SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION.

IRRIGATION LEVEL x TRASH MANAGEMENT x N-CARRIER TRIAL 4200/1.

Catalogue No.: 105
Code No.: 4200/1
This crop: Plant
Site: Experiment Station, Chiredzi.
Altitude: 1350'
Soil: PE 1 sandy clay loam
Design: Split plot
Fertilizer:

	N	P_2O_5	K_2O
Level	140	150	50
Carrier	Urea	Triple Supers	Muriate

Rainfall on crop: 23.6 in.
Age: 12.2 months (24/11/66 - 29/11/67)

Soil Analysis:

pH	($CaCl_2$)	6.4
Clay %		18
Cond.	(mmho/cm.)	.105
P_2O_5	(p.p.m.)	12
Ex. K	(m.e. %)	0.85
Ex. Ca	(m.e. %)	8.6
Ex. Mg	(m.e. %)	3.1
Min. N)	Initially	12
p.p.m.)	after incubation	24

Object: To determine the effect of various irrigation regimes on cane yield, sucrose % cane, smut susceptibility and stalk count. To determine the effects on yield of burning vs. a trash blanket, and any interaction with level of irrigation. To compare sulphate of ammonia with urea as N carriers.

Results:

Irrigation Treatments	W1	W2*	W3	W4	W5	W6	C.V. %	L.s.d. 5%	L.s.d. 1%
Pan Factor	1.0	1/.5	.84	.68	.53	.37	-	-	-
Irrigation applied (in.)	57.7	45.7	49.7	41.7	35.7	29.7	-	-	-
Total precipitation (in.)	81.2	69.2	73.2	65.2	59.2	53.2	-	-	-
Yield tons cane/acre	62.9	51.1	62.0	51.2	44.1	40.6	5.3	4.0	5.5
Sucrose % cane	14.1	13.5	14.0	14.3	15.1	14.0	5.5	0.7	0.9
Yields tons sucrose/acre	8.88	6.90	8.65	7.31	6.65	5.70	7.3	0.67	0.93
Stalk count ('000/acre)	53.5	53.5	52.2	54.1	52.1	54.8	4.0	3.4	4.8
% Lodging	61	1	34	4	0	0	95	15	21
Stalk height (ft.)	8.6	7.4	8.4	7.8	6.5	6.0	-	-	-
Tons cane/in. irrig. water	1.09	1.12	1.25	1.23	1.24	1.37	-	-	-
Tons cane/in. total water	0.77	0.74	0.85	0.79	0.74	0.76	-	-	-
lb sucrose/in. irrigation	308	302	348	351	373	384	-	-	-

* In Treatment W2, 1.0 x Pan was applied in summer and 0.5 x Pan in Winter.

Omitting W2, a mean increase was obtained of 0.89 tons cane or 0.12 tons sucrose per inch irrigation applied above the lowest level (29.7 in.). In addition to highly significant linear functions for both cane yield and sucrose yield ($P > 001$), there was a highly

The response of cane yield to irrigation was very large; yields increased with increasing levels of irrigation up to .84 x Pan. The yields of the 1.0 x Pan treatment were no better than those of 0.84 x Pan, partly because of the greater lodging in the 1.0 x Pan treatment. Sucrose % cane and E.R.S.C. were significantly reduced at both extremes of irrigation, with the optimum level at 0.68 x Pan. Brix and Purity followed the same trends, while fibre content increased steadily with increasing levels of irrigation. It is clear that a moderate degree of stress produces the highest recoverable sugar % cane.

Tons recoverable sugar per acre was highest with 0.84 x Pan, while even 0.68 x Pan gave as high yields as 1.0 x Pan.

The most economic use of water, expressed as tons cane or lb. sugar per acre in.water (irrigation or total) was consistently obtained with the 0.68 x Pan treatment. This was during a crop which received 17.8 in. rain. During the 1st ratoon, when only 7.3 in. effective rain was recorded, the most economic use of water was obtained with 0.84 x Pan.

Stalk count increased significantly with increasing levels of irrigation, from 60,000/acre in the driest to 65,000 in the wettest treatment.

Lodging increased sharply with increased levels of irrigation, as did stalk height.

Irrigation had no effect on the incidence of smut.

Although there was relatively little flowering, the wetter treatments had more flowers than the dry ones.

Burning vs. Trashing

IRRIGATION x TRASH MANAGEMENT

IRRIGATION LEVELS

Irrigation Treatments	W1	W3	W2	W4	W5	W6	Mean	Lsd(Means) 5%	1%
Pan Factor (Net)	1.0	.84	.84/.6	.68	.53	.37	-	-	-
Irrigation applied (in.)	58	48	44	36	26	18	-	-	-
Total precipitation(in.)	75.8	65.8	61.8	53.8	43.8	35.8	-	-	-

TONS CANE/ACRE

Burning	63.2	61.9	60.0	52.9	37.3	19.4	49.1	2.2	2.9
Trashing	59.2	62.7	59.6	58.3	42.4	32.4	52.4		

L.s.d. Body of Table (5%) 5.3 (1%) 7.1

ESTIMATED RECOVERABLE SUGAR % CANE

Burning	12.2	12.6	13.4	13.6	13.2	12.2	12.9	0.3	0.4
Trashing	11.2	12.3	12.6	13.0	13.0	12.5	12.4		

L.s.d. Body of Table (5%) 0.7 (1%) 0.9

TONS ESTIMATED RECOVERABLE SUGAR/ACRE

Burning	7.65	7.73	8.03	7.14	4.94	2.35	6.31	0.31	0.41
Trashing	6.63	7.73	7.53	7.56	5.49	4.08	6.50		

L.s.d. Body of Table (5%) 0.75 (1%) 1.01

STALK COUNT ('000s/acre)

Burning	69.2	69.7	68.0	67.7	66.4	61.4	67.1	1.4	1.8
Trashing	60.7	59.1	61.2	59.3	58.9	60.3	59.9		

L.s.d. Body of Table (5%) 3.3 (1%) 4.4

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

IRRIGATION LEVEL x TRASH x N-CARRIER TRIAL (4200/1/1R)

Catalogue No: 105

This crop: 1st Ratoon

Site: Experiment Station

Altitude: 1350'

Soil: PE 1 sandy clay loam

Design: Split plot

Fertilizer: N P_2O_5

Level 160 75

Carrier Treatment Double Supers

Rainfall on crop: Total 11.02 in.

Effective 7.34 in.

Age: 11.9 months (29/11/67-25/11/68)

Soil Analysis:

pH ($CaCl_2$)

Clay %

Cond. (mmho/cm) .105

P_2O_5 (p.p.m)

Ex.K (m.e.%)

Ex. Ca (m.e.%) 8.6

Ex. Mg (m.e.%) 3.1

Min. N) initially 12

p.p.m) after incubation 24

Object:

To determine the effect of various irrigation regimes on cane yield, sucrose % cane, smut susceptibility and stalk count. To determine the effects on yield of burning vs. a trash blanket, and any interaction with level of irrigation. To compare sulphate of ammonia with urea as N carriers.

Results: Irrigation level

Irrigation Treatments	W1	W2*	W3	W4	W5	W6	C.V. %	L.s.d. 5%	L.s.d. 1%
Pan Factor	1.0	1/.5	.84	.68	.53	.37	-	-	-
Irrigation applied (in)	67.0	57.0	59.0	47.0	37.0	27.0	-	-	-
Total precipitation (in)	78.0	68.0	70.0	58.0	48.0	38.0	-	-	-
Yield tons cane/acre	75.7	62.2	71.6	52.2	38.5	20.7	8.1	3.7	5.1
Sucrose % cane	12.8	12.2	13.1	13.7	13.0	11.8	6.2	0.9	1.3
Yield tons sucrose/acre	9.66	7.58	9.39	7.14	4.99	2.48	10.7	0.70	0.98
Stalk count ('000/acre)	68.7	68.3	65.9	64.2	63.0	60.1	4.8	3.1	4.2
% Lodging	71	26	52	1	0	0	67	15	21
Smut whips per acre	249	208	365	281	221	180	96	152	210
Stalk height (ft).	7.8	6.8	7.8	6.1	3.9	3.0	-	-	-
Tons cane/in. irrig.water	1.13	1.09	1.21	1.11	1.04	0.77	-	-	-
Tons cane/in. total water	0.97	0.91	1.02	0.90	0.80	0.54	-	-	-
lb sucrose/in. irrigation	288	266	318	304	270	184	-	-	-
lb sucrose/in. total water	248	223	268	246	208	131	-	-	-

*In treatment W2, 1.0 x Pan was applied in summer and 0.5 x Pan in Winter.

