

(124)

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

Code : FT11NK/80
Cat. No. : 1261

Title: Rates of nitrogen and potassium for ratoon cane grown on a granite derived soil on the South Coast.

1. Particulars of the project:

This crop : 4th ratoon
Site : C.G. Smith (Pty) Ltd
Nkwifa Valley
Region : South Coast Coastal
Soil system : Umzinto Coast
Lowlands
Soil form/series : Glenrosa/Cartref
Design : 6 x 3 Factorial
with 2 reps
Variety : NCo 376
Fertilizer : N P K
kg/ha ↓ 40 ↓
see treatments

Soil analysis: Date: 6/11/80

pH	O.M.%	Clay %	P.D.I.
5,3	1,75	8	

ppm					
P	K	Ca	Mg	Zn	Al
11	48	423	78	1,5	2

Age : 14,3 m Dates: 24/9/80 -
2/12/81

Rainfall : 978 mm L.T.M.: -

Irrigation: Nil

Soil profile description:

The upper half of the trial (eastern section) is a Glenrosa soil form and has a dark grey loamy sand (orthic) topsoil merging into weathered granite parent material (LITHOCUTANIC) at 400-450 mm depth.

The lower half (western section) is a Cartref soil form and has a grey loamy sand (orthic) topsoil 250 mm deep overlying a light grey horizon (E-horizon), which in turn overlies weathered granite parent material (LITHOCUTANIC) at + 450 mm of depth.

1. Objectives:

To determine the optimum levels of N and K on a Glenrosa/Cartref soil form.

2. Treatments:

Levels of N and K (kg/ha)

<u>Nitrogen</u>	<u>Potassium</u>
NO - 0	K0 - 0
N1 - 100	K1 - 125
N2 - 130	K2 - 250
N3 - 160	
N4 - 190	
N5 - 220	

Notes on treatments:

1. Nitrogen was applied as urea (46%) and potassium as KCl in a single application in November at six weeks after harvest.
2. Phosphorus was applied as single supers (11,3%) at ten weeks after harvest.

3. Results:3.1 Yield:

Treatment (kg/ha)	<u>Tons cane/ha</u>						Mean
	N0 0	N1 100	N2 130	N3 160	N4 190	N5 220	
K0 0	61	66	65	69	65	72	67
K1 125	62	71	78	67	78	72	72
K2 250	71	73	77	69	87	89	78
Mean	65	70	73	69	77	78	

C.V. % 11,9

LSD (0,05) Treatment means 18,1
 N means 10,4
 K means 7,4

	<u>Sucrose % cane</u>						
	0	125	250	Mean	0	125	250
0	13,8	13,9	13,5	13,5	14,1	13,2	13,7
125	13,9	13,9	13,4	14,0	13,0	13,8	13,7
250	13,5	13,5	14,3	13,8	13,6	13,5	13,7
Mean	13,8	13,7	13,7	13,8	13,6	13,5	

C.V.% 4,2

LSD (0,05) Treatment means 1,21
 N means 0,70
 K means 0,49

	<u>Tons sucrose/ha</u>						
	0	125	250	Mean	0	125	250
0	8,4	9,2	8,8	9,3	9,1	9,5	9,1
125	8,6	9,9	10,4	9,5	10,2	10,0	9,8
250	9,7	9,9	11,0	9,6	11,9	12,0	10,7
Mean	8,9	9,6	10,1	9,5	10,4	10,5	

C.V.% 12,1

LSD (0,05) Treatment means 2,52
 N means 1,45
 K means 1,03
 LSD (0,01) K means 1,41

3.2 Treatment effects on harvested crop characteristics:

	Stalk population x 1000/ha	Stalk length (cm)	Stalk mass (kg)
N0	120	149	0,54
N1	132	153	0,53
N2	132	159	0,56
N3	133	151	0,52
N4	132	163	0,58
N5	141	166	0,55
K0	128	151	0,52
K1	132	157	0,54
K2	135	162	0,58

3.3 Third leaf analyses:

		N% dm				
Age/month		2,5	3,4	4,5	5,5	6,5
Treatment		Dec	Jan	Feb	Mar	Apr
N0		2,28	1,72	1,74	1,88	1,68
N1		2,53	2,05	1,91	1,94	1,70
N2		2,56	2,08	1,98	1,98	1,71
N3		2,53	2,00	1,93	1,98	1,67
N4		2,59	2,11	2,06	2,06	1,72
N5		2,45	2,15	2,02	2,12	1,73

