cane or sucrose yield in this trial. No significant differences were observed although the highest cane and sucrose yields were obtained from the 150 kg K/ha treatment. Cane quality steadily declined with increased applications of K (table 3).

6. CONCLUSIONS

* Sucrose yields obtained from this trial confirmed 160 kg N/ha to be optimum on this soil type (P = 0.05 significant).

* There were no significant responses to residual K in this trial where the soil K levels in the control were above 163 ppm (current threshold = 150 ppm).

* Leaf K levels in the control treatments were above the threshold level of 1.05 (% dm) and no yield response was expected.

* This trial will be continued and is now in its 11th ratoon.

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Figure 1: Influence of N Fertilizer on Cane Yield

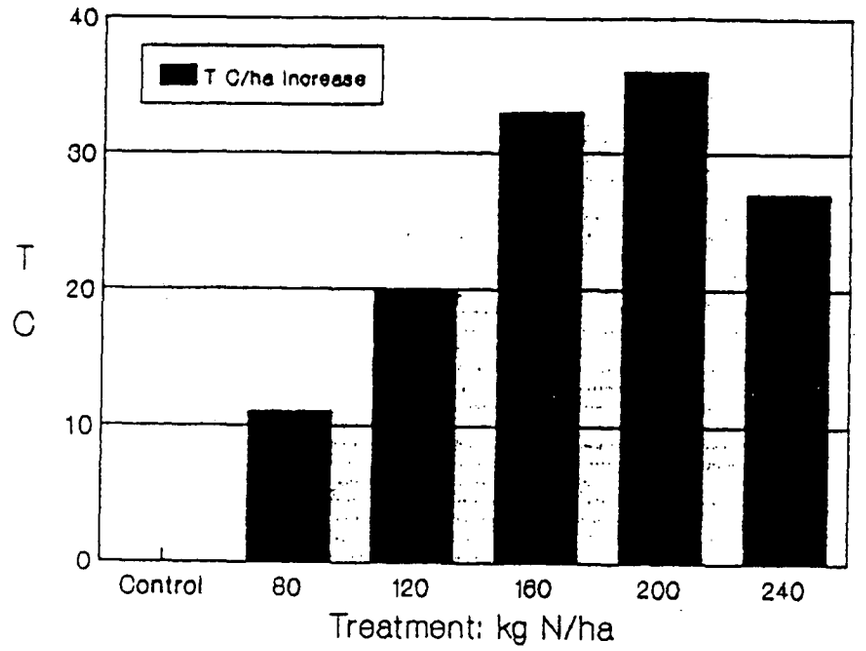


Figure 2: Influence of N on Cane Quality (Suc % Cane)

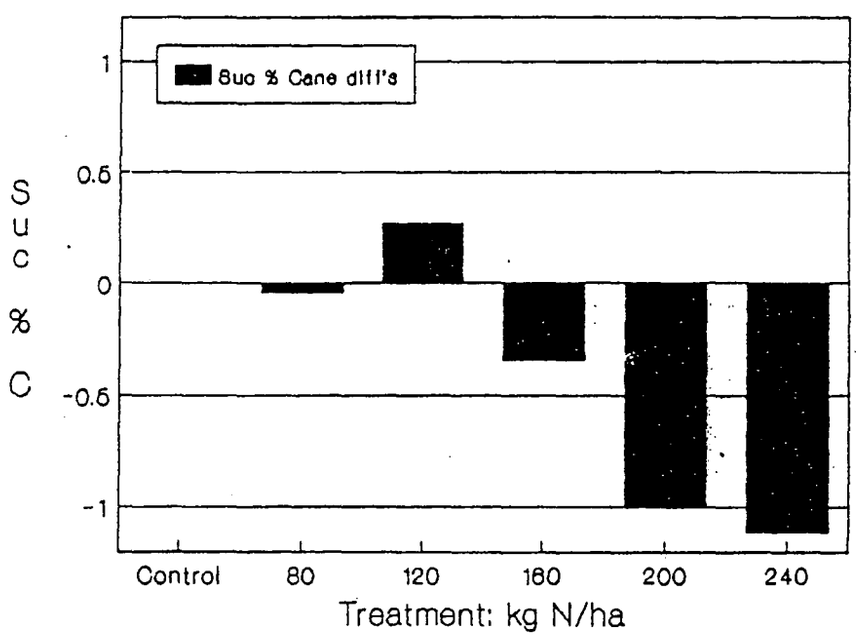
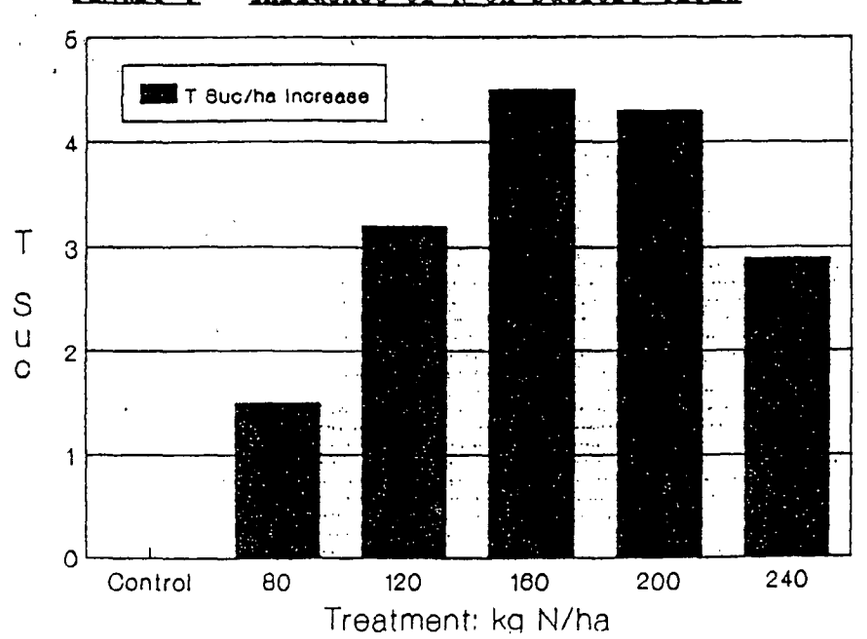


