SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS ASSOCIATION

Cat no : 1784
Code no: M-Ecca/88
Project: 3739

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

1. Particulars of project:

This crop	2nd & 3rd ratoon		
Site	La Mercy field 207C		
Region	North Coast		
Soil system	Umzinto		
Soil form	Longlands/Westleigh		
Design	Observation trial		
Varieties	NCo376 & N12		
Fertilizer	N	P	K
16/10/91	159	0	159
11/08/92	159	0	159
Rainfall (mm)	639(2R) & 572(3R)		

Soil analysis : 22/06/92

pH	**OM%**	**Clay**	**PDI**
5.0	-	12	-

ppm

P	**K**	**Ca**	**Mg**	**Al**
51	180	230	91	9

Dates :04/07/91-22/06/92
:22/06/92-22/07/93
Ages :11.6 & 13.0 months
LTM (mm):1081

2. Objectives

1. To establish the effect of ridge planting on germination and yield of cane planted in a winter cycle.
2. To monitor differences in soil water and root growth between control and ridged treatments.

3. Treatments

1. Control - conventional plant.
2. Planting on the ridge.

4. Introduction

To date the trial has yielded a plant and three ratoon crops and the results are summarised in Table 2. The trial was conducted under dry land conditions and is, therefore, solely dependant on rainfall as a source of water. Since the start of the trial annual rainfall has ranged from good in 1990 to severely droughted conditions in 1992 and 1993 (see Figure 1 and Table 2).

TABLE 1: Comparison of stalk heights and population for four crops – Winter plant, La Mercy.

Crop / Date	Plant 23/07/90(13.4 MONTHS)				1st Ratoon 04/07/91 (11.5 MONTHS)				2nd Ratoon 22/6/92 (11.6 MONTHS)				3rd Ratoon 22/07/93 (13 MONTHS)			
	Stalk height (mm)		Stalk counts (x10³/ha)		Stalk height (mm)		Stalk counts (x10³/ha)		Stalk height (mm)		Stalk counts (x10³/ha)		Stalk height (mm)		Stalk counts (x10³/ha)	
Variety	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE
NCo376	1410	1490	123	127	1790	1860	135	135	840	780	139	141	800	760	104	95
N12	1510	1320	134	131	1770	1720	133	140	990	860	145	143	850	830	107	110
MEAN	1460	1405	129	129	1780	1790	134	138	915	820	142	142	825	795	106	103

TABLE 2: Mean yield results of four crops – Winter plant, La Mercy.

Crop	Plant				1st Ratoon				2nd Ratoon				3rd Ratoon				Overall response (Ridge – Control)	
	tc/ha/an		ts/ha/an		tc/ha/an		ts/ha/an		tc/ha/an		ts/ha/an		tc/ha/an		ts/ha/an		tc/ha/an	ts/ha/an
Variety	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE	CONTROL	RIDGE		
NCo376	62	69	8.1	9.0	68	72	9.0	9.7	26.4	21.3	3.2	2.5	19.1	15.9	2.2	1.7	3	−1
N12	55	68	7.3	7.3	68	66	7.1	7.7	30.2	23.6	4.0	2.8	18.7	16.7	2.2	2.1		
MEAN	59	63	7.7	7.6	62	69	8.1	8.2	28.3	22.6	3.6	2.7	18.4	16.8	2.2	1.9		
Response Ridge – Cont	4		0.1		7		0.1		−6		−0.9		−2		−0.3			
Rain (mm)	1294				1037				639				682				LTM = 1081 mm	

TABLE 3: Ridge height changes for four crops – Winter plant, La Mercy.