		K% dm				
K0		1,07	0,80	0,88	0,87	1,14
K1		1,16	0,99	1,03	1,08	1,32
K2		1,15	1,10	1,06	1,13	1,35

4. Comments on results:

4.1 The crop was harvested relatively young (14,3 m) and yielded on average 5,03 tc/ha/m and 7,36 tc/ha/100 mm rainfall.

4.2 Nitrogen: Apart from the inexplicable result at the N3 level, the response appears to be linear up to 190 kg/ha in terms of tons cane and sucrose. There is a slight depression in cane quality with increasing N levels particularly at the N4 and N5 levels. Third leaf N data indicate a deficiency only where no N was applied. Stalk length and population were both increased with increasing amounts of N.

The soil mineralised nitrogen at a rate which was sufficient to produce 54,5 tc/ha per annum. The optimum level of N appears to be about 190 kg/ha.

- 4.3 Potassium: The response to K appears to be linear in respect of tons cane and sucrose with no adverse effect on cane quality. With the low soil K level (48 ppm) a good response to K was predicted but the substantial response between K1 and K2 is interesting. Third leaf K values indicated deficiencies at the K0 and K1 levels but the K content increased with time.

Stalk population and length increased with increasing K levels.

RKMcI/PMO
17.2.82

Notes on treatments

1. Nitrogen was applied as urea (46%) and potassium as KCl in a single application at six weeks of age.
2. Phosphorus was applied as single supers (11,3%) at six weeks of age.

3. Results

3.1 Yield

Tons cane/ha

Treatment (kg/ha)	N0 Nil	N1 100	N2 130	N3 160	N4 190	N5 220	Mean
K0 Nil	43,5	54,5	49,0	54,5	59,4	48,3	51,5
K1 125	50,5	49,0	*	57,8	51,7	57,3	53,3
K2 250	49,1	54,7	61,3	53,8	54,0	46,6	52,3
Mean	47,7	52,7	55,2	55,4	55,0	50,7	

* missing

CV % 13,1

LSD: Treatment means (0,05) = 14,6
 N means (0,05) = 8,5
 K means (0,05) = 6,0

*Rainfall 65%
 < 70%*

Sucrose % cane

K0 Nil	12,6	12,8	12,2	10,5	11,9	12,1	12,0
K1 125	13,5	11,8	*	11,9	11,8	12,0	12,2
K2 250	14,0	12,0	12,5	11,9	11,4	11,6	12,4
Mean	13,4	12,2	11,8	11,4	11,7	11,9	

CV % 5,9

LSD: Treatment means (0,05) = 1,5 ; (0,01) = 2,1
 N means (0,05) = 0,9 ; (0,01) = 1,2
 K means (0,05) = 0,6 ; (0,01) = 0,9

Tons sucrose/ha

K0 Nil	5,5	7,0	6,0	5,7	7,1	5,9	6,2
K1 125	6,8	5,9	*	6,9	6,1	6,8	6,5
K2 250	6,9	6,5	7,6	6,5	6,1	5,5	6,5
Mean	6,4	6,4	6,8	6,4	6,4	6,1	

CV % 16,4

LSD: Treatment means (0,05) = 2,2
 N means (0,05) = 1,3
 K means (0,05) = 0,9

3.2 Treatment effects on harvested crop characteristics

Treatment (kg/ha)		Stalk population 10 ⁻³ /ha	Stalk length (cm)	Stalk mass (kg)
N0	Nil	90	146	0,51
N1	100	92	149	0,58
N2	130	80	151	0,57
N3	160	102	151	0,55
N4	190	87	156	0,64
N5	220	88	160	0,52
K0	Nil	96	146	0,53
K1	125	84	152	0,56
K2	250	90	156	0,57

3.3 Third leaf analyses DM %

		Age (months)/date	
		2,2 m 9 Feb	4,4 m 13 April
N0	Nil	1,98	1,77
N1	100	2,39	2,15
N2	130	2,42	2,17
N3	160	2,46	2,24
N4	190	2,45	2,15
N5	220	2,44	2,19
Threshold value		1,70	1,60
K0	Nil	0,89	0,82
K1	125	1,31	1,21
K2	250	1,43	1,30
Threshold value		1,05	1,05

