SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

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Code:M-Ecca/88A
Cat. No:1811

Title: The effect of ridge planting on cane grown in a summer cycle.

1. Particulars of the project

This crop	:2nd ratoon
Site	:Field 207 CA La Mercy
Region	:North coast
Soil system	:Umzinto coast lowlands
Soil form/series	:Longlands/Westleigh
Design	:Randomised
Variety	:NCo376 and N12

Fertilizers/ Ameliorants (kg/ha) 12/12/90	**N**	**P**	**K**
	143	29	143

Date: 21/11/90
Soil analysis:

pH	**O.M%**	**Clay**	**P.D.I.**
5.60	-	12	-

ppm

P	**K**	**Ca**	**Mg**	**Zn**	**Al**
50	58	368	127	-	-

Age: 11.7 mths
Dates:21/11/90-12/11/91
Rainfall:1089 **L.T.M:**1081
Irrigation: Nil

2. Objectives:

a) To establish the effect of ridge planting on germination and yield of cane planted in a summer cycle.
b) To monitor soil moisture and root growth in ridged plots under the treatments under 3 below.

3. Treatments:

a) Control - conventional plant
b) Planting on the ridge

4. Results:

Table 1: Comparison of stalk heights (mm) and population (x1000/ha) for three crops (Summer plant - La Mercy).

Variety	Plant crop Height (mm) T1	Plant crop Height (mm) T2	Plant crop Population (*1000) T1	Plant crop Population (*1000) T2	1st ratoon Height (mm) T1	1st ratoon Height (mm) T2	1st ratoon Population (*1000) T1	1st ratoon Population (*1000) T2	2nd ratoon Height (mm) T1	2nd ratoon Height (mm) T2	2nd ratoon Population (*1000) T1	2nd ratoon Population (*1000) T2
NCo376	1250	1240	114	118	1300	1350	145	145	1730	1790	162	169
N12	1250	1210	129	130	1370	1400	159	152	1900	1740	170	191**

T1 = Control T2 = Ridged
** Significant over control at 1 % level.

Table 2: Variation of cane height and population during the second ratoon (Summer plant - La Mercy).

Date	Heights (mm) NCo376 T1	Heights (mm) NCo376 T2	Heights (mm) N12 T1	Heights (mm) N12 T2	Population ($x10^3$/ha) NCo376 T1	Population ($x10^3$/ha) NCo376 T2	Population ($x10^3$/ha) N12 T1	Population ($x10^3$/ha) N12 T2
11/03/91	1100	1080	1060	940	228	214	224	243
06/05/91	1470	1550	1500	1490	165	174	168	181
12/11/91	1730	1790	1900	1740	162	169	170	191

T1 = Control T2 = Ridged

Table 3: Mean yield results of three crops (Summer plant - La Mercy).

Variety	Plant crop tc/ha/an T1	Plant crop tc/ha/an T2	Plant crop ts/ha/an T1	Plant crop ts/ha/an T2	1st ratoon tc/ha/an T1	1st ratoon tc/ha/an T2	1st ratoon ts/ha/an T1	1st ratoon ts/ha/an T2	2nd ratoon tc/ha/an T1	2nd ratoon tc/ha/an T2	2nd ratoon ts/ha/an T1	2nd ratoon ts/ha/an T2
NCo376	62	69	8.1	9.0	68	72	9.0	9.7	68	73	8.3	8.6
N12	55	56	7.3	7.3	56	65	7.1	7.7	67	66	8.1	7.9
Mean	59	63	7.7	8.2	62	69	8.1	8.8	68	70	8.2	8.3
Mean resp. (T1-T2)	4		0.5		7		0.6		2		0.1	
Rain mm	1327+				1270+				1060			

T1 = Control T2 = Ridged + Above long term mean

Table 4: The percentage gaps present in the row at harvest of each treatment for the first three crops (Summer plant La Mercy).