Figure 3: Influence of N on Sucrose Yield



SOUTH AFRICAN SUGAR INDUSTRY AGRONOMISTS' ASSOCIATION

Cat. No.: 1392

CODE: NK7/82/Sw/SIM 'R'

TITLE: RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON AN 'R' SET SOIL

1. PARTICULARS OF PROJECT

This crop	: 11th Ratoon	Soil Analysis: Date 25/08/92		
Site	: Simunye Sugar Estate Field 914	pH 6.6	OM% 1.75*	Clay % 32*
Region	: Northern Irrigated (Swaziland)	ppm (control)		
		P	K	Ca	Mg	(Ca+Mg)/K
		33	187	1354	437	10
Soil Set/Series	: 'L' /R (Lesibovu/Rondspring)					
Design	: 6 * 3 factorial 2 replications	Age : 11.8 months Date : 18/08/92 - 12/08/93				
Variety	: NCo376					
		Rainfall : 588 mm				
Fertilizer	: N & K P	Irrigation : 576 mm (overhead)				
Total (kg/ha)	:See treatments 0	Total : 1164 mm				

* Sampled on 18/02/92

2. OBJECTIVES

2.1 To determine the optimum levels of N and K for older ratoon cane on a deep 'L'/'R' set soil.

2.2 To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on this soil set.

3. TREATMENTS

3.1 Notes on Treatments: 1992/93

Nitrogen		**Potassium***	
Treatment	(kg/ha)	Treatment	(kg/ha)
N0	Nil	K0	Nil
N1	80	K1	150
N2	120	K2	300
N3-	160		
N4	200		
N5	240		

* These rates of K were applied from 1982 - 1991

No K was applied in this crop

Nitrogen (Urea, 46 % N) was banded on the cane row on 4/9/1992, two weeks after harvest

3.2 Notes on Soil Sampling

Topsoil: 40 cores were taken from each plot at a ratio of 16 on row to 24 interrow.

4. RESULTS

4.1 Soil Analysis

Table 1: K, Ca and Mg status (ppm) of the topsoil - August 1992

Treatment	ppm			(Ca+Mg)/K
	K	Ca	Mg	
K0	187	1354	437	9.9
K1	340	1243	420	5.4
K2	550	1287	414	3.3
LSD (0.05)	98	117	42	1.1
SED ±	46.5	55.4	19.9	0.5
Significance	**	NS	NS	**
Mean	359	1295	424	6.2
CV %	31.8	10.5	11.5	20.6

4.2 Leaf Analysis

Table 2: Third leaf nutrient analysis (% dm) at various ages

Treatment	N		P		K		Ca		Mg	
	Nov (3.4m)	Jan (5.1m)	Nov (3.4m)	Jan (5.1m)	Nov (3.4m)	Jan (5.1m)	Nov (3.4m)	Jan (5.1m)	Nov (3.4m)	Jan (5.1m)
N0	1.85	1.56	0.21	0.21	0.80	1.08	0.33	0.18	0.18	0.15
N1	1.95	1.57	0.21	0.22	0.90	1.40	0.34	0.19	0.20	0.16
N2	2.04	1.74	0.22	0.23	0.94	1.32	0.33	0.22	0.21	0.17
N3	2.06	1.85	0.21	0.22	0.90	1.39	0.34	0.19	0.21	0.20
N4	2.10	1.87	0.21	0.23	0.97	1.32	0.38	0.21	0.23	0.20
N5	2.08	1.89	0.18	0.21	0.99	1.46	0.35	0.19	0.22	0.20
LSD (0.05)	0.13	0.09	0.04	0.03	0.15	0.15	0.04	0.05	0.04	0.04
SED ±	0.06	0.04	0.02	0.01	0.07	0.07	0.02	0.03	0.02	0.02
Significance	**	**	NS	NS	NS	**	*	NS	NS	**
K0	2.01	1.75	0.21	0.23	0.79	1.21	0.38	0.19	0.24	0.19
K1	2.04	1.74	0.21	0.22	0.96	1.33	0.33	0.20	0.20	0.17
K2	1.99	1.75	0.19	0.21	1.00	1.45	0.32	0.19	0.19	0.17
LSD (0.05)	0.09	0.06	0.03	0.02	0.11	0.11	0.03	0.04	0.03	0.03
SED ±	0.04	0.03	0.01	0.01	0.05	0.05	0.01	0.02	0.01	0.01
Significance	NS	NS	NS	NS	**	**	**	NS	**	NS
Interaction N*K	NS	NS	NS	NS	NS	NS	*	NS	NS	NS
Mean	2.01	1.75	0.21	0.22	0.92	1.33	0.35	0.20	0.21	0.18
CV %	5.1	4.0	18.3	9.7	13.9	9.6	6.7	21.1	18.4	14.8

Table 3: The effect of N*K rates on third leaf Ca content (%dm) in November at 3.4 months

Treatment	N0	N1	N2	N3	N4	N5
K0	0.37	0.35	0.39	0.36	0.43	0.43
K1	0.34	0.32	0.30	0.36	0.37	0.31
K2	0.30	0.37	0.30	0.32	0.34	0.32

