

(17)

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION.

Code: FT 8NK/80/R3

Cat. No.: 1154

TITLE: Rates of Nitrogen and Potassium for Ratoon cane grown in a Hutton form soil in the Natal Midlands.

1. Particulars of the project

<u>This crop</u>	: 3rd ratoon	Soil analysis: Date: 30/7/80					
<u>Site</u>	: Richmond	<u>pH</u>	<u>O.M.%</u>	<u>Clay %</u>	<u>P.D.I.</u>		
<u>Region</u>	: Midland	5,83	8.5	40	0,045		
<u>Soil System</u>	: Nottingham	ppm					
<u>Soil form/series</u>	: Hutton Balmoral	<u>P</u>	<u>K</u>	<u>Ca</u>	<u>Mg</u>	<u>Zn</u>	<u>Al</u>
<u>Design</u>	: Randomised Block x 5 Reps	15	114	729	217	216	-
<u>Variety</u>	: NCo 293	<u>Age</u> : 16,3 months Dates 29/7/80-7/12/81					
<u>Fertilizer</u>	: <u>N</u> <u>P</u> <u>K</u> See Treatments	<u>Rainfall</u> : 1051 mm			<u>L.T.M.</u> : 1090 mm		
		<u>Irrigation</u> : Nil		(Stn Ten-Glower o'er)			

Objectives.

To measure the response to levels of N and K on ratoon cane grown in a Hutton form, Balmoral series soil in the Natal Midlands

Treatments.

Levels of N and K. (kg/ha)

	<u>N</u>	<u>K</u>
1	0	125
2	50	125
3	100	125
4	100	250
5	100	375
6	150	125

Notes on Treatments.

N as Urea and K as Potassium chloride were applied as single dressings in early October at 8 weeks after harvest.

## 4. Results

## 4.1 Yield and crop characteristics at harvest

<u>Nitrogen</u>							
Treatments	(kg/ha)	t/ha	Sucrose %	t/ha	Stalk	Stalk	Stalk
		cane	cane	sucrose	counts	length	Mass
					$\times 10^{-3}/ha$	x (cm)	(kg)
1.	Nil	63	13,1	8,2	116	121	0,54
2.	50	62	12,4	7,7	119	128	0,52
3.	100	69	13,0	9,0	120	133	0,59
4.	150	66	12,8	8,5	126	130	0,53
Mean		65	12,8	8,4	120	128	0,54
<u>Potassium</u>							
Treatments	(kg/ha)						
1.	125	69	13,0	9,0	120	133	0,59
2.	250	73	13,1	9,6	124	136	0,59
3.	375	72	12,6	9,1	129	134	0,56
Mean		71	12,9	9,2	124	134	0,58
C.V.%		10,2	3,9	10,4	7,8	4,7	
S.E. of treat. means		3,1	0,22	0,40	4,2	2,7	
L.S.D. (0,05)		9	0,67	1,2	12,5	8,8	

## 4.2 Third leaf N and K (d.m. %)

Age & date of sampling	4 m	5 m	6 m	7 m	8 m	9 m
	15 Dec	12 Jan	17 Feb	10 Mar	10 Apr	18 Nov
<u>Nitrogen</u>						
0 N	2,42	2,36	1,88	2,01	1,81	1,44
50 N	2,52	2,35	1,96	2,01	1,85	1,38
100 N	2,51	2,42	2,05	2,01	1,87	1,42
150 N	2,46	2,45	1,96	2,06	1,95	1,42
<u>Potassium</u>						
125 k	0,92	0,92	1,08	0,64	0,80	1,12
250 K	0,92	1,01	1,11	0,73	0,85	1,15
375 K	1,01	1,05	1,21	0,77	0,90	1,22

#### 4.3 Soil K (ppm) at the end of the third ratoon

K (ppm)

125 kg K/ha = 122

250 kg K/ha = 146

375 kg K/ha = 170

#### 5. Comments on results

5.1 Rainfall was 95% of the LTM but due to frost and a very dry period, sideshooting occurred and the crop was cut relatively young at 16,3 months. The yield from the optimum N plots was 6,5 tc/ha/100 mm of rainfall and 4,2 tc/ha/month.

