SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

IRRIGATION & FERTILIZER TRIAL

Catalogue No.: 102
This Crop: 4R.
Site: Devaux, Inyaninga.
Altitude: 300'
Soil Series: Windermere, Clay Loam.
Design: Randomised Block, Split Plot.
Variety: N:Co.310
Fertilizer:

	Urea	D.Supers	M.of Potash
A	150	-	150
B	350	100	250
C	450	200	350

Water Regime: Irrigated.

Soil Analysis:

pH	OM%	Clay%
	Nil	

p.p.m.

P	K	Ca	Mg
	Nil		

Age: 18 months. (Dec. '64 - June '66.)
Rainfall: 46.20"
Irrigation: $W_1 = 28"$ - $W_2 = 18"$

Object: To attempt to revive a deteriorating ratoon with various combinations of irrigation and fertilizer.

Treatments:

Wo = Dryland Control

W1 = 1" Irrigation @ 1" deficit.

W2 = 1" Irrigation @ every 10 days

Results: TREATMENT

Block	Wo			W2			W1			Block Totals
	A	B	C	A	B	C	A	B	C	
1	15.6	17.5	15.0	25.7	35.9	43.9	33.0	36.6	37.5	260.7
2	15.5	15.4	22.9	24.3	35.7	37.5	27.6	35.0	42.4	256.3
3				26.9	38.0	36.0				100.9
4				26.7	34.9	29.0				90.6
Treatment Totals	31.1	32.9	37.9	50.0	71.6	81.4	60.6	71.6	79.9	517.0
				103.6	144.5	146.4				

S.E. of a single yield = 3.2

L.S.D. 5% = 14.76 T.C. per treatment Total *

L.S.D. 1% = 15.07 "   "   "   " **

L.S.D. 0.1% = 32.26 "   "   "   " ***

SUCROSE % CANE

Wo			W2			W1		
A	B	C	A	B	C	A	B	C
13.7	13.6	13.4	14.8	13.8	13.6	14.4	14.0	14.3

COMMENTS:

Treatment Comparisons (straight)

WoA	vs	W2A	* *	
WoB	vs	W2B	* * *	
WoC	vs	W2C	* * *	
W2A	vs	W1A	N.S. (nearly @ *) irrigation dominant.	
W2B	vs	W1B	N.S.	fertilizer dominant.
W2C	vs	W1C	N.S.	" "
W1A	vs	WoA	* * (nearly * * *)	
W1B	vs	WoB	* * *	
W1C	vs	WoC	* * *	

1. This experiment site is very even, as illustrated by the low S.E. of a single yield, considering low replication.

2. Average yield per water regime:

    Wo = 16.9 T.C.A.

    W2 = 32.9 "

    W1 = 35.3 "

3. Average yields per fertilizer treatment:

    A = 24.4 T.C.A.

    B = 31.1 "

    C = 33.0 "

4. There has been a magnificent response to irrigation - doubling of yield of dryland cane. When plotted as a function of inches irrigation applied there is marked curvilinearity with 87% of the highest yield response being obtained with only 64% of the irrigation applied. Treatment W2 represents a water duty of 180 acres to the cusec; or the application of 1 effective inch every 10 days. Treatment W1 has an estimated comparative water duty of 108 acres per cusec, or 1 inch effective every 6 days. Individual treatment comparisons are interesting =

											Response
	Dryland	+	150 Urea,		150 M.P.			= 15.5	T.C.A.		NIL
W2	Irrigated	+	" "	,	" "			= 25.9	"		(10.4)
W1	"	+,	" "	,	" "			= 30.3	"		(14.8)
	Dryland	+	350 Urea,	100 D.S.,	250 M.P.			= 16.4	"		NIL ?'4
W2	Irrigated	+	" "	, " "	, " "			= 38.1	"/		*(21.7)
W1	Irrigated	+	" "	, " "	, " "			= 35.8	"		(19.4)
	Dryland	+	450 Urea,	200 D.S.,	350 M.P.			= 18.9	"		NIL
W2	Irrigated	+	" "	" "	" "			= 38.8	"		(19.9)
W1	Irrigated	+	" "	" "	" "			= 39.9	"		(21.0)

There appears to have been an excellent response to fertilizer between average A - B - C yields. Analysis however, reveals that all this response occurs under irrigation, there being no significant response to additional fertilizer under dryland conditions.

The largest individual response occurs between W2A and W2B - namely 12.2 T.C.A. response to additional fertilizer, and this is probably the optimum economic level of fertilizer for this water regime.

The largest response to irrigation occurred between this medium fertilizer level in WoB and W2B treatments, where the difference was 21.7 T.C.A.

In terms of tons sugar per acre, treatment differences are even more widely spread because, on the average for all plots, irrigation has increased the sucrose % cane by 0.62% from 13.56% for dryland to 14.18% for irrigated cane.

Individual treatment comparisons are:

Response over dryland
fertilizer

WoA	=	2.13	T.S.A.			
W2A	=	3.74	"	(1.61)	T.S.A.	
W1A	=	4.49	"	(2.36)	"	
WoB	=	2.23	T.S.A.	Nil	T.S.A.	
W2B	=	5.45	"	(3.22)	"	
W1B	=	4.95	"	(2.72)	"	
WoC	=	2.53	T.S.A.	Nil	T.S.A.	
W2C	=	5.55	"	(3.02)	"	
W1C	=	5.46	"	(2.93)	"	

Once again the highest response to irrigation came from W2B - WoB comparison. Whereas with T.C.A. the response between these two treatments was 132% of the total dryland (WoB) yield, for T.S.A. the response has increased to 144% of the total dryland (WoB) sugar yield.

The following represents the estimated number of stalks per acre that were cut at harvest:

		No. of shoots per acre
WoA	=	38315
W2A	=	36860
W1A	=	31622
WoB	=	29585
W2B	=	43650
W1B	=	35793
WoC	=	31719
W2C	=	33174
W1C	=	45008

Without additional fertilizer, irrigation has reduced the number of stalks for harvest. This is probably due to the lower amount of canopy in the dryland plots, permitting higher shoot densities to develop - a similar effect was measured by Thompson and Stewart (1965).

Once fertilizer has been increased, the situation tends to reverse with irrigation increasing population density. Mean stalk heights per treatment is shown below at 1 month prior to harvest:

	Mean stalk height (inches)
WoA	34.2
W2A	50.8
W1A	57.9
WoB	40.5
W2B	61.5
W1B	68.5
WoC	35.5
W2C	64.0
W1C	68.7

Correlations between yield and population density, and yield and stalk height 1 month before harvest are 0.52 (NS) and 0.97 *** respectively.

Thus although certain trends are indicated for the effects of treatment on population density, the yield differences are very adequately described by stalk height data.

The aims of this experiment were achieved.

21st May, 1968.