4.3 Growth Data

Table 4: Cane measurements at 5.5 months of age in February

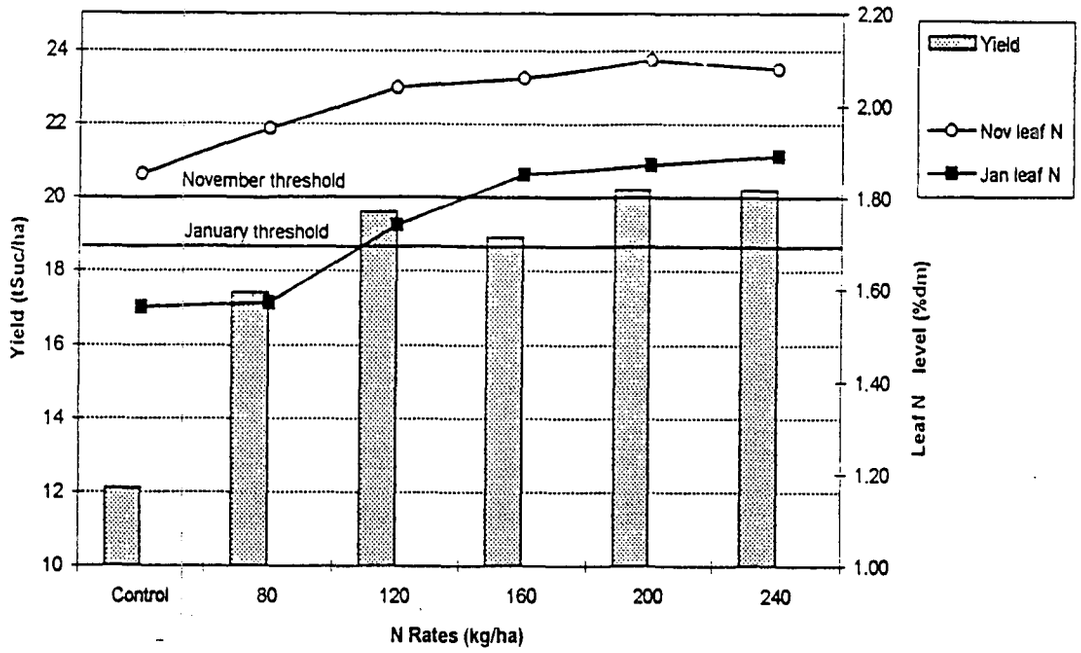
Treatment	Stalk height (cm to TVD)	Stalk population (* 1000/ha)
N0	131	198
N1	147	221
N2	142	215
N3	139	201
N4	146	219
N5	149	218
K0	139	205
K1	148	219
K2	140	211
Mean	142	212

4.4 Harvest Data

Table 5: Cane yield, sucrose % cane and sucrose yield

Treatment	TCane/ha	Suc. % Cane	TSuc/ha
N0	81	14.98	12.1
N1	118	14.85	17.4
N2	131	14.90	19.6
N3	136	14.04	19.0
N4	144	14.07	20.2
N5	137	14.68	20.2
LSD (0.05)	18	1.02	3.0
SED ±	8.4	0.48	1.4
Significance	**	NS	**
K0	122	14.87	18.0
K1	126	14.39	18.1
K2	126	14.50	18.2
LSD (0.05)	13	0.72	2.1
SED ±	6.0	0.34	1.0
Significance	NS	NS	NS
Interaction N*K	NS	NS	NS
Mean	125	14.59	18.1
CV%	11.8	5.7	13.6

Figure 1: N Rates vs. Sucrose yield and leaf N levels in November and January



5. COMMENTS

5.1 Soil Analysis

The soil K level of the control was above the FAS threshold of 150 ppm (soil 30-40% clay). A yield response to K application was therefore not expected (table 1).

The Ca+Mg/K ratio was low at this site and no limitations to the uptake of K were expected.

5.2 Leaf Analysis

Nitrogen

Third leaf nutrient analysis in November and January, at 3.4 and 5.1 months of age, showed P, Ca and Mg levels to be satisfactory and above the respective thresholds. Leaf N levels of the control treatment were just above the threshold (1.80 %dm) in November and levels of all the other treatments were well above threshold and increased with increasing rates of N. In January, leaf N levels of the control and N1 treatments were below threshold (1.70 %dm). K, Ca and Mg uptake in January were improved by applications of N (figure 1; table 2).

Potassium

Leaf K levels of the control were below the threshold level in November (0.85 %dm), but were well above the threshold for January (0.95 %dm). Leaf K levels of treatments receiving K were increased by applications of K and above the threshold levels for the respective months. It was therefore possible that yields would be improved by treatments which had received K in previous crops (table2).

The uptake of Ca and Mg in November was reduced by the residual effects of previous K application, but there were no significant effects on N and P contents.

Nitrogen x Potassium

There was apparently a significant interaction (P=0.05) between N and K on the uptake of Ca in November. This interaction was however, variable and not consistent (table 3).

5.3 Growth Data

Both stalk height and stalk populations were increased by applications of N and by previous applications of K. These improvements were however, variable and not consistent (table 4).

5.4 Harvest Data

General

There were no statistically significant interactions between N and K treatments with regard to harvest results. As a result of this, yield results have been reviewed independently.

Nitrogen

Cane yield was significantly (P = 0.01) improved by treatments of N. The highest cane yield was obtained from the N4 treatment (200kg N/ha) (table 5).