5.2 Nitrogen: The yield of 63 tc/ha (46 tc/ha annum) was obtained from applying no nitrogen, indicating a high rate of N. mineralization in the soil.

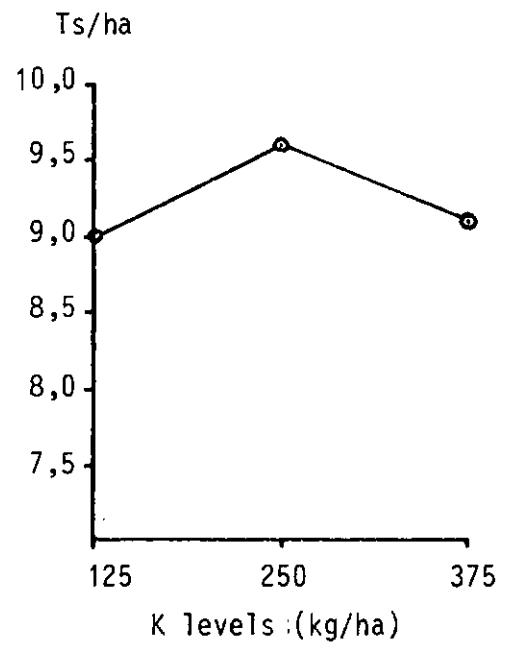
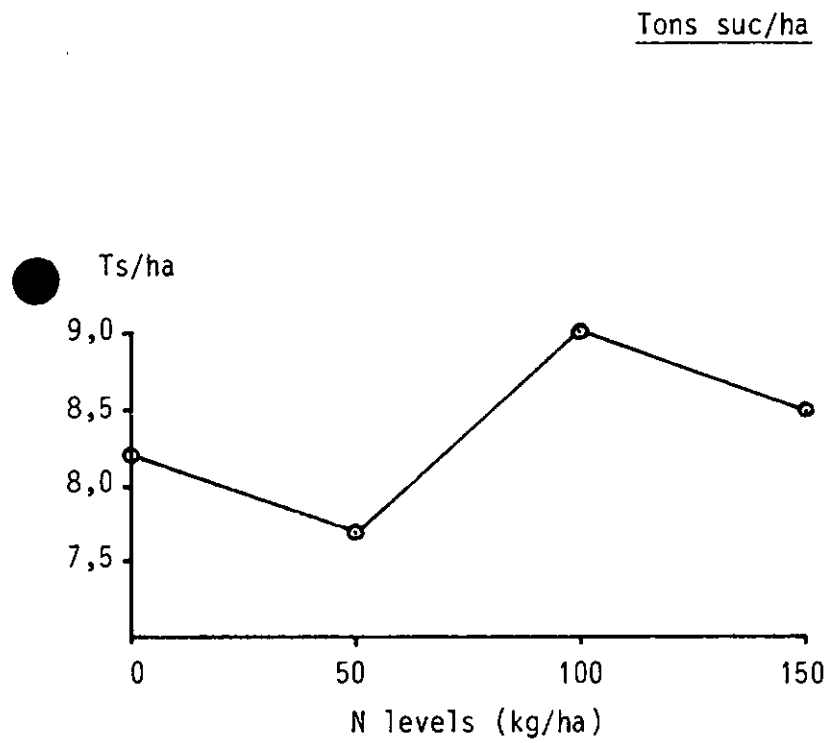