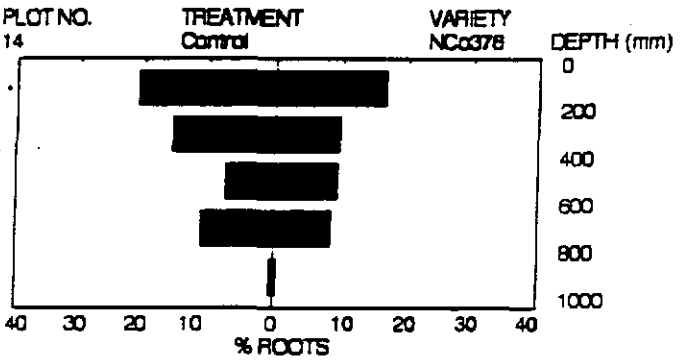
Crop	Plant			1st Ratoon			2nd Ratoon				3rd Ratoon
Date	02/06/89	05/01/90	12/06/90	20/09/90	06/03/91	03/07/91	30/10/91	22/01/92	18/06/92	07/07/92	10/11/93
Operation	RIDGED			RE-RIDGED			RE-RIDGED				
Ridge Heights (mm)	250	133	141	221	224	187	259	212	207	227	167

Table 4: Root counts and distribution for ridged and control treatments (Winter plant – La Marcy).

PLOT NO. 14 | TREATMENT Control | VARIETY NCo376

DEPTH (mm)	GRID NO	1	2	3	4	5	TOTAL	%
0–200	A	22	29	31	25	12	119	38
200–400	B	18	25	13	11	13	80	25
400–600	C	9	8	13	14	9	53	17
600–800	D	13	15	14	13	7	62	20
800–1000	E	1	0	2	0	0	3	0.9
TOTAL							317	100

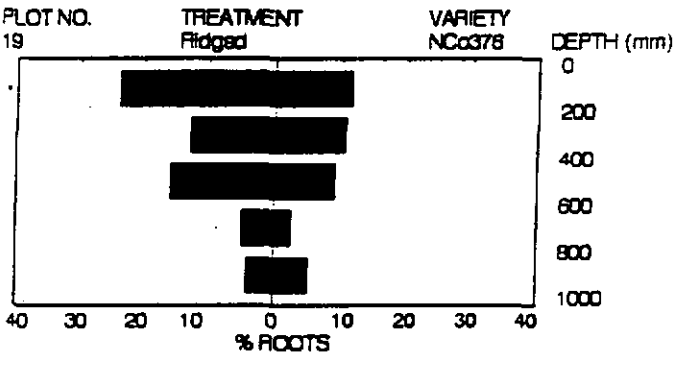
DATE 28/09/93 | AREA La Marcy



PLOT NO. 19 | TREATMENT Ridged | VARIETY NCo376

DEPTH (mm)	GRID NO	1	2	3	4	5	TOTAL	%
0–200	A	32	30	32	15	6	115	35
200–400	B	20	14	15	10	17	76	23
400–600	C	19	22	21	10	9	81	25
600–800	D	4	10	4	4	2	24	7
800–1000	E	2	7	8	2	11	30	9.2
TOTAL							326	100

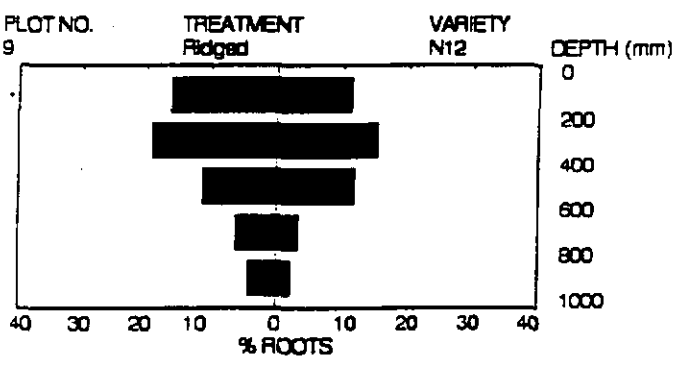
DATE 28/09/93 | AREA La Marcy



PLOT NO. 9 | TREATMENT Ridged | VARIETY N12

DEPTH (mm)	GRID NO	1	2	3	4	5	TOTAL	%
0–200	A	0	63	90	30	0	183	27
200–400	B	45	52	62	44	26	229	34
400–600	C	32	30	25	36	30	153	23
600–800	D	13	22	13	8	7	63	9
800–1000	E	10	16	5	6	5	42	6.3
TOTAL							670	100