Sucrose content was reduced by applications of N. Differences were not statistically significant although sucrose content was reduced considerably by N applications of 160 kg/ha and above (N3 - N5) (table5).

Sucrose yield was significantly improved (P=0.01) by rates of applied N. Sucrose yield increases did not follow cane yield increases due to the fact that sucrose contents decreased with N applications above the level of 120 kg/ha. The highest average yields were recorded at 200 kg N/ha although these were only 0.6 of a ton higher than those recorded at 120 kg N/ha. Sucrose yields at 160 kg N/ha were unusually low (figure 1, table 5).

Potassium

Cane yields were marginally (NS) increased by the residual effects of treatments previously receiving K. Cane quality was reduced by these effects (NS). The net effect was that sucrose yields were similar to the control treatments (table 5).

6. CONCLUSIONS

- The determination of the optimum Nitrogen treatment in this trial was complicated by the unusually poor response to the rate of 160 kg N/ha. If this anomaly is ignored for the purpose of drawing the response curve it can be seen that the optimum rate of N fell between 120 and 200 kg N/ha and that there was a relatively small increase between these two rates. Previous results have shown that the optimum rate of N at this site varies between 160 and 200 kg N/ha. This year's results indicate that 160 kg N/ha would have been adequate on this site

- Results from this trial indicate that leaf threshold levels for Nitrogen may need to be increased, particularly when sampling is carried out at between 3 and 4 months of age.

- No response to high residual levels of K was obtained and yield results from this trial confirm the current soil K threshold of 150 ppm currently recommended for this soil. Yield results, however, suggest that the leaf K threshold for November (0.85 %dm) may be too high under certain conditions.

- This trial has been continued and it is now in its 12th ratoon.

DMZ/AJD/fkn
10.01.94

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

CAT. NO.: 1392
CODE: NK7/82/Sw/SIM 'R'

TITLE: RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON A 'R' SET SOIL

1. PARTICULARS OF PROJECT

This crop : 12th Ratoon	Soil analysis: August 1993
Site : Simunye Sugar Co. Field 914	pH 6.1 · OM% 1.75 · Clay % 32
Region : Northern Irrigated (Swaziland)	ppm(control): P 31 · K 200 · Ca 1379 · Mg 458 · (Ca+Mg)/K 9
Soil Set : 'L'/'R' (Lesibovu / Rondspring)	KDI : 0.99
Design : 6 * 3 factorial 2 replications	CEC : 11.6 meq/100g soil
Variety : NCo376	Age : 12.2 months Date : 12/08/93 - 18/08/94
Fertilizer N & K P Total (kg/ha) : See treatments 20	Rainfall : 232 mm Irrigation : 979 mm (overhead) Total : 1211 mm

2. OBJECTIVES

2.1 To determine the optimum levels of N and K for older ratoon cane on a deep 'L'/'R" set soil.

2.2 To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on this soil set.

3. TREATMENTS

3.1 Notes on treatment: 1993/94

Nitrogen		Potassium*	
Treatment	(kg/ha)	Treatment	(kg/ha)
N0	0	K0	0
N1	80	K1	150
N2	120	K2	300
N3	160	Applied from 1983 to 1991 and in 1993/94	
N4	200	.	
N5	240	No K was applied in 1992/93	

Nitrogen (Urea, 46%N) was banded on the cane row while potassium (KCl, 50% K).

4. FERTILIZERS AND SOIL SAMPLING

4.1 Notes on fertilizers

Phosphorus (Superphosphate, 10.5% P) at 20kg P/ha was broadcast 3 weeks after harvest.

4.2 Notes on Soil Sampling

Topsoil: 40 cores were taken from each plot at a ratio of 16 on row to 24 interrow (i.e. 1:1.5) before fertilization in October

5. RESULTS

5.1 Soil Analysis

Table 1: K, Ca, and Mg status (ppm) of the topsoil - August 1993

Treatment	ppm			
	K	Ca	Mg	(Ca + Mg)/K
K0 - 0	200	1379	458	9.2
K1 -150	225	1239	350	7.1
K2 - 300	367	1300	396	4.6
LSD (0.05)	101	151	65	-
SED ±	48.1	71.3	30.7	-
Significance	**	NS	**	-
Mean	264	1306	401	7.0
CV%	44.6	13.4	18.8	-