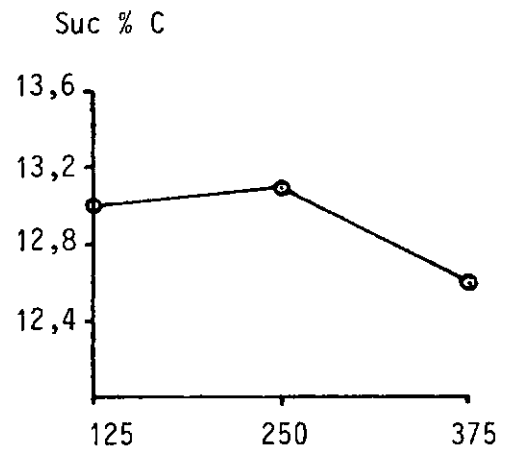
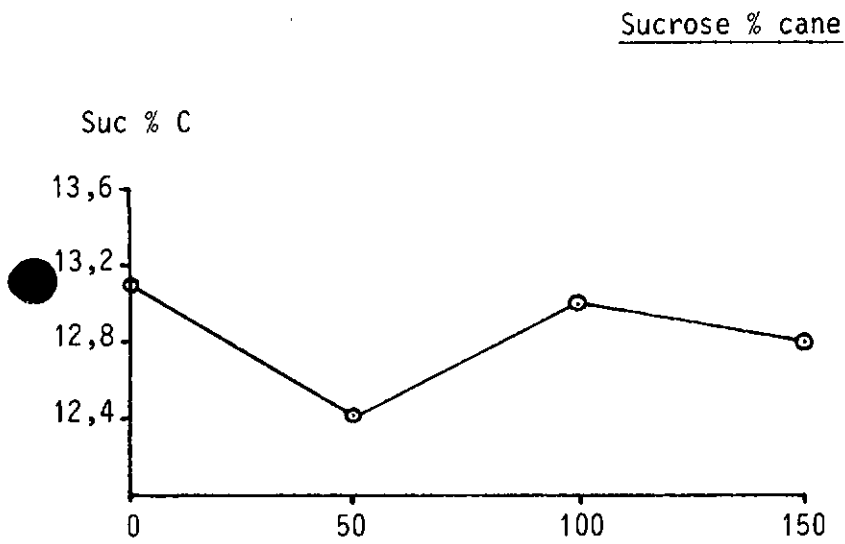
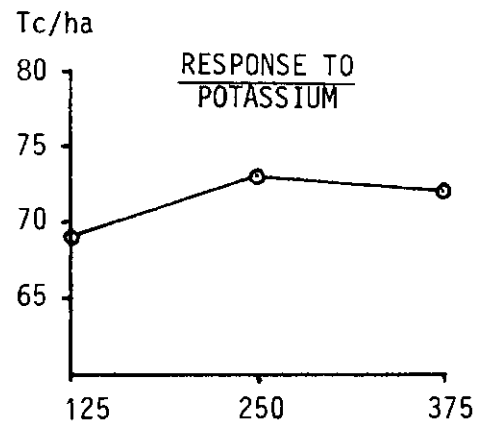
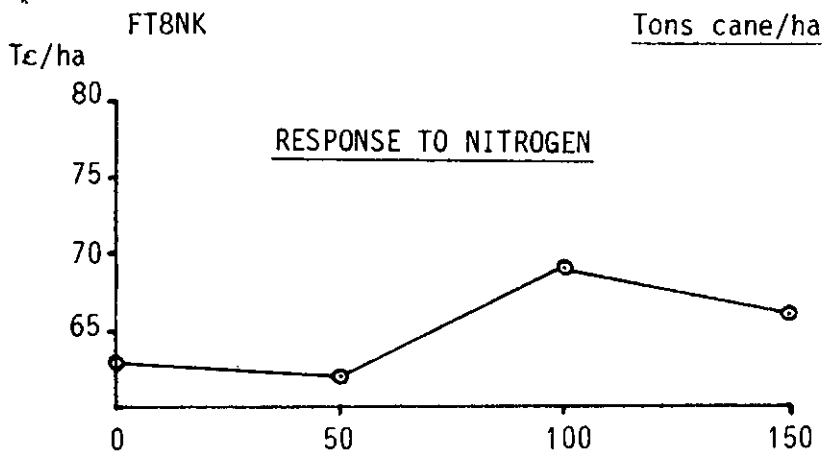
There is an indication only (n.s.) of a very small response to nitrogen at the 100 kg/ha level.