The response to irrigation was very large, because of the very dry season (of the total of 11.02 in. rain during the crop, 3.68 in. fell during the last fortnight before harvest and may be regarded as ineffective). It

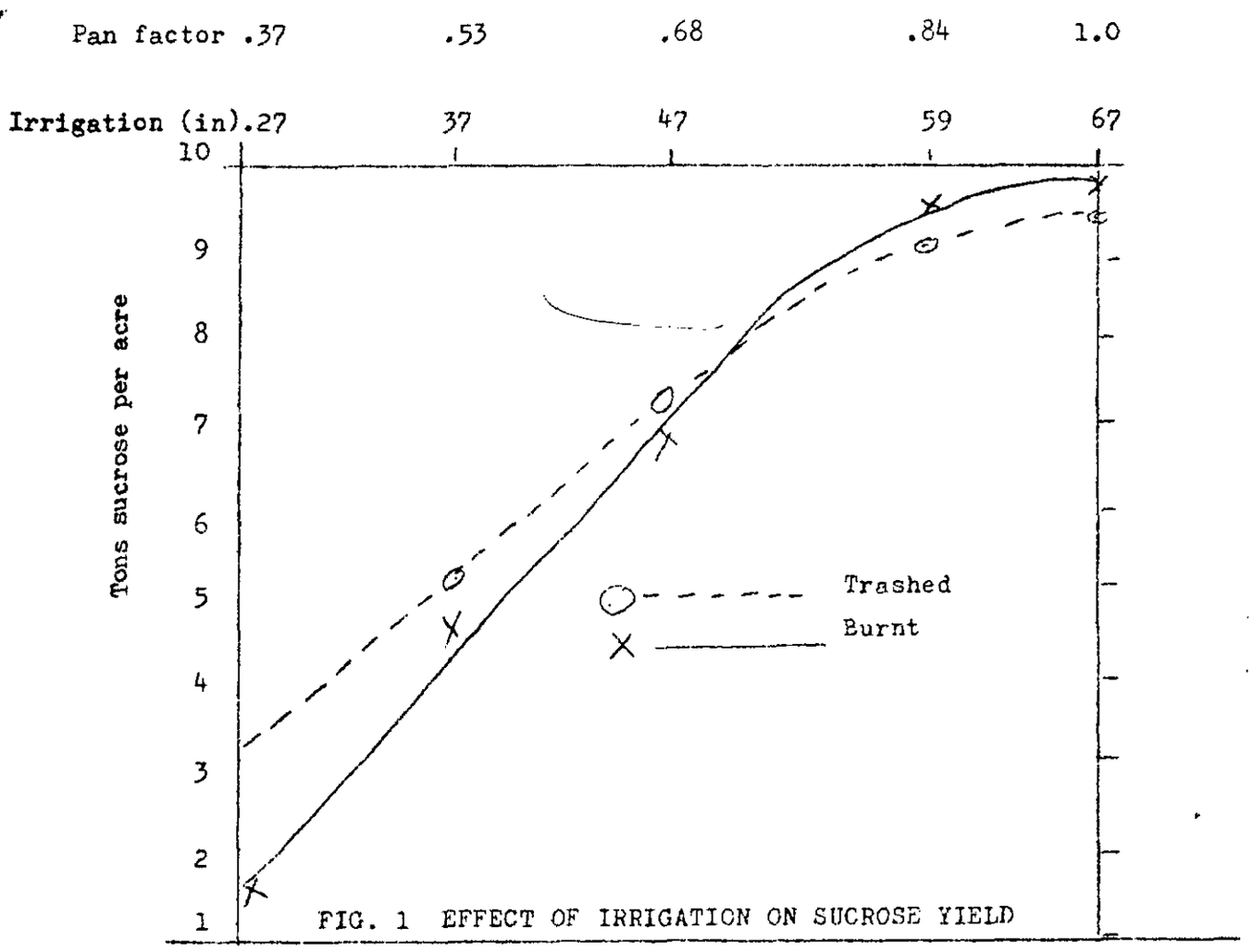


FIG. 1 EFFECT OF IRRIGATION ON SUCROSE YIELD

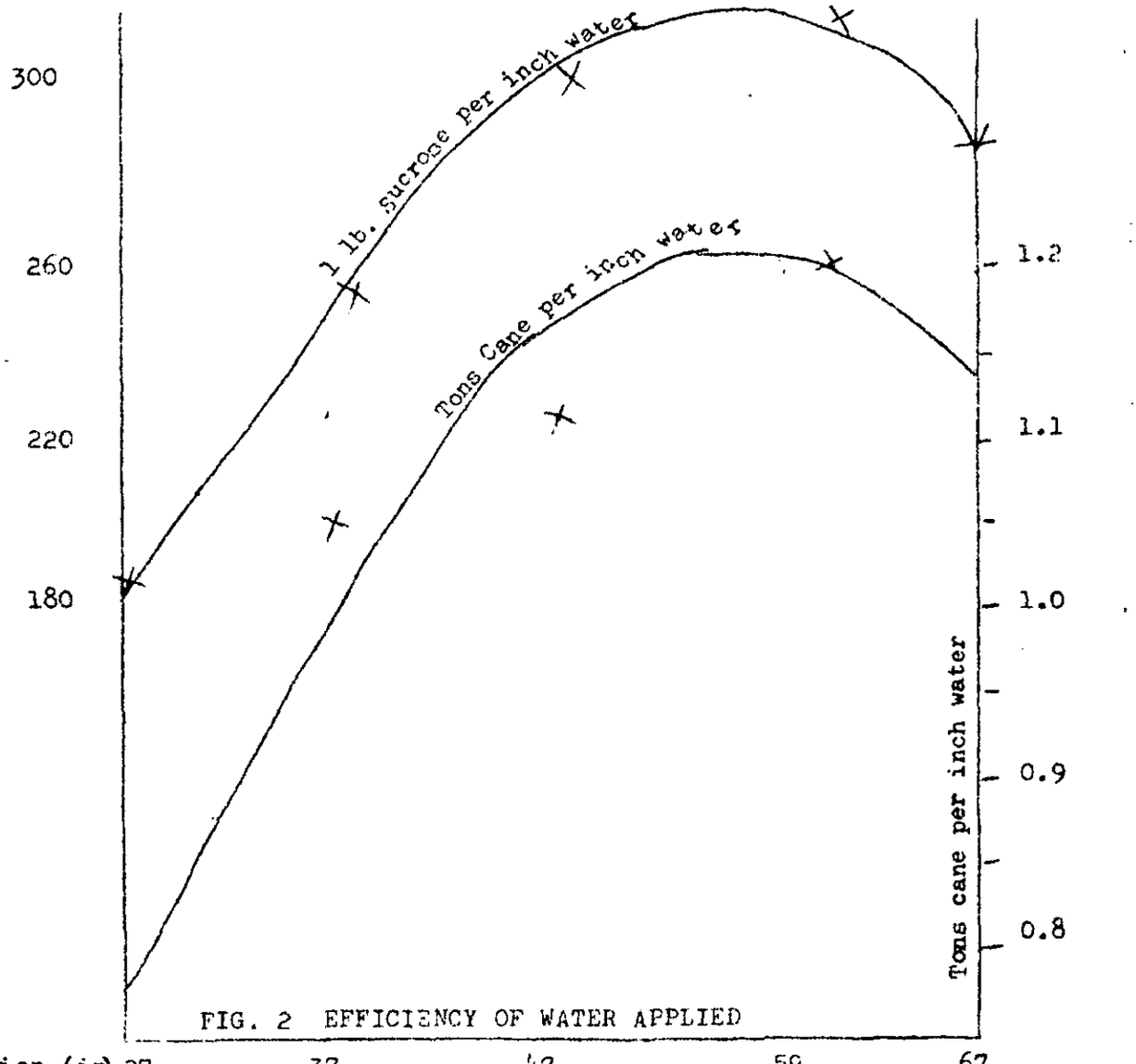


FIG. 2 EFFICIENCY OF WATER APPLIED

is apparent from Fig. 1 that yields increased steadily up to an application of 59 in. (0.84 x Class 'A' pan evaporation), with only a slight increase from the additional water applied in the 1.0 Class 'A' pan treatment. The response in yield per inch of water applied is shown in Fig. 2, and it appears that maximum efficiency was obtained at somewhere between 0.68 and 0.84 pan or about 54 inches water applied or 65 in. water gross. The sharp drop in efficiency with lower water application is noteworthy; this is due to the great reduction in canopy caused in the highly stressed treatments; thus each irrigation was followed by a period of renewal of foliage before additional cane could be formed. The driest treatment produced less than half the yield per inch of total water (irrigation + rainfall) compared with the optimum treatment.

Sucrose content was also significantly affected by irrigation; both the wettest and the driest treatments producing significantly lower sucrose content than the optimum (0.68 pan). The former was evidently not dry enough, while in the latter treatment desiccation presumably resulted in destruction of sucrose.

The wet treatments produced a significantly higher stalk population than the dry treatments, whilst lodging increased markedly with the wet treatments. There was no consistent effect of irrigation on sumt count.