5.2 Leaf Analysis

Table 2: Third leaf nutrient analysis (% dm) at various ages

Treatment	N			P			K			Ca			Mg		
	Nov 3.2m	Dec 4.1m	Jan 5.0m	Nov 3.2m	Dec 4.1m	Jan 5.0m	Nov 3.2m	Dec 4.1m	Jan 5.0m	Nov 3.2m	Dec 4.1m	Jan 5.0m	Nov 3.2m	Dec 4.1m	Jan 5.0m
N0 - 0	1.97	1.52	1.94	0.25	0.28	0.27	1.01	1.17	1.62	0.31	0.32	0.30	0.19	0.16	0.19
N1 - 80	2.09	1.67	1.90	0.25	0.27	0.29	1.16	1.27	1.55	0.33	0.35	0.29	0.23	0.23	0.19
N2 - 120	2.27	1.86	1.89	0.25	0.27	0.27	1.12	1.45	1.39	0.30	0.37	0.29	0.23	0.21	0.19
N3 - 160	2.26	2.04	1.93	0.25	0.28	0.27	1.13	1.47	1.75	0.33	0.32	0.28	0.23	0.23	0.21
N4 - 200	2.28	2.08	1.87	0.25	0.29	0.27	1.19	1.47	1.70	0.33	0.34	0.26	0.24	0.22	0.19
N5 - 240	2.29	2.16	1.92	0.25	0.28	0.27	1.12	1.42	1.62	0.36	0.30	0.28	0.23	0.20	0.20
LSD (0.05)	0.10	0.12	0.09	0.02	0.02	0.02	0.15	0.20	0.32	0.07	0.08	0.04	0.08	0.05	0.04
SED ±	0.05	0.06	0.04	0.01	0.01	0.01	0.07	0.09	0.15	0.03	0.04	0.02	0.04	0.03	0.02
Significance	**	**	NS	NS	NS	NS	NS	*	NS	NS	NS	NS	NS	NS	NS
K0 - 0	2.20	1.91	1.88	0.26	0.28	0.27	1.00	1.24	1.56	0.36	0.34	0.28	0.28	0.25	0.19
K1 - 150	2.17	1.87	1.93	0.25	0.28	0.28	1.11	1.46	1.61	0.30	0.34	0.29	0.21	0.20	0.20
K2 - 300	2.20	1.89	1.91	0.24	0.27	0.28	1.24	1.43	1.64	0.32	0.32	0.28	0.19	0.17	0.19
LSD (0.05)	0.07	0.09	0.06	0.01	0.01	0.02	0.11	0.14	0.23	0.05	0.05	0.03	0.05	0.04	0.03
SED ±	0.03	0.04	0.03	0.01	0.01	0.01	0.05	0.07	0.11	0.02	0.03	0.01	0.03	0.02	0.01
Significance	NS	NS	NS	NS	NS	NS	**	**	NS	NS	NS	NS	*	**	NS
Interact. N*K	NS	NS	NS	*	NS	NS	NS	NS	NS	NS	**	NS	NS	NS	NS
Mean	2.19	1.89	1.91	0.25	0.28	0.27	1.12	1.38	1.60	0.33	0.33	0.28	0.23	0.21	0.19
CV%	3.7	5.4	3.6	6.5	5.8	7.1	10.9	11.7	16.4	16.2	19.4	13.1	27.3	23.6	15.1

5.3 Growth Data

Table 3: Growth measurements at various ages

Treatment	Stalk height (cm to TVD)			Stalk population (*1000/ha)		
	Jan (5.3 m)	Feb (6.5 m)	Mar (7.4 m)	Jan (5.3 m)	Feb (6.5 m)	Mar (7.4 m)
N0 - 0	112	160	194	332	139	134
N1 - 80	143	194	222	323	142	139
N2 - 120	146	195	222	317	154	143
N3 - 160	151	208	240	340	152	141
N4 - 200	151	208	241	325	152	143
N5 - 240	160	204	246	317	153	143
K0 - 0	139	190	224	324	149	143
K1 - 150	145	197	232	323	148	140
K2 - 300	147	197	226	330	149	138
Mean	144	195	227	326	149	140

5.4 Lodging

Table 4: Lodging scores in May at 9.6 months of age

Treatment	Lodging Score*
N0 - 0	2
N1 - 80	4
N2 - 120	4
N3 - 160	7
N4 - 200	8
N5 - 240	5
Mean	5

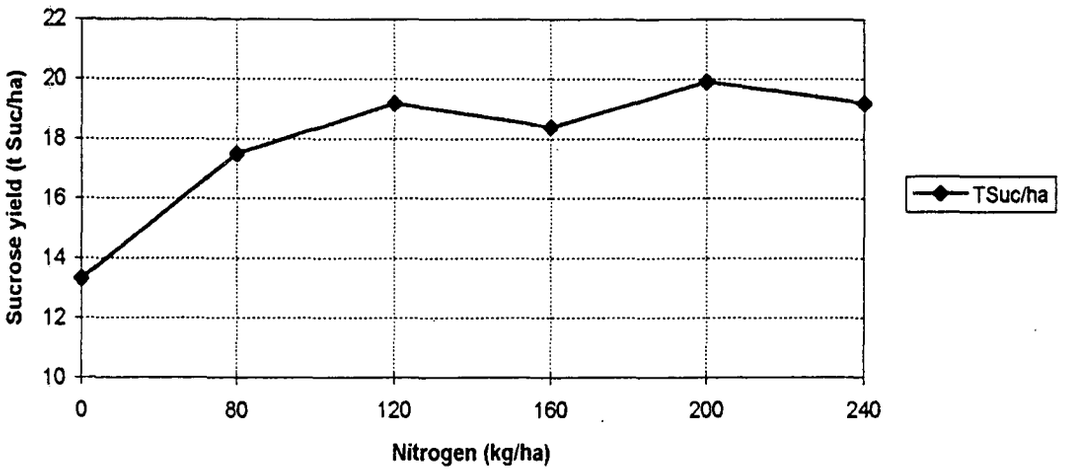
* On a scale of 1 - 9, where 9 represents complete lodging

5.5 Harvest Data

Table 5: Cane yield, sucrose % cane and sucrose yield

Treatment	TCane/ha	Suc % Cane	TSuc/ha
N0 - 0	84	15.97	13.3
N1 - 80	118	15.01	17.5
N2 - 120	127	15.22	19.2
N3 - 160	129	14.46	18.4
N4 - 200	145	13.76	19.9
N5 - 240	142	13.56	19.2
LSD (0.05	19	1.29	3.0
SE Diff.±	9.1	0.61	1.4
Significance	**	**	**
K0 - 0	119	14.81	17.4
K1 - 150	130	14.29	18.3
K2 - 300	123	14.88	18.2
LSD K (0.05)	14	0.91	2.1
SE Diff ±	6.4	0.43	1.0
Significance	NS	NS	NS
Interaction N*K	NS	NS	NS
Mean	124	14.66	17.9
CV%	12.7	7.2	13.6

Figure 1: N rates vs. Sucrose yield



6. COMMENTS

6.1 Soil Analysis

Soil K levels of the control as well as those of treatments receiving K, were well above the current FAS threshold of 150 ppm (soil = 30 - 40% clay) before fertilization. No responses to applications of potassium were therefore expected. Ca and Mg levels were low and it was not expected that K uptake would be limited (table 1).