Third leaf analysis indicated adequacy at all levels in samples taken between four to eight months of age.

5.4 Potassium: The soil K level was marginal to low but there was no indication of a response, although a response would be predicted to levels greater than 125 kg/ha. The higher k level (375 hg/ha) tended to depress cane quality (n.s.).

Third leaf k values were marginal to very deficient in all treatments at ages between four and eight months but were adequate at 15 months of age.

RKMCI/IS  
25th March, 1982



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SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

Code : FT 8NK/80/R4

Cat. No.: 1154

Title: Rates of nitrogen and potassium for ratoon cane grown in a Hutton form soil in the Natal Midlands

1. Particulars of the project:

This crop : 4th ratoon  
Site : Richmond  
Region : Midland  
Soil system : Nottingham  
Soil form/series : Hutton/Balmoral  
Design : Randomised block x 5 reps  
Variety : NCo 293  
Fertilizer/Ameliorants : N      P      K  
    1      50      1  
    See treatments  
Soil description : Brown clay top-soil overlying a deep red brown weakly structured subsoil

Soil analysis:    Date: 7.11.81

<u>pH</u>	<u>O.M. %</u>	<u>Clay %</u>	<u>P.D.I.</u>
5,7	8,5	46%	0,02

ppm

<u>P</u>	<u>Ca</u>	<u>Mg</u>	<u>Zn</u>	<u>Al</u>	<u>K</u>	
13	761	215	111	39	<u>Applied</u>	<u>ppm</u>
					125	122
					250	146
					375	170

Age: 20,3 m    Dates: 7.12.81-16.8.83

Rainfall: 962 mm    L.T.M.: 1 415 mm (Thornville)

Irrigation: nil

2. Objectives

To measure the response to levels of N and K of ratoon cane grown in a Hutton form, Balmoral series soil in the Natal Midlands.

3. Treatments

Levels of N and K (kg/ha)

	<u>N</u>	<u>K</u>
1.	0	125
2.	50	125
3.	100	125
4.	100	250
5.	100	375
6.	150	125

Notes on treatments:

\* N as urea and K as KCl were applied as single dressings on 7 January at four weeks after harvest.

\* P was applied as superphosphate (10,5), also on 7 January.

4. Results

4.1 Yield and crop characteristics at harvest

Treatments (kg/ha)	Cane t/ha	Sucrose % cane	Sucrose t/ha	Stalk counts x 10 <sup>-3</sup> /ha	Stalk length (cm)	Stalk mass (kg)
<u>Nitrogen</u>						
1. Nil	75	14,3	10,7	130	158	0,57
2. 50	83	14,3	11,8	135	164	0,61
3. 100	89	15,2	13,5	137	171	0,65
4. 150	87	14,9	13,0	139	168	0,63
Mean	84	14,7	12,3	135	165	0,62
<u>Potassium</u>						
1. 125	89	15,2	13,5	137	171	0,65
2. 250	93	15,6	14,5	145	169	0,64
3. 375	97	14,6	14,2	137	172	0,71
Mean	93	15,1	14,1	140	171	0,67
CV %	7,6	3,8	8,5	6,1	3,4	-
SE of treat. means	3,0	0,3	0,5	3,8	2,5	-
LSD (0,05)	8,8	0,7	1,5	11,1	7,4	-
LSD (0,01)	11,9	1,0	2,0	15,1	10,1	-

4.2 Third leaf N and K (d.m.%)

Treatments (kg/ha)		Age and date of sampling	
		4 m 8 March	12,4 m 29 December
<u>Nitrogen</u>			
1.	Nil	2,13	1,65
2.	50	2,20	1,75
3.	100	2,26	1,76
4.	150	2,30	1,81
<u>Potassium</u>			
1.	125	1,22	0,99
2.	250	1,29	1,10
3.	375	1,36	1,15

5. Comments on results

5.1 The rainfall was 68% of the LTM and the mean yield was 4,3 tc/ha/m and 9,1 tc/ha/100 mm of rainfall.

5.2 Nitrogen

Despite the low rainfall a yield of 75 tc/ha was obtained when no nitrogen had been applied, confirming the high N release characteristic of this soil.