Burning vs. Trashing

TONS CANE/ACRE

	W1	W2	W3	W4	W5	W6	Mean	L.s.d. 5%	(Means) %
Burning	77.0	63.5	71.9	49.4	36.4	14.1	52.1	1.8	2.4
Trashing	74.3	61.0	71.3	55.0	40.5	27.3	54.9		

L.s.d: Body of Table (5%) 4.3 (1%) 5.8

SUCROSE % CANE

Burning	12.8	12.5	13.3	13.9	13.0	11.4	12.8	0.3	0.4
Trashing	12.7	12.0	12.9	13.5	12.9	12.1	12.7		

L.s.d: Body of Table (5%) 0.8 (1%) 1.1

TONS SUCROSE/ACRE

[illegible]	9.87	7.85	9.54	6.87	4.77	1.62	6.76	0.30	0.40
[illegible]	9.44	7.31	9.22	7.41	5.21	3.35	6.99		

L.s.d: Body of Table (5%) 0.74 (1%) 0.98

STALK COUNT '000s/ACRE

Burning	71.3	73.0	68.9	66.1	64.1	58.7	67.0	1.3	1.7
Trashing	66.1	63.5	63.0	62.3	61.9	61.6	63.1		

L.s.d: Body of Table (5%) 3.1 (1%) 4.2

LODGING %

	W1	W2	W3	W4	W5	W6	Mean	L.s.d. 5%	(Means) %
Burning	69	25	57	1	0	0	25	7	9
Trashing	73	27	48	0	0	0	25		

L.s.d: Body of Table (5%) 17 (1%) 22

SMUT WHIPS/ACRE

Burning	185	286	286	378	175	240	258	98	131
Trashing	314	129	443	185	268	120	243		

L.s.d: Body of Table (5%) 241 (1%) 320

The above table and Fig. 1 show the effects of burning compared with trashing at the various levels of irrigation. It is apparent that with increasing moisture stress, there was a marked advantage of conserving trash, with a yield increase of some 13 tons cane/acre. In addition, the sucrose content of stressed cane was improved by trashing. This resulted in the sucrose yield per acre of trashed plots at 0.37 Pan factor being over twice that of the burnt plots. In the wettest treatments, however, the burnt plots tended to outyield the trashed plots, probably because the stalk population was higher. With a 0.84 Pan factor, the yields of the burnt and trashed treatments were very similar, and it appears that the crossover point between burning and trashing occurs at the optimum economic water level i.e. between 0.68 and 0.84 x Pan, (see Figs. 1 & 2).

Trash management had no effect on lodging or on smut infestation.

Urea vs. Sulphate of Ammonia

	Urea	Sulphate of Ammonia	C.V. %	L.s.d. 5%	L.s.d. 1%
Tons cane/acre	52.5	54.4	8.1	1.8	2.4
Sucrose % cane	12.9	12.6	6.2	0.3	0.4
Tons sucrose/acre	6.86	6.88	10.7	0.30	0.40
Stalk count('000/acre)	65.4	64.7	4.8	1.3	1.7
Lodging %	21	29	67	7	9
Height (ft).	5.9	5.9	-	-	-
Smut count/acre	255	246	96	98	131

Urea produced significantly lower yields of cane with significantly higher sucrose content, to give almost identical yields of sucrose/acre with sulphate of ammonia. The lodging was significantly lower with urea. No difference was found in smut count or stalk population, and there were no significant interactions between N carrier and other treatments.

Summary

The optimum economic level of water application was around .8 pan or 65 in. total water (rainfall + irrigation). Both higher and lower levels of water application were less efficient in terms of lb sucrose obtained per inch of water; the driest treatment was only half as efficient as the optimum.

Where optimum irrigation was given, there was no difference in yields between burnt and trashed cane; where higher levels of water were applied burnt cane slightly outyielded trashed cane, due to its higher stalk population. Where the cane was badly stressed, trashed cane yielded far higher than burnt cane. This confirms other evidence that trash benefits the crop only through moisture conservation, and increased irrigation can be substituted for the trash blanket.

Urea gave lower cane yields, less lodging, higher sucrose content and the same sucrose yields/acre as sulphate of ammonia.

Urea vs. Sulphate of Ammonia

	52.5	54.4	5.1	1.6	2.4
	12.9	12.6	6.2	0.3	.1
	6.84	6.88	10.7	0.[illegible]	0.[illegible]
[illegible]	[illegible]	-	[illegible]	[illegible]	1.2
			[illegible]	-	[illegible]
(at).	3.9	3.9	-	-	-
wt/acre	[illegible]	246	96	98	141

LODGING %

Irrigation Treatments	W1	W3	W2	W4	W5	W6	Mean	Lsd(Means) 5%	1%
Burning	92	73	65	20	0	0	41.6	5.7	7.6
Trashing	97	71	92	29	0	0	48.0		

L.s.d. Body of Table (5%) 14 (1%) 19

SMUT WHIPS/ACRE

Burning	170	328	126	314	347	148	239	81	108
Trashing	222	207	211	159	196	170	176		

L.s.d. Body of Table (5%) 199 (1%) 265

FIBRE % CANE

Burning	14.9	13.2	14.0	13.8	13.5	13.2	13.8	0.4	0.6
Trashing	12.8	13.0	13.2	12.3	12.1	12.0	12.6		

L.s.d. Body of Table (5%) 1.0 (1%) 1.4

BRIX % CANE

Burning	16.8	16.7	17.5	17.7	17.6	17.4	17.3	0.2	0.3
Trashing	15.4	16.5	17.0	17.0	17.5	17.5	16.8		

L.s.d. Body of Table (5%) 0.6 (1%) 0.8

PURITY %

Burning	85.7	87.1	88.1	88.2	87.0	83.3	86.6	-	-
Trashing	85.7	86.7	86.6	87.5	85.8	83.9	86.0		

SUCROSE % CANE

Burning	14.4	14.5	15.4	15.6	15.3	14.5	15.0	0.25	0.34
Trashing	13.2	14.3	14.7	14.9	15.0	14.7	14.5		

L.s.d. Body of Table (5%) 0.6 (1%) 0.8

TONS CANE/ACRE INCH IRRIGATION

Burning	1.09	1.29	1.36	1.47	1.43	1.08	1.29		
Trashing	1.02	1.31	1.35	1.62	1.63	1.80	1.45		

TONS CANE/INCH TOTAL WATER

Burning	0.83	0.94	0.97	0.98	0.85	0.54	0.85		
Trashing	0.78	0.95	0.96	1.08	0.97	0.90	0.94		

LB. SUGAR/ACRE INCH IRRIGATION

Burning	264	322	365	397	380	261	331		
Trashing	229	322	342	420	422	453	365		

LB. SUGAR/ACRE INCH TOTAL WATER

Burning	202	235	260	265	226	131	220		
Trashing	175	235	244	281	251	228	236		

At the wettest irrigation level, the burnt plots produced a slightly higher cane yield and significantly higher sugar per acre. The advantage of burning disappeared at a level of around 0.8 x Pan, and trashing became increasingly superior to burning with drier treatments until it resulted in an increase of 13 tons cane/acre and 1.7 tons sugar per acre at an irrigation level of 0.37 x Pan. Burning also produced higher sucrose and recoverable sugar % cane in all treatments except the 0.37 x Pan. Brix and purity were higher in the burnt plots.

The fibre content of the burnt treatment was also much higher than in the trash treatment. Stalk counts were much higher in the burnt than in the trash treatments, for all levels of irrigation except 0.37 x Pan.

Lodging was generally greater in the trashed plots than in the burnt ones.

The efficiency of water use was greater with trash conservation than with burning. This was particularly marked with the dry treatments, but in the wetter treatments the reverse was true. The highest yield of sugar per inch total water (irrigation + rainfall) was obtained with the 0.68 x Pan treatment with trash conserved, while the second highest was with the same irrigation treatment, burnt.

At a yield level of 6 tons sugar/acre, 4 inches more irrigation would enable the burnt treatment to equal the trash treatment. At 7½ tons/acre, both treatments gave the same yield. This is evident from the graph on p.5.

Urea vs. Ammonium nitrate

No differences between the two nitrogen carriers were observed in tons cane/acre, recoverable sugar % cane, tons recoverable sugar/acre, stalk count, sucrose, brix, fibre or purity. However, it was observed that urea resulted in more smut whips per acre than ammonium nitrate, although this is probably not a genuine effect. Ammonium nitrate resulted in a greater % lodging than urea, especially in the burnt treatments.

UREA vs. AMMONIUM NITRATE

Treatments	Urea	A/N	L.s.d. 5%	L.s.d. 1%
Tons Cane/acre	50.2	51.3	2.2	2.9
E.R.S.C.	12.66	12.62	0.29	0.38
T.E.R.S.A.	6.34	6.47	0.31	0.41
Stalk Count '000s/acre	63.5	63.5	1.4	1.8
% Lodging	40	50	6	8
Smut whips/acre	252	162	81	108
Stalk height (ft.)	5.5	5.8	-	-
Sucrose % cane	14.7	14.7	0.25	0.34
Fibre % cane	13.2	13.2	0.4	0.6
Brix % cane	17.0	17.0	0.2	0.3
Purity %	86.4	86.2	-	-