Comments on results

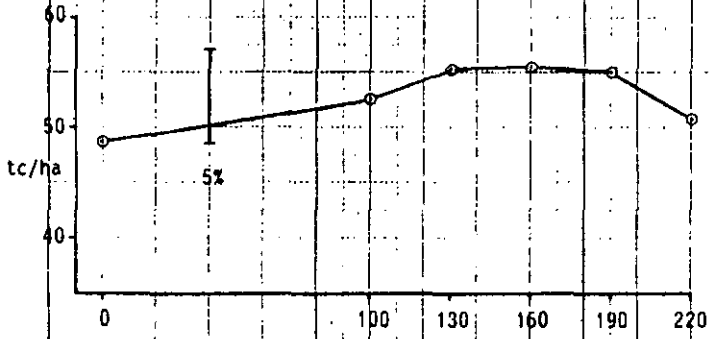
1. Rainfall was only 65% of the LTM and the mean yield was low: 3,8 tc/ha/m and 6,6 tc/ha/100 mm of rainfall. Stalk populations are remarkably low for NCo 376 due presumably to the drought.
2. Fairly high C.V's are probably the result of the low yield coupled with damage caused by monkeys. Plots 1 and 13 were badly damaged by monkeys and have been omitted in the results.
3. Nitrogen
 - 3.1. A yield 48 tc/ha in 13,8 months was produced without any applied nitrogen.
 - 3.2. The response to applied N in terms of tons cane was relatively small (12% and n.s) and the depression in cane quality with increasing N levels resulted in a very small (n.s) response in terms of tons sucrose/ha. The comparatively poor response to N is presumably due to the low rainfall.
 - 3.3. Third leaf N data indicated adequacy at all N levels including the zero N level at two and at four months of age.
 - 3.4. Stalk length increased consistently with increasing N levels but stalk population and mass appeared to be unaffected.
4. Potassium
 - 4.1. Although soil K level was low (46ppm) in the K0 plots there was only a slight yield response (n.s.) to the intermediate level of K (125 kg/ha)
 - 4.2. Applied potassium appeared on average to be beneficial to cane quality but the effect was small and n.s.
 - 4.3. Third leaf K values indicated a deficiency at the K0 levels.
 - 4.4. Stalk length and mass appeared to increase slightly with increasing K levels but effects on stalk population were inconsistent.
5. The trial continues into the sixth ratoon with the same N and K levels being applied.

RKMcI/IS
13 July 1983

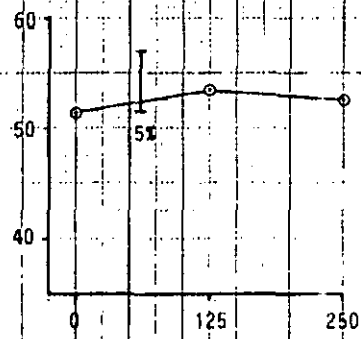
FT 11 NK/80/R5

Response to N

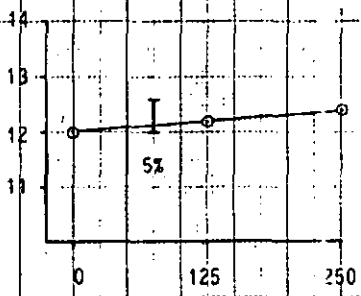
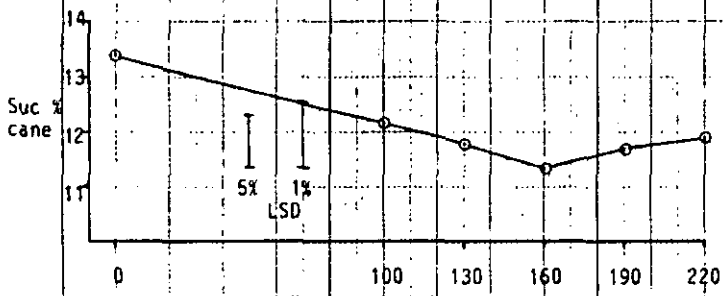
tons cane/ha