The yield response in tons cane and tons sucrose was curvilinear and the optimum level appears to be about 100 kg N/ha. Stalk length and mass followed the same trend.

The ratio of kg N : tc/ha at the optimum level is about 1:1.

Cane quality was also affected in a curvilinear way. Third leaf sampling indicated adequacy at all levels at four months of age and even at 12,4 months of age in the second summer the cane in the zero N plots showed only marginal deficiency.

### 5.3 Potassium

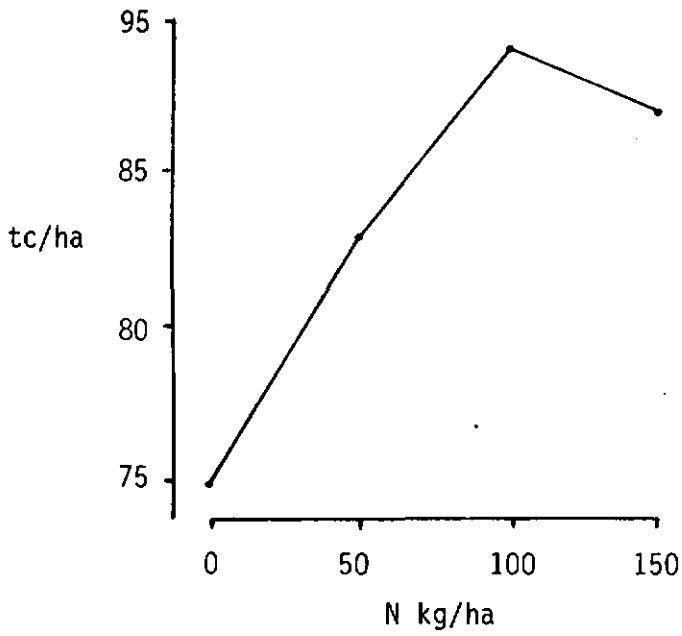
There appears to be a small (n.s.) linear response to K even at the high levels applied. The same K levels were applied to the previous crop leaving a K residue in the soil which was quite substantial (an increase of 24 ppm per 125 kg/ha applied, or 1:5). The third leaf K values were a good guide at the second sampling only.

The probability of a response being obtained to applied K can only be assessed on the basis of the mean soil K analysis for each K treatment and as each K treatment has a different base line for K the results cannot be logically interpreted, but some useful third leaf data may accrue in the following crop.