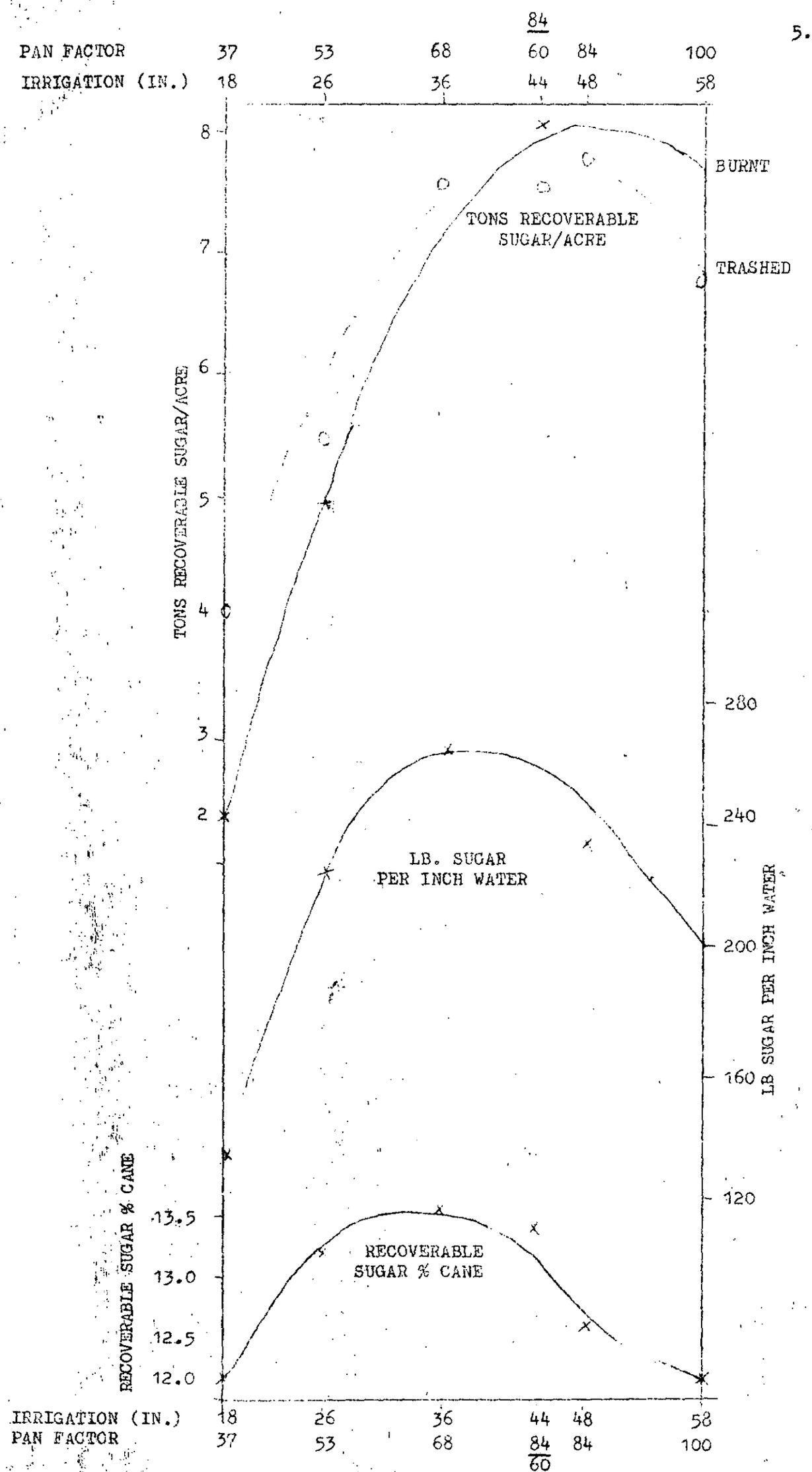


FIGURE 1. EFFECT OF IRRIGATION ON SUGAR YIELDS

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

IRRIGATION LEVEL x TRASH x N-CARRIER TRIAL 4200/1/2R

Catalogue No. : 105
This crop : 2nd ratoon
Site: R.S.A. Experiment Station
Altitude: 1350'
Soil: P E 1 sandy clay loam
Variety: N:Co.376
Design: Split plot
Fertilizer: N P_2O_5
Level 160 75
Carrier Treatment Double supers
Rainfall on crop: 17.8 in.
Age: 11.5 months (2/12/68-18/11/69)

Soil Analysis: (Dec. '68)

pH ($CaCl_2$)	6.6
Clay %	23
Cond. (mmho/cm. 1:5 extract)	.113
P_2O_5 (p.p.m. resin extract)	26
Ex. K (m.e. %)	0.71
Ex. Ca(m.e. %)	5.8
Ex. Mg(m.e. %)	3.0
Ex. Na(m.e. %)	0.80
Est. available moisture in effective rooting depth of 30 in.	4.1 in.

Object: To determine the effect of various irrigation regimes on cane yield and estimated recoverable sugar. To compare the effects of burning with a trash blanket and any interaction with levels of irrigation. To compare urea with ammonium nitrate as a N-carrier.

Note:

E.R.S.C.(Estimated Recoverable Sugar % Cane)= S - 0.451 (B-S) - .077 F where S= Sucrose, B= Brix and F= Fibre content of cane obtained by direct analysis. T.E.S.R.S.A. (Tons estimated recoverable sugar per acre)= T.C.A. x E.R.S.C./100.

Results: Table 1. Irrigation Levels

Irrigation Treatments	W1	W3	W2*	W4	W5	W6	C.V. %	Lsd 5%	Lsd 1%
Pan Factor (Net)	1.0	.84	.84/6	.68	.53	.37	-	-	-
Irrigation applied (in.)	58	48	44	36	26	18	-	-	-
Total precipitation (in.)	75.8	65.8	61.8	53.8	43.8	35.8	-	-	-
Tons Cane/acre	61.2	62.3	59.8	55.6	39.9	25.9	10.5	4.8	6.6
E.R.S.C.	11.7	12.4	13.0	13.3	13.1	12.3	5.6	0.9	1.2
T.E.R.S.A.	7.15	7.73	7.78	7.35	5.22	3.22	11.8	0.62	0.85
Stalk Count '000s/acre	65.0	64.4	64.6	63.5	62.6	60.8	5.3	3.0	4.2
% Lodging	94	72	78	24	0	0	31.0	24	33
Smut whips per acre	196	268	114	236	271	159	95.8	138	191
Stalk height (ft.)/	7.1	6.8	6.9	6.1	3.9	3.2	-	-	-
Sucrose % cane	13.8	14.4	15.1	15.2	15.2	14.6	6.2	0.8	1.2
Fibre % cane	13.9	13.1	13.6	13.0	12.8	12.6	7.6	0.9	1.2
Brix % cane	16.1	16.6	17.2	17.4	17.5	17.4	3.4	0.8	1.1
% Purity	85.7	86.9	87.3	87.8	86.4	83.6	-	-	-
Flower count/acre	18	23	9	3	5	2	-	-	-
Tons cane/ac. in. irrigation	1.06	1.30	1.36	1.54	1.53	1.44	-	-	-
Tons cane/ac. in. total	0.81	0.95	0.97	1.03	0.91	0.72	-	-	-
Lb. sugar/ac. in. irrigation	246	322	354	408	401	357	-	-	-
Lb. sugar/ac. in. total	189	235	252	273	238	180	-	-	-

* In Treatment W2, 0.84 x Pan was applied for the first 8 months while 0.60 x Pan was applied for the last 3½ months.

/ Height on 11/6/69 before excessive lodging occurred.

The response of cane yield to irrigation was very large; yields increased with increasing levels of irrigation up to .84 x Pan. The yields of the 1.0 x Pan treatment were no better than those of 0.84 x Pan, partly because of the greater lodging in the 1.0 x Pan treatment. Sucrose % cane and E.R.S.C. were significantly reduced at both extremes of irrigation, with the optimum level at 0.68 x Pan. Brix and Purity followed the same trends, while fibre content increased steadily with increasing levels of irrigation. It is clear that a moderate degree of stress produces the highest recoverable sugar % cane.

Tons recoverable sugar per acre was highest with 0.84 x Pan, while even 0.68 x Pan gave as high yields as 1.0 x Pan.

The most economic use of water, expressed as tons cane or lb. sugar per acre in.water (irrigation or total) was consistently obtained with the 0.68 x Pan treatment. This was during a crop which received 17.8 in. rain. During the 1st ratoon, when only 7.3 in. effective rain was recorded, the most economic use of water was obtained with 0.84 x Pan.

Stalk count increased significantly with increasing levels of irrigation, from 60,000/acre in the driest to 65,000 in the wettest treatment.

Lodging increased sharply with increased levels of irrigation, as did stalk height.

Irrigation had no effect on the incidence of smut.

Although there was relatively little flowering, the wetter treatments had more flowers than the dry ones.