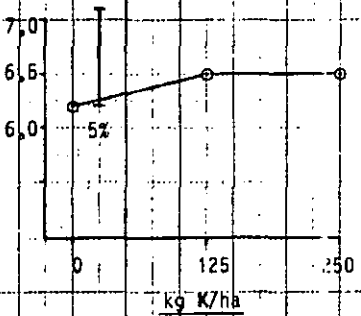
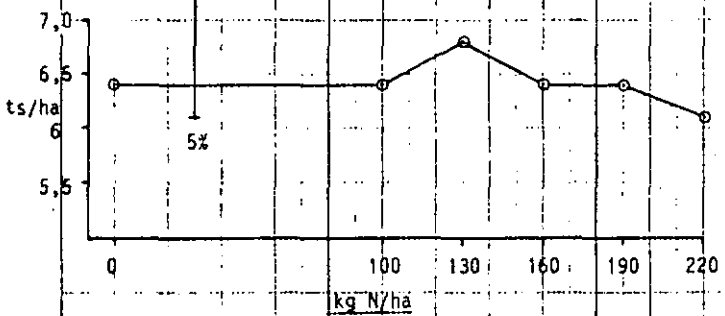
Response to K



Sucrose percent cane



Tons sucrose/ha



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TITLE: Rates of nitrogen and potassium for ratoon cane grown on a granite derived soil on the South Coast

1. Particulars of the project

This crop : 6th ratoon
Site : CG Smith (Pty)Ltd
 Nkwifa Valley
Region : South Coast Coastal
Soil system : Umzinto Coast
 Lowlands
Soil form/series: Glenrosa &
 Cartref
Design : 6 x 3 factorial with
 2 reps.
Variety : NCo 376
Fertilizer/ : N P K
Ameliorates : ↓ 40 ↓
 : See Treatments

Soil analysis:

Date: 25/1/83

OM% Clay%
 1,75 9

ppm
 pH P Ca Mg
 5,3 14 453 72

kg k ha ⁻¹	K ppm		
	4R	5R	6R
Nil	39	44	38
125	47	62	64
250	51	77	81

Age: 15,5 months: Dates (25/1/83-10/5/8)

Rainfall: 1043 mm L.T.M.: 1279 mm

Irrigation: Nil

Soil Description: The greater part of the trial site consists of a grey loamy sandy soil overlying a light grey E-Horizon which in turn overlies weathered granite rock at a depth of about 0,5 m

Rainfall mm:

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1983	0	87	23	25	11	4	88	23	25	87	146	87
LTM	(106)	127	112	57	68	16	34	49	73	97	111	132
1984	142	163	84	47	Total: 1043 mm							
LTM	106	127	112	57	- : 1279 mm							

2. Objectives

To determine the optimum levels of N and K for ratoon cane growing on soils of the Glenrosa and Cartref Forms

3. Treatments

Levels of N and K kg ha⁻¹

<u>NITROGEN</u>	<u>POTASSIUM</u>
N0 = Nil	K0 = Nil
N1 = 100	K1 = 125
N2 = 130	K2 = 250
N3 = 160	
N4 = 190	
N5 = 220	

3.1 Notes on Treatments

- Nitrogen was applied as Urea (46%) and Potassium as Kcl (50%) in a single application 15/2/83
- Phosphorus was applied as single supers (10,5%) on 15/2/83

4. Results

4.1 Yields

Tons cane ha⁻¹

Kg ha ⁻¹ N		N					Mean	
		N0	N1	N2	N3	N4		N5
K		Nil	100N	130N	160N	190N	220N	
K0	Nil	80,4	83,5	92,4	86,3	98,4	88,7	88,3
K1	125K	75,3	71,0	80,3	112,0	89,4	127,9	92,7
K2	250K	84,4	103,3	103,6	116,1	120,7	114,9	107,2
Mean		80,0	85,9	92,1	104,8	102,8	110,5	

C.V.% 12,5

L.S.D. Treatment Means = 25,65

(P=0,05) N Means = 14,78

K Means = 10,45

Sucrose % cane

K0	Nil	11,44	11,50	11,74	11,25	12,12	11,07	11,52
K1	125K	12,95	12,20	11,54	12,00	12,99	11,23	12,15
K2	250K	12,76	12,38	12,40	11,78	11,35	12,64	12,22
Mean		12,39	12,03	11,89	11,68	12,15	11,65	

C.V.% 5,2

L.S.D. Treatment Means = 1,32

(P=0,05) N Means = 0,76

K Means = 0,54

Tons Sucrose ha⁻¹

K0	Nil	9,0	9,5	10,8	9,7	11,9	9,9	10,1
K1	125K	9,8	8,6	9,3	13,4	11,7	14,2	11,2
K2	250K	10,8	12,7	12,8	13,7	13,6	14,5	13,0
Mean		9,8	10,3	11,0	12,3	12,4	12,9	