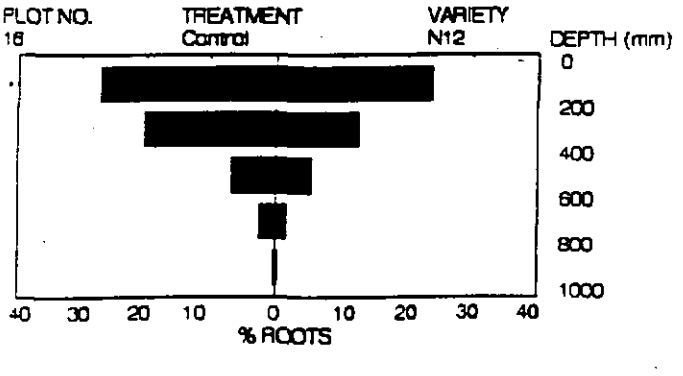
DATE 28/09/93 | AREA La Marcy



PLOT NO. 16 | TREATMENT Control | VARIETY N12

DEPTH (mm)	GRID NO	1	2	3	4	5	TOTAL	%
0–200	A	40	63	130	56	25	314	51
200–400	B	48	56	42	34	23	203	33
400–600	C	13	15	27	10	10	75	12
600–800	D	6	5	10	3	2	26	4
800–1000	E	1	0	0	0	1	2	0.3
TOTAL							620	100

DATE 28/09/93 | AREA La Marcy



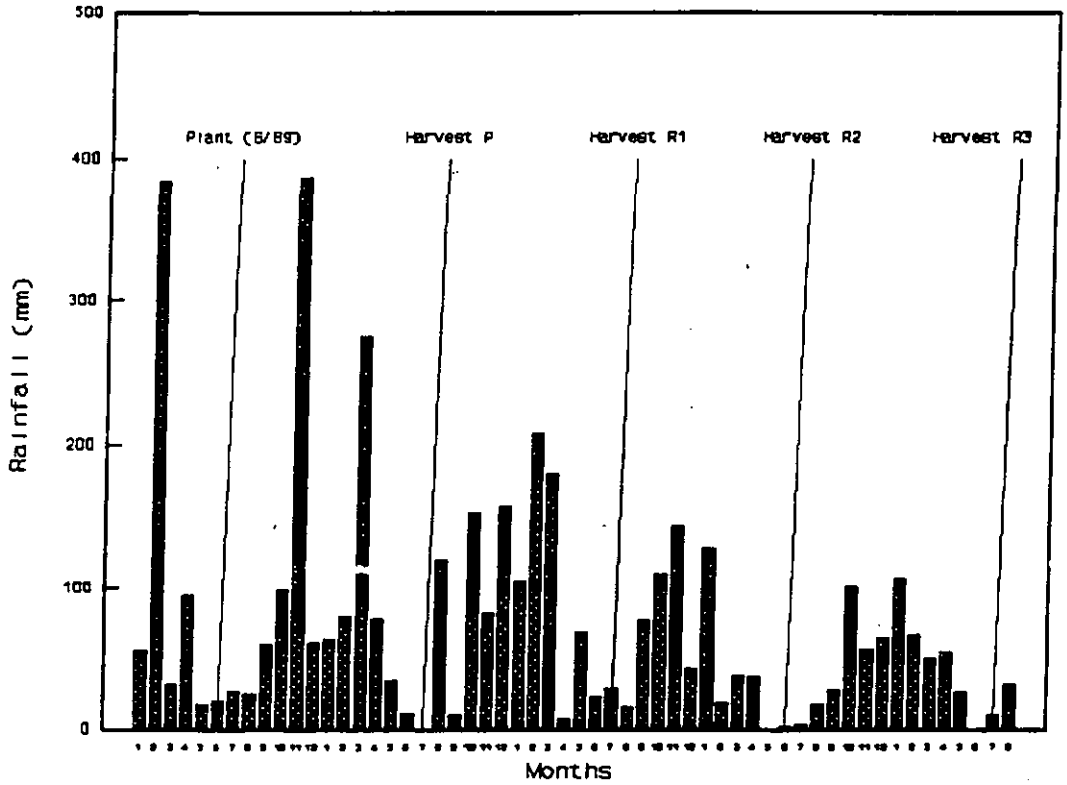


Figure 1: Monthly rainfall distribution for each crop harvested.