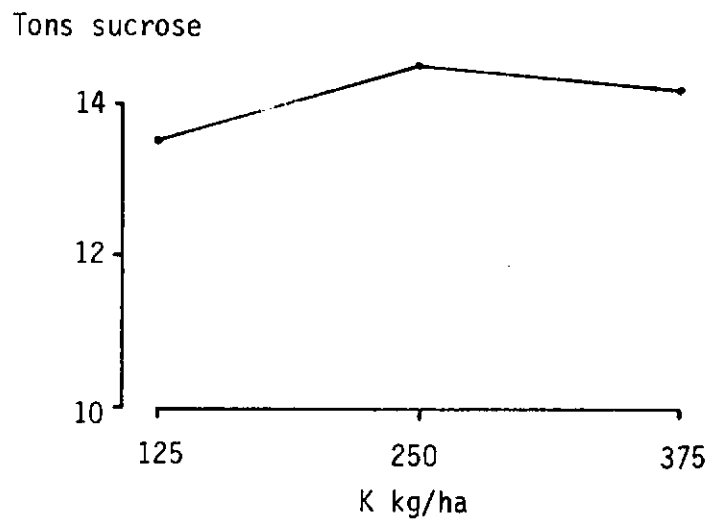
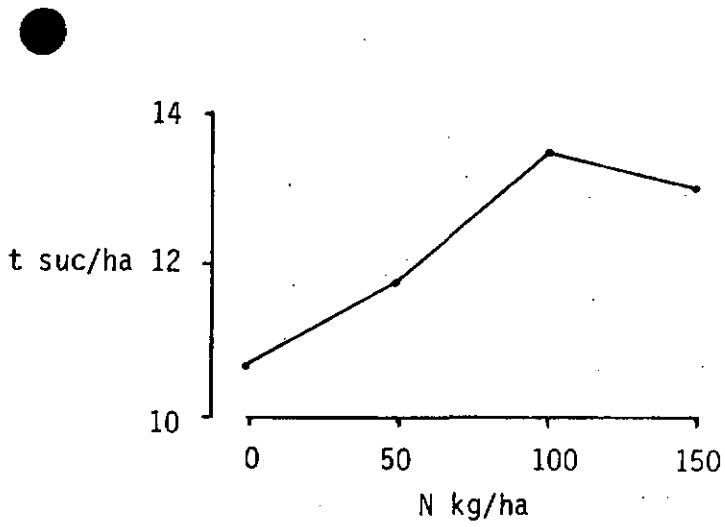
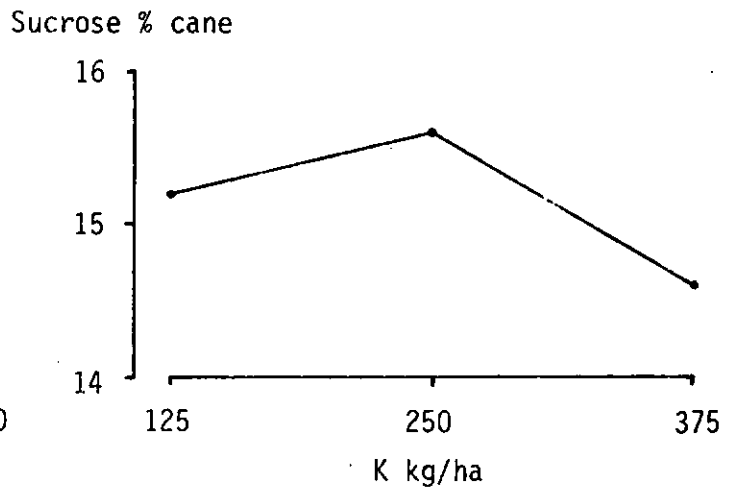
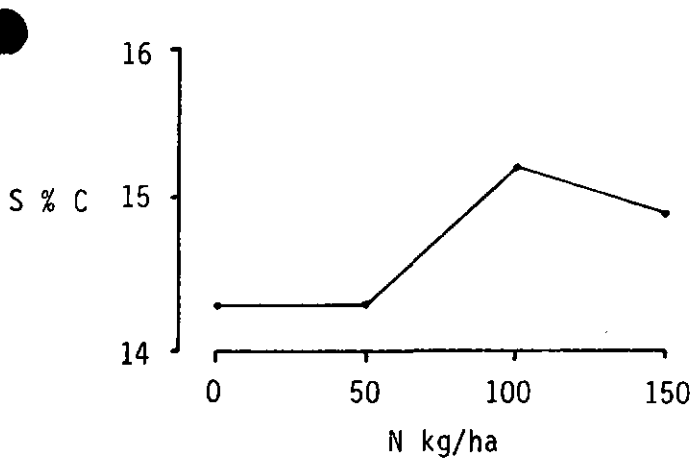
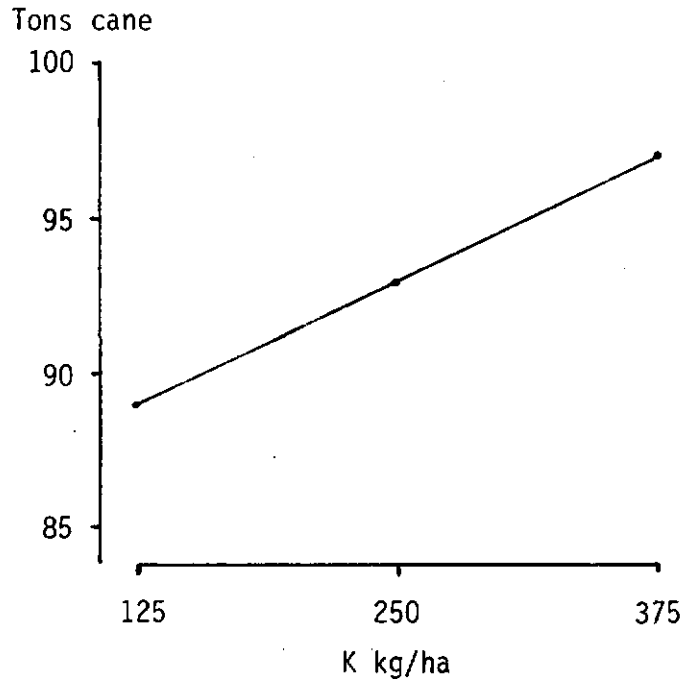
RKMCI/GC  
5 October 1983