	Plant crop 10/11/89	1st ratoon 23/11/90	2nd ratoon 13/11/91	Mean of 3 crops
NCo376				
Control	1.3	3.0	2.3	2.20
Ridged	9.3	5.3	9.0	7.87
N12				
Control	2.7	2.7	2.3	2.57
Ridged	4.3	4.0	4.3	4.20

Table 5: Mean ridge height for the La Mercy summer plant cycle (mm).

Date	08/01/91 Re-ridge	05/03/91 Height	03/07/91 Height	30/10/91 Width	30/10/91 Height	10/12/91 Re-ridge	20/01/92 Width	20/01/92 Height
Mean		228(18)	179(24)	592(24)	176(13)		630(39)	219(20)

5. Growth measurements

Height and population differences between the control and ridged cane was greater for the third crop than the previous crops (Table 1). Although N12 showed a significant population benefit for the ridged cane over that of the control it was not reflected in the yield results (Table 3), probably because the stalk length of the ridged cane (N12) was on average 160 mm shorter than that of the control.

Table 2 shows that about 6 months after ratooning the cane had reached about 85 % of its final height and about 97 % of its final population at the harvested age of 12 months.

6. Yield measurements

Although the rainfall was equivalent to the long term mean, no significant yield increases were obtained (Table 3). Overall means for the second ratoon were smaller than those of the previous ratoons. Variety NCo376 showed a slight increase and N12 showed a slight decrease in yield when results of the ridged plots were compared with those of the control plots.

7. Gaps in the row

The percentage gaps present in the cane row of each treatment are summarized in Table 4. Although no trends between yield and gap percentages were found it was clear that the ridges had on average 5.7 and 1.6 % more gaps than the control plots for varieties NCo376 and N12 respectively. Since the percentage gaps showed no increase with cropping it is likely that lack of germination at planting was responsible for the gaps and not moisture stress as previously believed.

8. Ridge height

After harvesting the first ratoon the trial was re-ridged to a height of about 228 mm. Ridges subsided and stabilised at about 176 mm with a width of about 590 mm after a period of four months (Table 5). After harvesting the second ratoon the trial was again re-ridged. The aim was to build the ridges as high as possible in an attempt to increase the yields. Early indications are that the ridges have stabilised at about the same height as that found after the first ratoon (219 mm). The reason the ridge is not higher is that the 1,2 m row spacing does not permit the tractor wheels to fit in the interrows without destroying part of the ridge.

9. Ridging and soil N mineralization

In the early stages of the third ratoon, before topdressing with fertilizer,it was noticed that the ridged cane had a darker green colour than the cane on the control plots. The likely explanation is that soil disturbance by the ridging operation caused a higher N mineralization rate in the ridge compared with the control. Both leaf and soil samples have been taken to test this possiblilty. Subject to the results there may be merit in superimposing N treatments on this trial in which half of all ridged and control plots would receive normal FAS recommendations and the other half 50 % of FAS recommendations. The objective would be to determine whether ridged cane has a lower N requirement.

10. Future work

Three crops have been harvested to date and none has produced yield results that differ significantly from that of the control. Consideration should therefore be given to vertically mulching the interrow on half of each treatment in order to increase rooting depth on these shallow soils.

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30 March 1993

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Code : M-Ecca/88A
Cat No : 1811

Title: The effect of ridge planting on cane grown in a summer cycle.

1. Particulars of the project

This crop	: 3rd ratoon
Site	: Field 207 CA La Mercy
Region	: North coast
Soil System	: Umzinto coast Lowlands
Soil form/series	: Longlands/ Westleigh
Design	: Randomised
Variety	: NCo376 and N12
Fertilizer/ Ameliorants (kg/ha)	: N 143 P 29 K 143

Soil analysis Date : 15/10/1992

pH	OM%	Clay%	PDI
5,15	-	12	-

ppm

P	K	Ca	Mg	Zn	Al
60	108	377	119	-	4

Age : 11,1 months
Dates : 12/11/91 - 15/10/92
Rainfall : 450 mm L.T.M: 1081
Irrigation : Nil

2. Objectives

a) To establish the effect of ridge planting on germination and yield of cane planted in a summer cycle.

b) To monitor soil moisture and root growth in ridged plots under the treatments under 3 below.