C.V.% 12,9

L.S.D. Treatment Means = 3,16

(P=0,05) N Means = 1,82

K Means = 1,29

4.2 Treatments effects on harvested crop characteristics

Kg ha ⁻¹	Stalk population 10 ⁻³ ha ⁻¹	Stalk length (Cm)	Stalk mass (kg)
N0 = Nil	122	212	0,65
N1 = 100N	119	221	0,75
N2 = 130N	114	236	0,85
N3 = 160N	142	237	0,74
N4 = 190N	138	229	0,76
N5 = 220N	123	230	0,93
K0 = Nil	139	218	0,63
K1 = 125K	119	225	0,80
K2 = 250K	121	239	0,91

4.3 Third Leaf analyses d.m.% Age (Months) and Date

Kg ha ⁻¹	2,7 m April	10,9 m December	11,9 m January
<u>NITROGEN</u>			
N0 = Nil	2,00	1,59	1,61
N1 = 100N	2,28	1,74	1,74
N2 = 130N	2,36	1,88	1,70
N3 = 160N	2,51	1,79	1,65
N4 = 190N	2,31	1,83	1,73
N5 = 220N	2,42	1,94	1,81
<u>POTASSIUM</u>			
K0 = Nil	0,70	0,62	0,64
K1 = 125K	1,18	1,03	1,05
K2 = 250K	1,39	1,22	1,18

Comments on results

Rainfall was 82% of the longterm mean and good yields were obtained. The mean yield was 96 tons cane/ha. This is equivalent to 6,2 tons cane/ha/month or 9,2 tons cane/ha/100 mm rainfall. The rainfall was however unevenly distributed. The first summer and the following winter were particularly dry, but the second summer was wet.

Nitrogen

A yield of 80 tons cane/ha was obtained with no applied nitrogen indicating that this soil mineralises considerable quantities of N.

The response to applied nitrogen in this 6th ratoon crop was linear, but was significant ($P=0,05$) only at the high rates (160 kg/ha, 190 kg/ha, and 220 kg/ha). There was no significant difference in yield at these high N levels, although cane quality was slightly depressed.

The optimum rate of N was 220 kg/ha and at this level the rates of applied N were 1,9 kg N/ton cane and 17,1 kg N/ton sucrose.

The same linear response was also observed in the 4th ratoon crop. In the 5th ratoon crop the response was obscured because of the drought and the low yields that ensued.

Third Leaf N data indicated adequacy in all treatments when the cane was very young at 2,7 months of age. The two other samplings (10,9 months and 11,9 months) showed a deficiency in the treatment where no nitrogen was applied. These samplings, however, were done in the 2nd summer when the cane was comparatively old.

There seems a definite tendency for stalk length and stalk mass to increase with increasing N levels. There was no apparent trend for stalk population.

Potassium

The soil K levels were low in all plots at the end of this 6th ratoon crop. This points to the difficulty of increasing the soil K level in the sandy granite derived soils. However some residual effects can be seen at the end of the 5th and 6th ratoon crop.

The soil K level was particularly low in the K0 plots and this is reflected in third leaf data which indicate a value well below the threshold. There appears to be an N & K interaction.

At the low N levels there is a significant difference ($P=0,05$) between the two rates of applied K with the higher rate (250 kg/ha) resulting in higher yields. However at the high N levels there is a negligible yield difference resulting from the two levels of K.

The response to applied K over all levels of N was significant ($P=0,01$) at the high rate of K. The optimum K level was thus 250 kg/ha.