Burning vs. Trashing

IRRIGATION x TRASH MANAGEMENT

IRRIGATION LEVELS

Irrigation Treatments	W1	W3	W2	W4	W5	W6	Mean	Lsd(Means) 5%	1%
Pan Factor (Net)	1.0	.84	.84/.6	.68	.53	.37	-	-	-
Irrigation applied (in.)	58	48	44	36	26	18	-	-	-
Total precipitation(in.)	75.8	65.8	61.8	53.8	43.8	35.8	-	-	-

TONS CANE/ACRE

Burning	63.2	61.9	60.0	52.9	37.3	19.4	49.1	2.2	2.9
Trashing	59.2	62.7	59.6	58.3	42.4	32.4	52.4		

L.s.d. Body of Table (5%) 5.3 (1%) 7.1

ESTIMATED RECOVERABLE SUGAR % CANE

Burning	12.2	12.6	13.4	13.6	13.2	12.2	12.9	0.3	0.4
Trashing	11.2	12.3	12.6	13.0	13.0	12.5	12.4		

L.s.d. Body of Table (5%) 0.7 (1%) 0.9

TONS ESTIMATED RECOVERABLE SUGAR/ACRE

Burning	7.65	7.73	8.03	7.14	4.94	2.35	6.31	0.31	0.41
Trashing	6.63	7.73	7.53	7.56	5.49	4.08	6.50		

L.s.d. Body of Table (5%) 0.75 (1%) 1.01

STALK COUNT ('000s/acre)

Burning	69.2	69.7	68.0	67.7	66.4	61.4	67.1	1.4	1.8
Trashing	60.7	59.1	61.2	59.3	58.9	60.3	59.9		

L.s.d. Body of Table (5%) 3.3 (1%) 4.4

LODGING %

Irrigation Treatments	W1	W3	W2	W4	W5	W6	Mean	Lsd(Means) 5%	1%
Burning	92	73	65	20	0	0	41.6	5.7	7.6
Trashing	97	71	92	29	0	0	48.0		

L.s.d. Body of Table (5%) 14 (1%) 19

SMUT WHIPS/ACRE

Burning	170	328	126	314	347	148	239	81	108
Trashing	222	207	211	159	196	170	176		

L.s.d. Body of Table (5%) 199 (1%) 265

FIBRE % CANE

Burning	14.9	13.2	14.0	13.8	13.5	13.2	13.8	0.4	0.6
Trashing	12.8	13.0	13.2	12.3	12.1	12.0	12.6		

L.s.d. Body of Table (5%) 1.0 (1%) 1.4

BRIX % CANE

Burning	16.8	16.7	17.5	17.7	17.6	17.4	17.3	0.2	0.3
Trashing	15.4	16.5	17.0	17.0	17.5	17.5	16.8		

L.s.d. Body of Table (5%) 0.6 (1%) 0.8

PURITY %

Burning	85.7	87.1	88.1	88.2	87.0	83.3	86.6	-	-
Trashing	85.7	86.7	86.6	87.5	85.8	83.9	86.0		

SUCROSE % CANE

Burning	14.4	14.5	15.4	15.6	15.3	14.5	15.0	0.25	0.34
Trashing	13.2	14.3	14.7	14.9	15.0	14.7	14.5		

L.s.d. Body of Table (5%) 0.6 (1%) 0.8

TONS CANE/ACRE INCH IRRIGATION

Burning	1.09	1.29	1.36	1.47	1.43	1.08	1.29		
Trashing	1.02	1.31	1.35	1.62	1.63	1.80	1.45		

TONS CANE/INCH TOTAL WATER

Burning	0.83	0.94	0.97	0.98	0.85	0.54	0.85		
Trashing	0.78	0.95	0.96	1.08	0.97	0.90	0.94		

LB. SUGAR/ACRE INCH IRRIGATION

Burning	264	322	365	397	380	261	331		
Trashing	229	322	342	420	422	453	365		

LB. SUGAR/ACRE INCH TOTAL WATER

Burning	202	235	260	265	226	131	220		
Trashing	175	235	244	281	251	228	236		

At the wettest irrigation level, the burnt plots produced a slightly higher cane yield and significantly higher sugar per acre. The advantage of burning disappeared at a level of around 0.8 x Pan, and trashing became increasingly superior to burning with drier treatments until it resulted in an increase of 13 tons cane/acre and 1.7 tons sugar per acre at an irrigation level of 0.37 x Pan. Burning also produced higher sucrose and recoverable sugar % cane in all treatments except the 0.37 x Pan. Brix and purity were higher in the burnt plots.

The fibre content of the burnt treatment was also much higher than in the trash treatment. Stalk counts were much higher in the burnt than in the trash treatments, for all levels of irrigation except 0.37 x Pan.

Lodging was generally greater in the trashed plots than in the burnt ones.

The efficiency of water use was greater with trash conservation than with burning. This was particularly marked with the dry treatments, but in the wetter treatments the reverse was true. The highest yield of sugar per inch total water (irrigation + rainfall) was obtained with the 0.68 x Pan treatment with trash conserved, while the second highest was with the same irrigation treatment, burnt.

At a yield level of 6 tons sugar/acre, 4 inches more irrigation would enable the burnt treatment to equal the trash treatment. At 7½ tons/acre, both treatments gave the same yield. This is evident from the graph on p.5.

Urea vs. Ammonium nitrate

No differences between the two nitrogen carriers were observed in tons cane/acre, recoverable sugar % cane, tons recoverable sugar/acre, stalk count, sucrose, brix, fibre or purity. However, it was observed that urea resulted in more smut whips per acre than ammonium nitrate, although this is probably not a genuine effect. Ammonium nitrate resulted in a greater % lodging than urea, especially in the burnt treatments.

UREA vs. AMMONIUM NITRATE

Treatments	Urea	A/N	L.s.d.	
			5%	1%
Tons Cane/acre	50.2	51.3	2.2	2.9
E.R.S.C.	12.66	12.62	0.29	0.38
T.E.R.S.A.	6.34	6.47	0.31	0.41
Stalk Count '000s/acre	63.5	63.5	1.4	1.8
% Lodging	40	50	6	8
Smut whips/acre	252	162	81	108
Stalk height (ft.)	5.5	5.8	-	-
Sucrose % cane	14.7	14.7	0.25	0.34
Fibre % cane	13.2	13.2	0.4	0.6
Brix % cane	17.0	17.0	0.2	0.3
Purity %	86.4	86.2	-	-

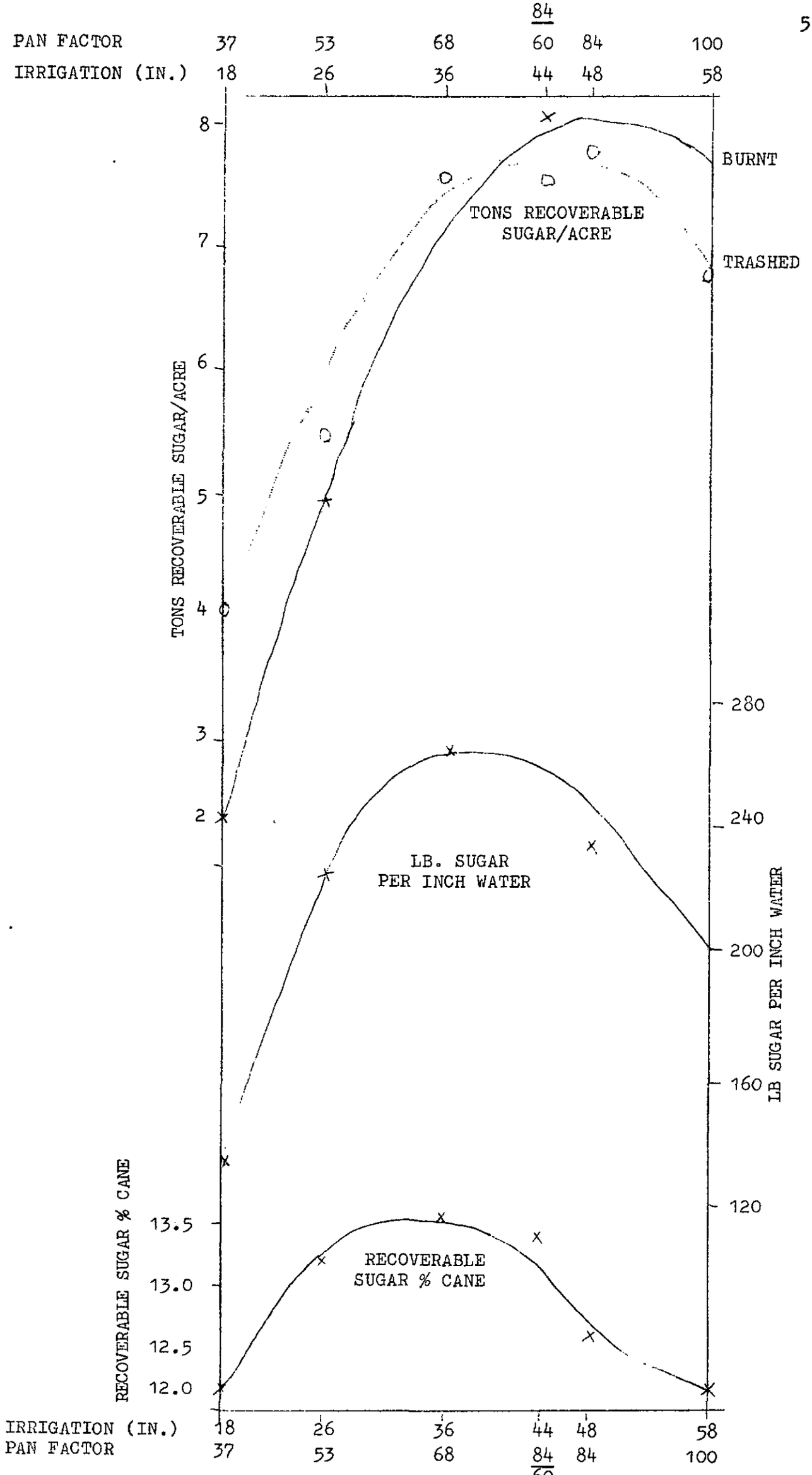
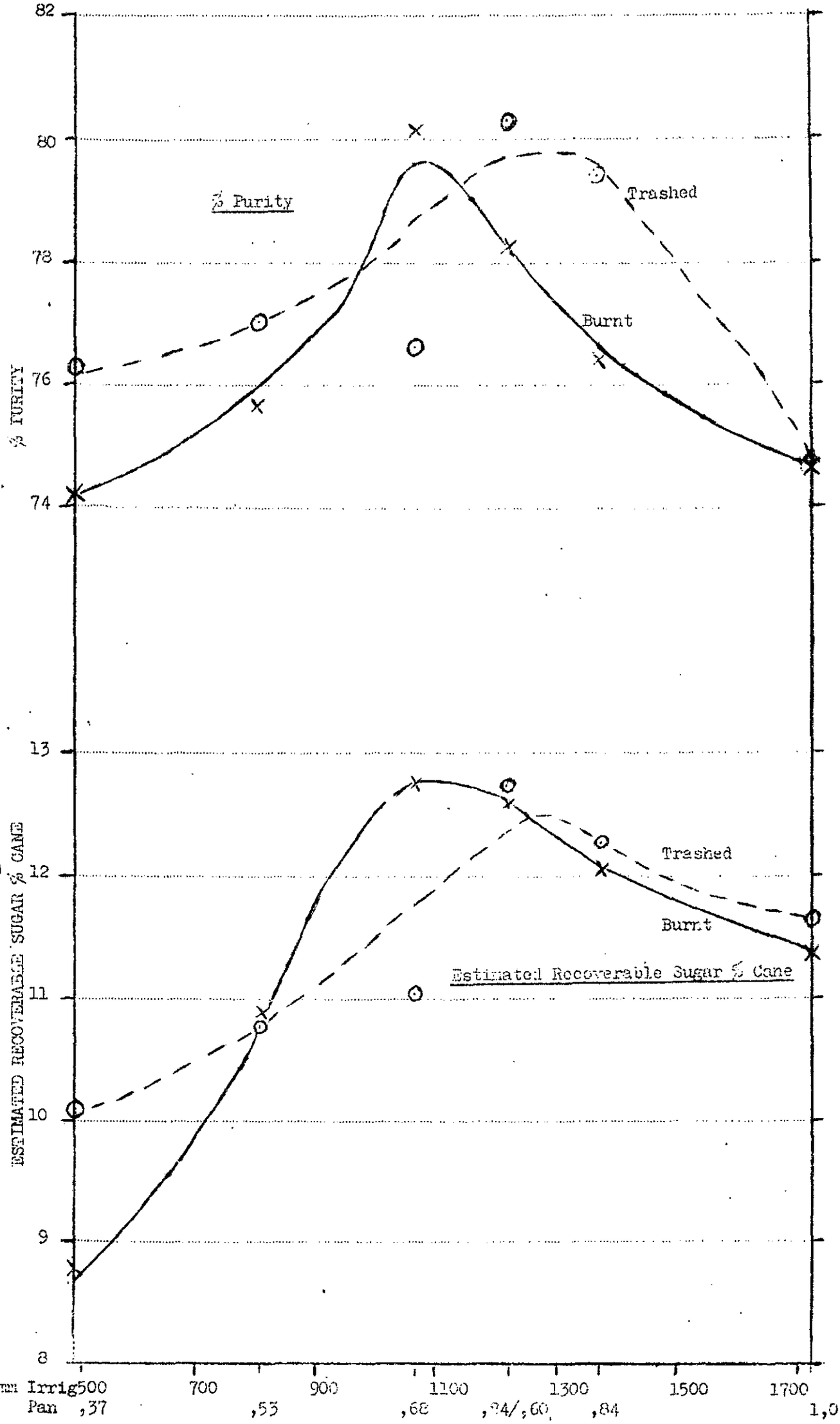