6.2 Leaf Analysis

Nitrogen

Third leaf nutrient analysis showed that levels of P, K, Ca and Mg were satisfactory and above their respective thresholds from November to January (table2).

Leaf N levels were generally above the FAS threshold (1.8 % dm in November and December and 1.7 % dm in January) in all treatments, except in the control and N1 treatments (80kg N/ha) in December. Leaf N levels were improved by applications of N in November and December and increases in leaf N levels generally corresponded with the amounts applied in these months. This was however, not the case in January at 5 months of age.

Potassium

Leaf K levels of the control were above the current FAS threshold of 0.85% dm in November and 0.95% dm in December and January and no responses to K applications were expected. Leaf K levels were generally improved by applications of K in all months sampled (table 2).
Applications of K had no significant effect on the uptake of either N, P or Ca.

6.3 Growth Data

Stalk heights were considerably increased by applications of N in the early stages of growth at 5.3 and 6.5 of age while stalk populations were noticeably improved at 6.5 months (table 3).
Neither stalk height nor stalk populations were affected by applications of K in this trial.

6.4 Harvest Data

General

There were no statistically significant interactions between N and K treatments and yield results can be reviewed independently.

Nitrogen

Both cane and sucrose yields were significantly improved, (P = 0.01) while cane quality was significantly reduced (P = 0.01) by applications of N (table 5). The highest sucrose yields were obtained from treatments N2 (120 kg N/ha), N4 (200kg N/ha) and N5 (240 kg N/ha) and no statistically significant differences were observed between these treatments (table 5 and figure 1).

Potassium

Cane and sucrose yields were marginally improved by applications of K although no statistically significant differences were observed. The effect of K on cane quality was variable and not statistically significant (table 5). The best cane and sucrose yields were observed in treatment K1 (150kg K/ha).

7. CONCLUSIONS

- Cane and sucrose yields were significantly increased by applications of N in this trial and the best yields were obtained from the 120kg N/ha, 200kg N/ha and 240 kg N/ha treatments. The fact that some of the best yields were obtained from the 120 kg N/ha treatment (N2) indicates that the current recommendation for this soil (140 - 160 kg N/ha) might be too high.

- Results from this trial indicate that current leaf threshold levels for Nitrogen may be too low.

- Leaf and soil K levels were high in this trial and yield responses to K applications were neither expected nor obtained. This supports the current FAS soil and leaf K threshold levels.

- This trial has been continued to further observe the N requirements for older ratoons and it is now in its 13th ratoon.

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17.01.95

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMIST'S ASSOCIATION.

EXPERIMENT RESULT 1995

CODE: NK7/82/Sw/Sim 'R'
CAT : 1392

TITLE: **RATES OF NITROGEN AND POTASSIUM FOR RATOON CANE ON A 'R' SET SOIL**

1. PARTICULARS OF PROJECT

This crop	: 13th Ratoon		
Site	: Simunye Sugar Co. Field 914		
Region	: Northern Irrigated (Swaziland)		
Soil Set	: 'L'/R (Lesibovu /Rondspring)		
Design	: 6 * 3 factorial 2 replications		
Variety	: NCo376		
Fertilizer	: N & K	P	
Total (kg/ha)	: See treatments	20	

Soil Analysis: September 1994

pH	OM%	Clay %
5.91	1.75	32

ppm(control)

P	K	Ca	Mg	(Ca+Mg)/K
30	197	1354	447	9

KDI : 0.99
CEC : 11.6 meq/100g soil

Age : 11.8 months
Date : 18/8/94 - 10/8/95

Rainfall : 435 mm
Irrigation : 768 mm (overhead)
Total : 1203 mm

2. OBJECTIVES

2.1 To determine optimum levels of N & K for older ratoon cane on a deep 'L'/'R" set soil.

2.2 To test the availability of exchangeable potassium and to determine approximate threshold values for this nutrient on this soil set.

3. TREATMENTS

3.1 Notes on treatment:

Nitrogen		Potassium*	
Treatment	(kg/ha)	Treatment	(kg/ha)
N0	Nil	K0	Nil
N1	80	K1	150
N2	120	K2	300
N3	160	Applied from 1983 to 1991 and in 1994/95	
N4	200		
N5	240	*No K was applied in 1992/93 and 1993/94	

Nitrogen (Urea, 46%N) was banded on the cane row while potassium (KCl, 50% K) was broadcast 3 weeks after harvest.

4. FERTILIZER AND SOIL SAMPLING

4.1 Notes on Fertilizers

Phosphorus (Super phosphate, 10.5%) at the rate of 20kg P/ha was broadcast on the cane row 3 weeks after harvest.