Response to N



Response to K



(115)

SOUTH AFRICAN SUGAR INDUSTRY  
AGRONOMISTS' ASSOCIATION

Code : FT8NK/80/R5

Cat. No.: 1154

**TITLE:** Rates of Nitrogen and Potassium for ratoon cane grown in a Hutton form soil in the Natal Midlands.

1. Particulars of the project

<p><u>This crop</u> : 5th ratoon</p> <p><u>Site</u> : Richmond</p> <p><u>Region</u> : Midland</p> <p><u>Soil system</u> : Nottingham</p> <p><u>Soil form/series</u>: Hutton/Balmoral</p> <p><u>Design</u> : Randomised block x 5 reps</p> <p><u>Variety</u> : NCo293</p> <p><u>Fertilizer</u> : <u>N</u> <u>P</u> <u>K</u> * 50 *</p> <p>*See treatments</p>	<p><u>Soil analysis</u>: Date: 16/8/83</p> <table border="0"> <tr> <td><u>pH</u></td> <td><u>O.M.%</u></td> <td><u>Clay%</u></td> <td><u>P.D.I.</u></td> </tr> <tr> <td>5,31</td> <td>9,20</td> <td>46</td> <td>0,05</td> </tr> </table> <hr/> <table border="0"> <tr> <td></td> <td colspan="4" style="text-align: center;">ppm</td> </tr> <tr> <td><u>P</u></td> <td><u>Ca</u></td> <td><u>Mg</u></td> <td><u>Zn</u></td> <td><u>Al</u></td> </tr> <tr> <td>17</td> <td>791</td> <td>&gt; 220</td> <td>2,2</td> <td>7</td> </tr> </table> <hr/> <table border="0"> <tr> <td><u>Applied, K</u></td> <td><u>Soil K</u></td> </tr> <tr> <td><u>Kg ha</u></td> <td><u>ppm</u></td> </tr> <tr> <td>125</td> <td>150</td> </tr> <tr> <td>250</td> <td>227</td> </tr> <tr> <td>375</td> <td>286</td> </tr> </table> <p><u>Age</u>: 15,4 mnths Date: (16.8.83-27/11/83)</p> <p><u>Rainfall</u>: 909 mm 86% of L.T.M.: 1054 mm (Stn: Ten Glower O'er)</p> <p><u>Irrigation</u>: NIL</p>	<u>pH</u>	<u>O.M.%</u>	<u>Clay%</u>	<u>P.D.I.</u>	5,31	9,20	46	0,05		ppm				<u>P</u>	<u>Ca</u>	<u>Mg</u>	<u>Zn</u>	<u>Al</u>	17	791	> 220	2,2	7	<u>Applied, K</u>	<u>Soil K</u>	<u>Kg ha</u>	<u>ppm</u>	125	150	250	227	375	286
<u>pH</u>	<u>O.M.%</u>	<u>Clay%</u>	<u>P.D.I.</u>																															
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**Soil Description:** Brown clay topsoil overlaying a deep red brown weakly structured subsoil.