6. Growth measurements

Stalk heights of both varieties of 2nd and 3rd ratoon cane grown on the ridges were on average shorter than the cane growing in the control treatment (Table 1). Stalk counts between tillage treatments were, however, very similar. Stalk length was about 50% shorter for droughted compared to non-droughted cane and more shoots were produced in the 2nd ratoon and less in the 3rd ratoon droughted crops when compared with the non-droughted. Varietal differences in the non-droughted period was not as consistent as in the droughted period where N12 invariably produced the tallest and most shoots. These differences were not significant.

7. Yield measurements

Yields measured in the 2nd and 3rd ratoons were consistently lower for the ridged treatment, compared to the control (see Table 2). However, in the wetter periods (P & R1) the situation was reversed with the ridged treatment producing higher yields. As the purpose of ridge

tillage is to improve the conditions for growing cane on poorly drained soils, it has the adverse effect in dry years as soil temperatures of ridges tend to be higher than normal flat culture (especially before canopy closure) and therefore, tend to be drier (see report on the first ratoon). It can thus, be expected that the drought must have had a serious impact on the growth and yields of sugarcane growing on ridges when compared to normal flat culture. Varietal differences of crops growing in the wetter periods (P & R1) showed that NCo376 produced on average 10 tc/ha/an or 1.4 ts/ha/an more than N12. The yield performance of these two varieties was about the same during the drought stricken years. The drop in yield due to drought was more than 50% for both tillage treatments and varieties.

8. Ridge height measurements

The aim of ridge tillage is to maintain a ridge height of at least 200 mm. Initially the stability of the ridges was poor because there were no roots to bind the soil, a surface crust was absent and rainfall was high. The stability improved in the second crop and the required height was still evident six months after re-ridging (see Table 3) despite rainfall in excess of 100 mm in the months of August, October and December 1990 (see Figure 1). The trial was again re-ridged at the beginning of the 2nd ratoon and measurements revealed that the required ridge height was maintained for a period of at least nine months. A factor contributing to the improved stability of the ridges was the drought with only 60% rainfall received, compared to the long term mean, for the 2nd ratoon. However, total rainfall for the months October, November (1991) and January (1992) exceeded 100 mm/month. The rainfall intensities were not been measured.

9. Root measurements

Root distribution was monitored using the profile washing technique. Comparative treatment effects on root distribution are shown in Table 4. Only one pit was opened per treatment. The results indicated that:

* The control treatments had the greatest amount of roots in the surface layers but the lowest amount in the deepest soil layers when compared with the ridged treatments.
* The total amount of roots produced by N12 are about twice as much as that of NCo376.

By comparing the root distribution patterns for the same profiles washed in 1991 before the drought (see 1st ratoon report) with those collected at the end of the drought in September 1993 then it is evident that:

* The total amount of roots counted per profile are about the same between these dates for N12 but that NCo376 produced about 40% less roots.
* Both varieties had less roots in the surface layers and more in the deeper soil layers for the 1993 measurement compared to the 1991 measurement.

10. Future work

Despite the lack of waterlogged conditions to test the merits of ridging this trial did provide us with the opportunity to compare the performance of two sugarcane varieties before and after the drought. Again the trial produced non-significant results both in terms of yields and growth differences between tillage treatments. It is therefore suggested to terminate this trial and to replace it with a vertical mulching trial to evaluate ameliorants such as pinebark chips, chopped cane trash, bagasse and filtercake. One final crop (4th ratoon) will be harvested in June 1994.

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