3. Treatments

a) Control - conventional plant.
b) Planting on the ridge.

4. Results

Table 1 : Comparison of stalk heights (mm) and population (x 1000/ha) for four crops (summer plant - La Mercy)

Variety	Plant Crop				1st Ratoon				2nd Ratoon				3rd Ratoon			
	Height		Population		Height		Population		Height		Population		Height		Population	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
NCo376	1250	1240	114	118	1300	1350	145	145	1730	1790	162	169	507	607	49	54
N12	1250	1210	129	130	1370	1400	159	152	1900	1740	170	191**	552	505	82	68
Mean	1250	1225	122	124	1335	1375	152	149	1815	1765	166	180	530	556	66	61
Mean Response (T2-T1)	-25		2		40		-3		-50		14		26		-5	

T1 = Control T2 = Ridged ** Significant over control at 1% level.

Table 2 : Mean yield results of four crops (Summer plant - La Mercy)

Variety	Plant crop				1st Ratoon				2nd Ratoon				3rd Ratoon			
	tc/ha/an		ts/ha/an		tc/ha/an		ts/ha/an		tc/ha/an		ts/ha/an		tc/ha/an		ts/ha/an	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
NCo376	62	69	8,1	9,0	68	72	9,0	9,7	68	73	8,3	8,6	3,6	8,1	0,2	0,6
N12	55	56	7,3	7,3	56	65	7,1	7,7	67	66	8,1	7,9	9,0	3,3	0,6	0,2
Mean	59	63	7,7	8,2	62	69	8,1	8,8	68	70	8,2	8,3	6,3	5,7	0,4	0,4
Mean Response (T2-T1)	4		0,5		7		0,7		2		0,1		-0,6		0	
Rain (mm)	1327+				1270+				1060				450			

T1 = Control T2 = Ridged + Above long term mean

Table 3 : Mean gravimetric moisture percentage per treatment and per variety at depths 0-300, 300-600, 600-900 mm (Summer plant ridging trial - La Mercy - 01/10/92)

Treatment	NCo376			N12		
	0-300 mm	300-600 mm	600-900 mm	0-300 mm	300-600 mm	600-900 mm
Moisture						
Control	7,77	10,61	11,19	6,64	9,73	13,23
Ridged	5,43	6,83	11,10	5,68	7,43	8,81
Stds						
Control	1,42	2,65	2,11	0,99	3,71	3,83
Ridged	1,98	2,68	2,96	1,87	3,92	4,67
CV%						
Control	18,26	24,98	18,86	14,87	38,15	28,92
Ridged	36.55	39,24	26,70	32,95	52,82	52,95

Table 4 : Mean root length density (cm/cc) from selected sites of the summer plant ridging trial La Mercy - 03/12/92

Treatment	NCo376					N12				
	Depth (mm)				Total root length (cm/cm^2)	Depth (mm)				Total root length (cm/cm^2)
	100	200	300	400		100	200	300	400	
Lv (cm/cc)										
Control	0,5791	0,3887	0,2028	0,2359	2,813	0,6724	0,4240	0,3718	0,1675	3,271
Ridged	0,7694	0,6195	0,4056	0,1168	3,823	0,5015	0,6724	0,3042	0,1499	3,796
Stds										
Control	0,2182	0,2446	0,0585	0,1562		0,2282	0,1751	0,1553	0,0874	
Ridged	0,4464	0,2656	0,2241	0,0474		0,1858	0,2984	0,1427	0,0467	
CV%										
Control	37,7	62,9	28,8	66,2		33,9	41,3	41,8	52,2	
Ridged	58,0	42,9	55,3	40,6		37,0	44,4	46,9	31,1	