4.2 Notes on Soil Sampling

Topsoil: 40 cores were taken from each plot before fertilization at a ratio of 16 on row to 24 interrow (i.e. 1 : 1.5)

5 RESULTS

5.1 Soil Analysis

Table 1: P, K, Ca and Mg status (ppm) of the topsoil - September 1994

Treatment	ppm				
	P	K	Ca	Mg	(Ca+Mg)/K
K0	30	197	1354	447	9.1
K1	27	320	1247	423	5.2
K2	26	474	1139	411	3.3
LSD (0.05)	6	70	148	41	1.2
SED ±	2.7	33.0	70.0	19.4	0.6
Significance	NS	**	*	NS	**
Mean	28	331	1247	427	5.9
CV%	24.2	24.5	13.8	11.1	22.7

5.2 Leaf Analysis

Table 2: Third leaf nutrient analysis (%dm) in November, December and January

Treatment	N			P			K		
	Nov. (2.9m)	Dec. 3.8m)	Jan. (5.0m)	Nov. (2.9m)	Dec. 3.8m)	Jan. (5.0m)	Nov. (2.9m)	Dec. 3.8m)	Jan. (5.0m)
N0	2.06	1.73	1.32	0.31	0.20	0.20	1.13	1.43	1.15
N1	2.31	1.93	1.55	0.28	0.18	0.21	1.22	1.44	1.22
N2	2.30	2.00	1.63	0.27	0.18	0.21	1.17	1.46	1.32
N3	2.50	1.98	1.75	0.29	0.18	0.22	1.17	1.32	1.18
N4	2.31	1.99	1.70	0.26	0.18	0.22	1.16	1.39	1.41
N5	2.44	2.00	1.77	0.27	0.18	0.22	1.23	1.33	1.32
LSD (0.05)	0.13	0.12	0.12	0.02	0.02	0.02	0.10	0.20	0.15
SED ±	0.06	0.05	0.05	0.01	0.01	0.01	0.05	0.09	0.07
Significance	**	**	**	*	NS	NS	NS	NS	*
K0	2.33	1.92	1.58	0.29	0.18	0.22	1.04	1.26	1.16
K1	2.32	1.91	1.59	0.27	0.18	0.21	1.22	1.40	1.23
K2	2.31	1.98	1.68	0.28	0.19	0.21	1.28	1.52	1.40
LSD (0.05)	0.09	0.08	0.08	0.02	0.01	0.01	0.07	0.14	0.11
SED ±	0.04	0.04	0.04	0.01	0.01	0.01	0.03	0.07	0.05
Significance	NS	NS	*	NS	NS	NS	**	**	**
Interact. N*K	NS	NS	NS	NS	NS	NS	NS	NS	NS
Mean	2.32	1.94	1.62	0.28	0.18	0.21	1.18	1.39	1.27
CV%	4.6	4.8	6.0	7.4	8.8	6.8	7.3	11.5	10.1

5.3 Growth Data

Table 3: Growth measurements in January and March and lodging in May

Treatment	Stalk height (cm to TVD)		Stalk population (*1000/ha)		Lodging*
	Jan. (4.8m)	Mar. (6.6m)	Jan. (4.8m)	Mar. (6.6m)	May (10 m)
N0	97	175	166	144	2
N1	105	198	170	162	4
N2	115	202	160	154	5
N3	109	215	180	160	5
N4	114	225	172	162	7
N5	108	212	159	155	5
K0	104	203	167	154	
K1	113	215	173	156	
K2	106	195	163	158	
Mean	108	204	168	156	5

* On a scale of 1 - 9, where 9 represents complete lodging

5.4 Harvest Data

Table 4: Cane yield , sucrose % cane and sucrose yield

Treatment	Tcane/ha	Suc. % cane	Tsuc/ha
N0	96	15.94	15.3
N1	130	14.65	18.9
N2	123	14.82	18.2
N3	122	14.32	17.4
N4	132	14.45	19.0
N5	119	14.04	16.7
LSD (0.05)	25	0.70	3.5
SED ±	11.8	0.33	1.7
Significance	NS	**	NS
K0	122	14.86	18.0
K1	121	14.85	17.9
K2	117	14.40	16.8
LSD (0.05)	18	0.49	2.5
SED ±	8.3	0.23	1.2
Significance	NS	NS	NS
Interact. N*K	NS	NS	NS
Mean	120	14.70	17.6
CV%	17.0	3.9	16.4