FIGURE 1. EFFECT OF IRRIGATION ON SUGAR YIELDS

FIG. 4 PURITY & ESTIMATED RECOVERABLE SUGAR % CANE

4200/1/4R



SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

IRRIGATION LEVEL x TRASH x N-CARRIER TRIAL 4200/1/3R

Catalogue No.: 105
This crop: 3rd Ratoon
Site: Experiment Station
Altitude: 1350'
Soil: P E 1 sandy clay loam
Variety: NCo 376
Design: Split plot
Fertilizer:

	N	P_2O_5
Level	160	75(Single Sup.)

Rainfall on crop: 14.96 in.

Soil Analysis: (Dec. 1970)

pH ($CaCl_2$)	5.5
O.M.%	1.3
Cond. (mmho/cm)	284
Ex. K (m.e. %)	0.90
Ex. Ca(m.e. %)	6.70
Ex. Mg(m.e. %)	2.26
Ex. Na(m.e. %)	0.76

Age: 12.0 months (23/11/69-23/11/70)

Object: To determine the effect of various irrigation regimes on cane yield and recoverable sugar. To compare the effects of burning with a trash blanket and any interaction with levels of irrigation. To compare urea with ammonium nitrate as N-carrier.

Results: Table 1. Irrigation Levels

Irrigation Treatments	W 1	W 3	W 2*	W 4	W 5	W 6	L.s.d. 5%	L.s.d. 1%	C.V.%
Pan factor (net)	1.00	0.84	.84/.6	0.68	0.53	0.37	-	-	-
Irrigation (in.)	70.0	60.0	52.0	48.0	36.0	24.0	-	-	-
Total precip. (in.)	85.1	75.1	67.1	63.1	51.1	39.1	-	-	-
Tons Cane/acre	65.5	63.6	59.1	51.4	31.6	19.1	4.9	6.8	9.0
T.R.S.% C.	12.43	12.97	13.36	13.30	12.47	11.64	0.51	0.70	4.5
T.E.R.S.A.	8.14	8.25	7.90	6.82	3.93	2.25	0.57	0.78	9.5
Stalk count'000s/acre	69.2	68.7	68.3	68.4	64.1	56.8	6.7	9.3	7.2
Stalk diameter (mm)	22.5	22.9	23.1	24.2	24.0	22.1	1.00	1.39	4.0
% Lodging	95	72	47	14	0	0	-	-	-
Stalk height (in)+	79.7	74.7	61.5	59.9	32.3	27.7	-	-	-
Sucrose % Cane	14.4	14.9	15.2	15.1	14.3	13.6	0.4	0.6	3.5
Brix % Cane	16.5	16.9	17.4	17.0	16.4	16.0	0.6	0.8	3.7
Fibre % Cane	13.3	12.9	12.0	12.2	12.1	11.8	0.6	0.9	6.4
% Purity	87.4	87.9	87.8	88.6	87.2	85.2	-	-	-
Smut whips/acre	413	568	369	352	604	378	315	435	83.0
Tons Cane/acre in. Irrig.	0.94	1.06	1.14	1.07	0.88	0.80	-	-	-
Tons Cane/acre in. Total	0.77	0.85	0.88	0.81	0.62	0.49	-	-	-
Lb. Sug./acre in. Irrig.	233	275	304	284	218	188	-	-	-
Lb. Sug./acre in. Total	191	220	235	216	154	115	-	-	-

*In Treatment W 2, 0.84 x Pan was applied for the first 8½ months while 0.60 x Pan was applied for the last 3½ months.
+Stalk height on 1/7/70 before excessive lodging occurred.

Expt. 4200/1/3R 1970

TRASH MANAGEMENT & IRRIGATION INTERACTION

Table 2.

		W 1	W 3	W 2	W 4	W 5	W 6	Mean	L.S.D. 5% Mean	L.S.D. 1% Body of Table
Tons cane per acre	B	68.2	66.3	60.0	48.8	27.3	13.0	47.3	1.8	4.4
	T	62.8	61.0	58.1	54.0	35.9	25.3	49.5	2.4	5.8
E.R.S.C.	B	12.62	13.25	13.84	13.71	12.72	11.36	12.92	0.23	0.57
	T	12.25	12.69	12.88	12.88	12.21	11.92	12.47	0.31	0.76
T.E.R.S.A.	B	8.60	8.77	8.30	6.67	3.48	1.47	6.22	0.24	0.59
	T	7.69	7.74	7.49	6.97	4.37	3.02	6.21	0.32	0.79
Stalk Count '000s/Acre	B	74.1	77.0	76.1	74.5	69.5	55.8	71.2	1.9	4.8
	T	64.3	60.4	60.4	62.4	58.7	57.8	60.7	2.6	6.3
Stalk Diam. mm	B	21.9	22.4	22.9	23.7	22.8	20.8	22.4	0.4	0.9
	T	23.2	23.4	23.2	24.8	25.1	23.4	23.8	0.5	1.2
Stalk Height (in.)	B	82.7	76.6	58.2	57.7	27.8	24.3	54.6	-	-
	T	76.6	72.7	64.8	62.1	36.9	31.2	57.4	-	-
Sucrose % Cane	B	14.6	15.2	15.8	15.6	14.6	13.4	14.9	0.2	0.5
	T	14.2	14.6	14.6	14.7	14.1	13.8	14.3	0.3	0.7
Brix % Cane	B	16.7	17.2	18.2	17.5	16.7	15.9	17.0	0.3	0.6
	T	16.2	16.6	16.6	16.6	16.2	16.0	16.4	0.3	0.8
Fibre % Cane	B	13.8	13.4	12.3	12.6	12.7	12.2	12.8	0.3	0.8
	T	12.9	12.4	11.7	11.7	11.6	11.5	12.0	0.4	1.1
% Purity	B	87.6	88.1	87.2	88.9	87.7	84.3	87.3	-	-
	T	87.3	87.7	88.4	88.3	86.7	86.2	87.4	-	-
Smut Count per acre	B	310	661	402	399	712	321	468	152	372
	T	517	476	336	306	495	436	428	202	496
% Lodging	B	91	71	25	13	0	0	33	-	-
	T	99	72	69	15	0	0	43	-	-
Tons Cane/ Ac. in. Irrig.	B	0.97	1.10	1.15	1.02	0.76	0.54			
	T	0.90	1.02	1.12	1.12	1.00	1.05			
Tons Cane/ Ac. in. Tot.	B	0.80	0.88	0.89	0.77	0.53	0.33			
	T	0.74	0.81	0.87	0.86	0.70	0.65			
lb. Sugar/ Ac. in. Irrig.	B	246	292	319	278	193	123			
	T	220	258	288	290	243	252			
lb. Sugar/ Ac. in. Tot.	B	202	231	247	211	136	75			
	T	181	206	223	220	171	154			