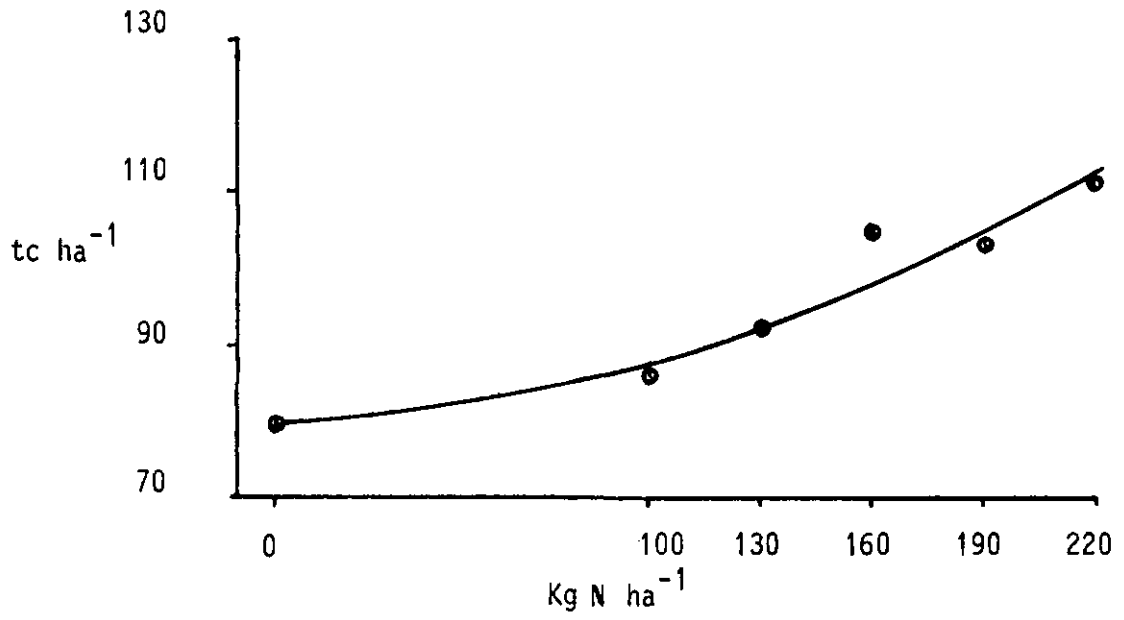
There was a marked increase ($P=0,05$) in cane quality with applied K.

Stalk length and stalk mass appeared to increase with increasing K levels.
The effects on stalk populations were inconsistent

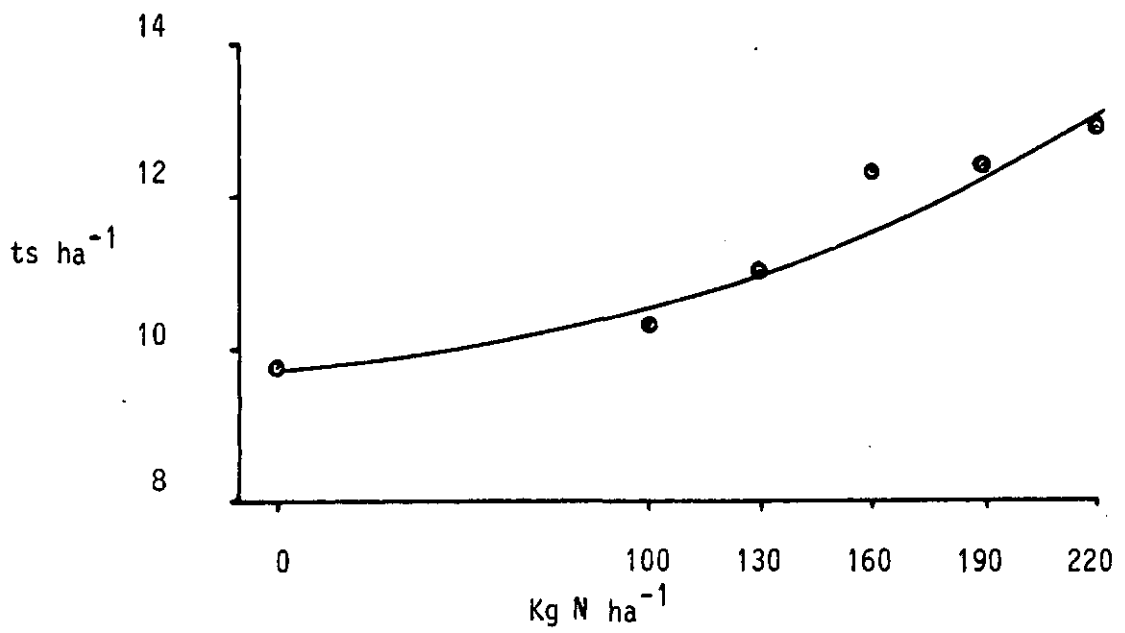
MFAL/IS
30 May 1984

RESPONSE TO NITROGEN

Tons cane ha⁻¹



Tons sucrose ha⁻¹



RESPONSE TO POTASSIUM