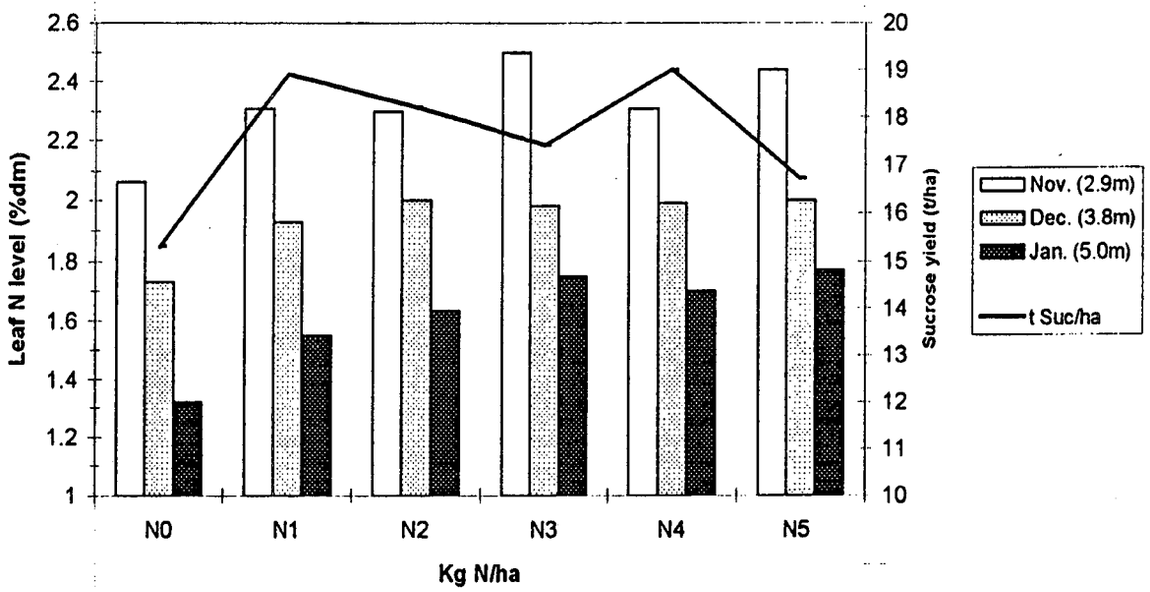

Figure 1: Leaf N levels at different months vs. Sucrose yield

6. COMMENTS

6.1 Soil Analysis

Soil K levels of the control were above the threshold of 175 ppm (clay = 30 - 40%, winter cut cane) and no responses to rates of K were expected (table 1). Treatments of applied K significantly improved (P = 0.01) soil K levels and differences between treatments corresponded with the amounts applied in the previous crop.

6.2 Leaf Analysis

General

Third leaf nutrient analysis in November, December and January, showed that leaf levels of Ca and Mg were above their respective threshold values, while leaf P levels were generally deficient in December (table 2, appendix 1).

Nitrogen

Third leaf N levels of all treatments were above the threshold value of 1.8 %dm in November. However, leaf N levels of the control were lower than threshold values in December (1.8 %dm) and January (1.7 %dm). Leaf N levels of treatments N1 and N2 were also below the threshold value in this month. Treatments of N significantly (P=0.01) improved leaf N levels throughout the sampling period. The fact that high leaf N levels were associated with relatively low cane and sucrose yields (treatments N3 & N5) indicates that the threshold value might be too low. This matter would need to be investigated (table 2, figure 1).

N applications significantly reduced the uptake of P in November (P = 0.05). The uptake of K was significantly improved by N rates in January (P= 0.05) including the uptake of Mg in November (P= 0.05) and January (P= 0.01).

Potassium

Leaf K levels of all treatments were above the threshold values of 0.90, 1.00 and 1.05% dm for November, December and January respectively. Responses to rates of applied K were therefore not expected. Leaf K levels of treatments receiving K were very high and reflected the cumulative effect of a high soil K status and rates of K that were applied (table 2).

N uptake was significantly improved by the K2 treatment in January (P = 0.05), while the uptake of Mg was significantly reduced by K treatments in November (P=0.01) and December (P = 0.05).

6.3 Growth Data

Stalk heights were improved by applications of N and K in March (P = 0.05). Treatments of applied N and K had no statistically significant effect on stalk populations and no consistent trend was observed (table 3).

6.4 Lodging

The highest lodging score (May) was recorded in the 200 kg N/ha treatment while lodging in the other treatments was less severe (table 3).

6.5 Harvest Data

There were no statistically significant interactions between N and K treatments and yield results can be reviewed independently (table 4).

Nitrogen

Cane and sucrose yields were improved (NS) by applications of N but variability was high and increases did not quite correspond with the rates that were applied (table 4).
Sucrose % cane was significantly reduced by rates of applied N (P = 0.01) and was lowest at the highest rate of 240kg N/ha. Sucrose yields were increased by applications of N but responses were variable. Maximum yield was obtained with 200 kg N/ha but this was not significantly higher than where 120 kg N/ha had been applied.

Potassium

As a result of high soil K levels before fertilization, rates of Potassium had no apparent effect on either cane yield, sucrose % cane or sucrose yield in this trial and the best yields were observed in the control treatment in all cases (table 4).

7. CONCLUSIONS

- Both cane and sucrose yields were improved by rates of applied N but increases were inconsistent and did not correspond with the rates that were applied.

- Sucrose yields at 120kg N/ha were very close to those at 200kg N/ha, indicating that the present recommendations for this soil (160kg N/ha) could be too high.

- Current leaf N thresholds might be too low and should be investigated.

- Soil and leaf K levels of the control were high and yield response were neither expected nor obtained.

- This trial has been continued as an N trial only to further monitor the responses of older ratoons to N application and corrective applications of K have been done to equalize soil K levels. The trial is now in its 14th ratoon.

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Appendix 1: Leaf Ca and Mg levels at different months

Treatment	Ca (%dm)			Mg (%dm)		
	Nov. (2.9m)	Dec. 3.8m)	Jan. (5.0m)	Nov. (2.9m)	Dec. 3.8m)	Jan. (5.0m)
N0	0.31	0.24	0.20	0.20	0.17	0.16
N1	0.35	0.30	0.21	0.25	0.19	0.16
N2	0.33	0.30	0.20	0.25	0.20	0.17
N3	0.39	0.30	0.24	0.28	0.22	0.22
N4	0.32	0.30	0.20	0.24	0.21	0.18
N5	0.36	0.30	0.20	0.25	0.21	0.18
LSD (0.05)	0.08	0.07	0.04	0.04	0.04	0.03
SED ±	0.04	0.03	0.02	0.02	0.02	0.01
Significance	NS	NS	NS	*	NS	**
K0	0.36	0.31	0.20	0.27	0.22	0.18
K1	0.35	0.29	0.22	0.25	0.19	0.18
K2	0.32	0.28	0.21	0.22	0.19	0.18
LSD (0.05)	0.05	0.05	0.03	0.03	0.03	0.02
SED ±	0.03	0.02	0.01	0.01	0.01	0.01
Significance	NS	NS	NS	**	*	NS
Interact. N*K	NS	NS	NS	NS	NS	NS
Mean	0.34	0.29	0.21	0.24	0.20	0.18
CV%	18.5	18.1	12.4	12.6	18.9	12.1