Note

E.R.S.C. = Estimated Recoverable Sugar % Cane = S - 0.451 (B - S) - .077 F
where S = Sucrose % cane, B = Brix and F = Fibre by direct analysis.
T.E.R.S.A. = Tons Estimated Recoverable Sugar/acre = T.C.A. x E.R.S.C./100.

Responses to Irrigation and Burning vs. Trashing

There was a very large response in cane yield to irrigation, which was essentially linear up to about 50 inches of water applied (84/60) treatment, after which there was a much smaller increment. The response to irrigation was much poorer under trashed conditions than burnt, due to the trashed treatments giving a higher yield with dry irrigation levels and a lower yield (5.4 tons cane/acre) with the wettest levels. The consistently higher cane yields being obtained with burnt than trashed cane with the wetter irrigation treatments is presumably a result of the much lower stalk population which was evident in the trash treatments in spite of parting the trash over the rows. Only in the 37% Pan treatment was the population higher in trash than burnt, due to the extreme desiccation suffered by the latter treatment. There was little or no effect of irrigation on stalk count within the range 68 to 100% Pan, but there was a very marked reduction with the drier treatments in burnt cane and a slight reduction in trashed cane. There was a highly significant quadratic response of stalk diameter to irrigation, with the medium levels (68 & 53% Pan) having significantly thicker stalks than either the wetter or drier treatments. Trashing resulted in significantly thicker cane than did burning over all irrigation levels. This is probably due to the lower stalk population of trashed cane in the wet treatments and to the severe desiccation of the cane in the burnt plots of the dry treatments. Stalk height showed similar trends to cane yield.

Sucrose % cane peaked at the intermediate irrigation treatments, being significantly lower in both wet and dry treatments. This trend was far more marked with burnt cane than with trashed cane. Burning produced significantly higher sucrose than trashing at all levels except 37% Pan. The differential was as much as 1% in the intermediate treatments (84% & 84/60% Pan). Brix % cane showed similar trends to sucrose except that the reduction with dry treatments was not nearly as marked. Consequently the purity of the dry treatments, especially where burnt, was much lower than in the medium - high irrigation levels. Fibre % cane showed a marked increase with increasing levels of irrigation. Burnt cane was consistently higher in fibre than trashed cane.

The Estimated Recoverable Sugar % Cane showed similar trends to sucrose with a peak in the intermediate irrigation levels and with burnt cane higher than trash at all levels except 37% Pan. Tons Recoverable Sugar/acre showed a dramatic increase with irrigation levels up to the 84/60% Pan treatment after which the increment was small. Burnt cane produced significantly more sugar/acre with 100%, 84% and 84/60% Pan irrigation levels; with a crossover point at about 75% Pan, burnt cane gave much lower yields than trashed cane at the dry irrigation levels.

Lodging showed a marked increase with increasing irrigation. Trashed cane lodged more than burnt cane. No effect of irrigation or burning vs. trashing could be detected on smut level.

Eficiency of water use (measured by either tons cane or lb. sugar produced per inch of water applied) was highest in the 84/60 treatment. Efficiency was higher with burnt cane in the wet treatments and higher with trashed cane in the dry treatments. There was relatively little change in efficiency with different irrigation levels in trashed cane but a large decrease in efficiency with the dry treatments in burnt cane.

Urea vs. Ammonium nitrate

The only significant difference between the two carriers was that urea resulted in higher fibre % cane than ammonium nitrate.

Urea gave an almost significant increase in tons recoverable sugar/acre compared with ammonium nitrate, due to slightly but not significantly higher cane yields and sucrose content. (Urea gave 6.34 and ammonium nitrate 6.09 tons sugar/acre). There were no important interactions with irrigation.

Table 3 UREA vs. AMMONIUM NITRATE

	U	A/N	L.s.d. 5%	L.s.d. 1%	
T.C.A.	48.9	47.8	1.8	2.4	NS
E.R.S.C.	12.78	12.61	0.23	0.31	NS
T.E.R.S.A.	6.34	6.09	0.25	0.32	NS(*)
Stalk count	66.5	65.3	1.9	2.6	NS
Stalk diameter	23.0	23.3	0.4	0.5	NS
% Lodging	36	39	-	-	
Sucrose % cane	14.69	14.51	0.21	0.28	NS
Brix % cane	16.76	16.64	0.26	0.34	NS
Fibre % cane	12.58	12.20	0.32	0.43	*
% Purity	87.6	87.2	-	-	
Smut whips	508	387	152	202	NS

FOLIAR ANALYSIS

Foliar samples were taken from each plot at 5 months (18/4/70) and the following analytical results obtained.

	W1	W3	W2	W4	W5	W6
%N	1.96	1.92	1.91	1.92	1.84	1.95
P	.234	.233	.227	.222	.222	.218
K	1.38	1.39	1.39	1.39	1.37	1.26
Ca	.230	.220	.230	.238	.271	.277
Mg	.184	.176	.174	.162	.171	.176
In water applied	70	60	52	48	36	24
Days after irrig.	5	7	7	8	13	5

There was a fairly close relationship between the %N and the number of days that the sample was taken after irrigation. This illustrates the importance of not taking samples when the cane is stressed.

Severe drought stress caused a reduction in P & K and an increase in Ca. Mg was largely unaffected.

Burning vs. trashing and urea vs. ammonium nitrate had no effect on foliar analysis. Results were:

	N	P	K	Ca	Mg
Burnt	1.91	.225	1.34	.254	.168
Trashed	1.92	.228	1.38	.235	.179
Urea	1.91	.226	1.38	.233	.173
Ammonium Nitrate	1.93	.226	1.35	.255	.175

SOIL ANALYSIS

After 4 years, the experiment was soil sampled plot by plot to ascertain whether there had been any effect of treatment on soil analysis. Mean results are given below.

	W1	W3	W2	W4	W5	W6
pH	6.11	5.41	5.49	5.78	5.20	5.27
Cond.	324	266	234	312	267	302
O.M.%	1.42	1.29	1.16	1.22	1.26	1.20
Ex. K m.e.%	0.97	0.88	0.76	0.94	0.84	1.01
Ex. Ca m.e.%	7.97	6.44	6.22	7.58	6.14	5.86
Ex. Mg m.e.%	2.59	2.38	1.91	2.19	2.32	2.15
Ex. Na m.e.%	0.71	0.77	0.77	0.83	0.73	0.77
pH U	6.42	5.85	5.85	5.99	5.59	5.70
pH S/AN	5.80	4.98	5.14	5.56	4.81	4.84