Table 5 : Mean topsoil and leaf N values from samples collected on 22/01/92 (Summer plant - La Mercy)

Variety	Soil analysis N (ppm)		Leaf analysis N (%)	
	Control	Ridged	Control	Ridged
NCo376	9,13	8,75	1,61	1,82
N12	4,13	10,83	1,53	1,78
Mean	6,63	9,79	1,57	1,80

Table 6 : Mean ridge height and width for the La Mercy summer plant cycle (mm)

Date	08/01/91 Re-ridge	05/03/91 Height	03/07/91 Height	30/10/91 Width	30/10/91 Height
Mean		228	179	592	176

Date	10/12/91 Re-ridge	20/01/921 Height	20/01/921 Height	01/10/92 Width	01/10/92 Height
Mean		630	219	519	251

5. Growth measurements

Like the previous crops there were no significant differences in terms of cane height and population between treatments (see Table 1). The effect that the drought had on the growth of the cane was very noticeable as cane height and population was only 30% and 37% respectively of that measured for the second ratoon.

6. Yield measurements

The rainfall received by the third ratoon was only 42% of that of the long term mean and this is dramatically reflected in the yields. The tc/ha/an for the third ratoon was less than that of any of the previous ratoons (see Table 2).

7. Gravimetric moisture content

The soil moisture content was measured gravimetrically to a maximum depth of 900 mm at intervals of 300 mm (see Table 3). It is apparent that the ridged areas were drier than the control areas and that this difference between treatments extended to a greater depth for variety N12 when compared with NCo376. The differences were however not significant. In general the values recorded for the 0-300 mm soil layer reflect the permanent wilting point.

8. Root distribution

Duplicate core samples were taken from 10 plots to a depth of 400 mm and at depth intervals of 100 mm to determine root distribution between treatments (see Table 4). The results indicated that there was little difference between treatments per soil layer in terms of rooting density (Lv, cm/cc) and that for both varieties the root length index (L, cm/cm^2) was, although not significant, consistently greater for the ridged treatment.

9. Ridging and soil N mineralisation

In the early stages of the third ratoon, before topdressing with fertiliser, it was noticed that the ridged cane had a darker green colour than the cane on the control plots. The likely explanation is that soil disturbance by the ridging operation caused a higher N mineralisation rate in the ridge compared with the control. On the 22/01/92 both leaf and soil samples were taken from each plot to test this possibility (see Table 5). Although the differences between treatments for soil and leaf N were small and not significant, higher values were consistently obtained from the ridged treatment.

10. Ridge height

On the 10/12/91 the third ratoon was re-ridged with three discs on either side. The tractor wheel spacing was wider than the 1,2 m row spacing with the result that the back wheels were driving on the foot slopes of the ridges, compacting the sides as it went along. The ridge width and height was measured on the 20/01/92 and again on the 01/10/92 just before the crop was harvested (see Table 6). As the results reflect the ridges at harvest were as they had been just after re-ridging indicating very stable ridges with a strong crust. The low rainfall may have been the main reason for the apparently stable appearance of the ridges. However, it was noticed on the Mtunzini ridging trial that the ridges did become more stable with each re-ridging operation.

11. Discussion

The growth and yield measurements reflect the severity of the 1992 drought and showed that both treatments performed equally badly under these extreme conditions. Although the root distribution between treatments and between varieties was similar to a depth of 400 mm the ridged treatments had in general extracted water more deeply (600 mm) and the N12 ridged treatment had extracted water to a depth of 900 mm. The higher N measured in the soil and leaf of cane growing on the ridges did not have any effect on the yield. It is suggested that these measurements be repeated on other ridging trials in a normal rain year in order to determine whether this extra N had any effect on the yield. It appears that ridges become stable only after the third or fourth re-ridging operation.

12. Future work

After harvest germination on 11 of the 24 plots was very poor mainly because of the drought. Thus, in order to normalise the population at least a third of the trial would have required replanting. The trial has been terminated and will be replaced with a new trial to test tied ridging.