2. Objectives:

To measure the response to levels of N and K of ratoon cane grown in a Hutton form, Balmoral series soil in the Natal Midlands.

3. Treatments

Levels of N and K (kg ha<sup>-1</sup>)

	N	K
T1	NIL	125
T2	50	125
T3	100	125
T4	100	250
T5	100	375
T6	150	125

Notes on treatments

- N as Urea(46) and K as KCl(50) were applied as single dressings on 15.9.83 four weeks after harvest.
- P was applied as Superphosphate (10,5) on 15.9.83

Rainfall mm

Months	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
1983-84	6	35	59	168	91	117	89	66	35	4	14	30
LTM	32	50	75	103	101	129	96	101	55	31	11	14
1984	28	10	113	46	Total = 909							
LTM	32	48	76	101	Total = 1054							

4. Results

4.1 Yield and harvest crop characteristics

Treatments kg ha <sup>-1</sup>	t ha <sup>-1</sup> cane	Sucrose % cane	t ha <sup>-1</sup> sucrose	Stalk counts x10 <sup>-3</sup> ha <sup>-1</sup>	Stalk length (cm)
N - Treatments					
T1 Nil	56	12,66	7,2	120	131
T2 50N	60	13,17	7,9	125	140
T3 100N	57	12,88	7,4	132	137
T6 150N	58	12,61	7,3	129	140
Mean	57	12,83	7,4	126	137
K - Treatments					
T3 125K	57	12,88	7,4	132	137
T4 250K	63	12,87	8,2	129	140
T5 375K	66	12,93	8,6	132	139
Mean	62	12,89	8,1	131	139
C.V.%	7,8	3,3	8,3	5,6	3,4
S.E. of treatment Mean ±	2,10	0,189	0,287	3,23	2,10
L.S.D. (0,05)	6,20	0,56	0,85	9,52	6,21
(0,01)	8,45	0,76	1,15	12,96	8,45

4.2 Third leaf % d.m. analyses

Treatments kg ha <sup>-1</sup>	9.1.84 4,6 months	13.2.84 5,9 months	19.4.84 7,9 months
N - treatments		N % d.m.	
T1 NIL	2,34	2,00	1,75
T2 50N	2,39	2,05	1,83
T3 100N	2,49	2,08	1,83
T6 150N	2,46	2,13	1,86
K - treatments		K % d.m.	
T3 125K	1,12	0,87	0,58
T4 250K	1,31	1,11	0,74
T5 375K	1,53	1,24	0,76

4.3 Exchangeable soil K ppm

Applied K kg ha <sup>-1</sup>	No treatments	ppm at the end of			
	R2	R3	R4	R5	
125K	108	122	150	174	
250K	108	146	227	288	
375K	114	170	286	270	

5. Comments

- Nitrogen: as in previous crops there was a small response only to N on these high organic matter soils, even in this fifth ratoon crop. Somewhere between 50 and 100 kg N/ha appears to be adequate. This conclusion is supported by 3rd leaf N data which show high levels even where no N had been applied, and crop characteristics ie stalk population and length. Cane quality was also depressed when levels of N greater than 50 kg/ha were applied.

The crop was very immature at harvest having had only one summer's growth and therefore limited time in which to utilise nitrogen.

- Potassium: the results add credence to the suggestion that in some soils ie those with a high clay content, there is a problem of K being readily available to the plant. There seems to be little doubt that there was a real response to the highest level of K ( $P > 0,1$  for tc and ts/ha) and third leaf data show clear deficiencies in K at 7,9 months and at 5,9 months where the lower levels of K were applied, and this despite a substantial build up in the soil K where KCl had been applied over the years.

RESPONSES TO NITROGEN AND APPLIED POTASSIUM

NITROGEN