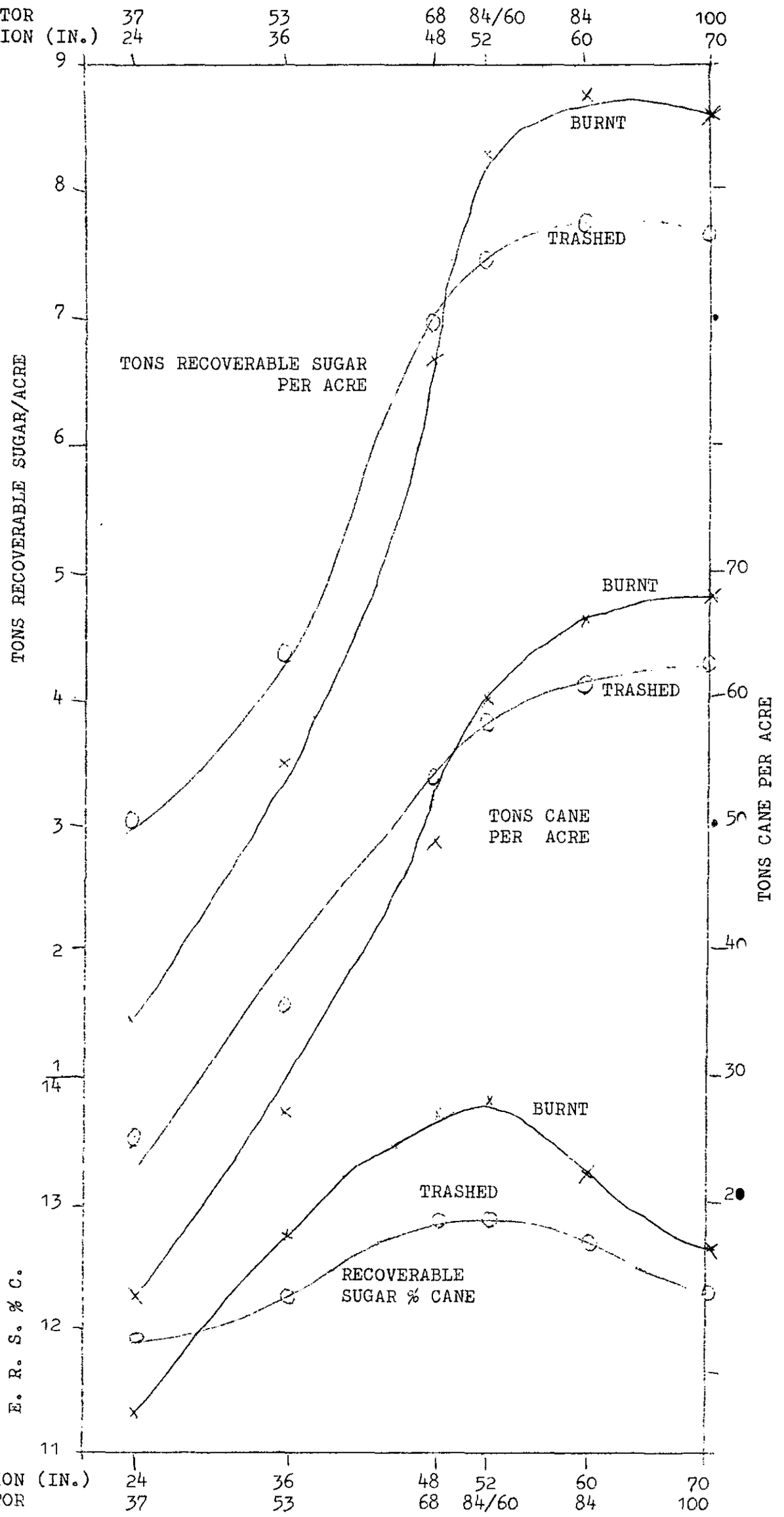
	B	T	U	S/AN	Original analysis
pH	5.67	5.42	5.90	5.19	6.40
Cond.	290	278	283	286	-
O.M.%	1.23	1.29	1.23	1.29	1.27
Ex. K m.e.%	0.94	0.86	0.90	0.90	0.85
Ex. Ca m.e.%	6.91	6.49	7.10	6.30	8.6
Ex. Mg m.e.%	2.33	2.18	2.49	2.03	3.1
Ex. Na m.e.%	0.77	0.76	0.73	0.80	-

Effect of Irrigation

There has been a drop in pH in all treatments; the drop has been much greater with the dry irrigation levels than with the wetter treatments. This also applies to the exchangeable Calcium in the soil. There also appears to be a drop in organic matter with the drier treatments, probably because the build-up of organic matter in the soil can only proceed when the soil is moist.

The application of sulphate of ammonia for two years and ammonium nitrate for two years has caused a sharp reduction in pH to 5.19 compared with the value of 5.90 for urea and 6.40 prior to starting the experiment. This is consistent over all irrigation levels also a reduction in Calcium and Magnesium with sulphate of ammonia/ammonium nitrate.

Trashing produced a small but consistent drop in pH compared with burning, and exchangeable cations were slightly higher in the burnt treatment. Organic matter was very slightly lower in the burnt plots.


PAN FACTOR
IRRIGATION (IN.)
37 53 68 84/60 84 100
24 36 48 52 60 70
BURNT
TRASHED
TONS RECOVERABLE SUGAR PER ACRE
BURNT
TRASHED
TONS CANE PER ACRE
BURNT
TRASHED
RECOVERABLE SUGAR % CANE
TONS RECOVERABLE SUGAR/ACRE
E. R. S. % C.
TONS CANE PER ACRE
IRRIGATION (IN.)
PAN FACTOR
24 36 48 52 60 70
37 53 68 84/60 84 100

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

IRRIGATION LEVEL x TRASH MANAGEMENT x N-CARRIER TRIAL 4200/1/4R

Catalogue No.: 105

This crop : 4th Ratoon

Site : RSA Experiment Station, Chiredzi

Altitude : 410 metres

Soil : P E 1 sandy clay loam

Variety : NCo 376

Design : Split plot

Fertilizer: N P_2O_5

Level 179 84

Carrier Treatment Single supers

Rainfall on crop 434 mm

Soil Analysis:

pH ($CaCl_2$)	5,5
O.M. %	1,3
Cond. (mmho/cm)	0,284
Ex. K (m.e.%)	0,90
Ex. Ca(m e.%)	6,7
Ex. Mg(m.e.%)	2,26
Ex. Na(m.e.%)	0,76

Age:

11,9 months (28/11/70-23/11/71)

Object To determine the effect of various irrigation regimes on cane yield and recoverable sugar. To compare the effects of burning with a trash blanket and any interaction with levels of irrigation. To compare urea with ammonium nitrate as N-carrier.

Results

Table 1 Irrigation Levels

IRRIGATION TREATMENTS	W1	W3	W2*	W4	W5	W6	L.S.D. 5%	L.S.D. 1%	C.V.%	Signif. Level
Pan Factor (Net)	1,0	,84	,84/ ,60	,68	,53	,37	-	-	-	
Irrigation (mm)	1727	1372	1219	1067	813	508	-	-	-	
Total Precip. (mm)	2161	1806	1653	1501	1247	942	-	-	-	
Tons Cane/ha	125,2	126,6	123,9	96,5	49,6	29,4	8,2	11,3	11,1	***
E.R.S. % C.	11,49	12,15	12,64	11,88	10,82	9,42	0,97	1,34	5,4	***
T.E.R.S.H.	14,39	15,38	15,64	11,43	5,35	2,86	1,36	1,89	12,8	***
Stalk Count '000s/ha	179,3	179,3	175,3	172,0	159,7	128,5	10,4	14,4	5,7	***
Stalk Diameter (mm)	20,4	20,7	20,7	21,1	20,1	19,9	0,7	0,9	3,5	*
% Lodging	93	82	72	10	0	0	20	27	45	***
Stalk height (cm)+	179,1	170,7	171,2	138,0	61,8	49,2	-	-	-	-
Sucrose % Cane	14,6	15,0	15,4	14,6	13,7	12,1	0,9	1,2	4,4	***
Brix % Cane	19,6	19,2	19,2	18,6	17,9	16,1	1,5	2,0	6,3	**
Fibre % Cane	11,6	12,2	12,6	11,9	12,3	12,0	1,5	2,1	11,8	NS
% Purity	74,6	77,9	79,8	78,6	76,4	75,3	-	-	-	-
kg Cane/m^3 irrig.	7,25	9,23	10,17	9,05	6,10	5,79	1,06	1,46	13,2	***
kg Cane/m^3 Tot. Water	5,79	7,01	7,50	6,43	3,98	3,12	0,63	0,87	12,1	***
kg Sug./m^3 irrig.	0,83	1,12	1,28	1,07	0,66	0,56	0,14	0,20	13,9	***
kg Sug./m^3 Tot. Water	0,67	0,85	0,95	0,76	0,43	0,30	0,09	0,13	13,2	***

*In Treatment W2, 0,84 x Pan was applied for the first 8½ months while 0,60 x Pan was applied for the last 3½ months.

+Stalk height 5/5/71 before excessive lodging occurred.

Cat. No. 105

Expt. 4200/1/4R 1971

TRASH MANAGEMENT & IRRIGATION INTERACTION

		W1	W3	W2	W4	W5	W6	Mean	Signif. Mean	L.S.D. 5% 1% Body of Table
Tons cane per hectare	B	130,8	136,1	128,5	92,9	45,3	18,8	92,1	NS	10,2
	T	119,5	117,1	119,3	100,2	53,9	40,0	91,7		13,6
E.R.S.C.	B	11,36	12,05	12,56	12,74	10,86	8,79	11,39	NS	0,61
	T	11,62	12,24	12,72	11,01	10,78	10,06	11,40		0,82
T.E.R.S.H.	B	14,89	16,41	16,13	11,84	4,90	1,65	10,97	NS	1,39
	T	13,89	14,34	15,15	11,02	5,81	4,06	10,71		1,85
Stalk count '000s/hectare	B	193,3	196,0	196,8	191,6	174,8	124,3	179,5	***	9,5
	T	165,2	162,5	153,8	152,5	144,6	132,6	151,9		12,6
Stalk Diameter millimetres	B	19,9	20,6	20,3	20,7	19,9	19,6	20,2	***	0,7
	T	20,9	20,9	21,0	21,4	20,3	20,2	20,8		1,0
Stalk Height	B	193,9	181,0	163,8	126,8	56,4	42,4	-	-	-
	T	164,4	160,4	178,7	149,2	67,2	56,0	-	-	-
Sucrose % cane	B	14,5	15,1	15,5	15,4	13,8	11,6	14,3	NS	0,6
	T	14,7	14,9	15,2	13,8	13,5	12,7	14,1		0,8
Brix % cane	B	19,5	19,8	19,8	19,2	18,2	15,6	18,7	NS	1,2
	T	19,7	18,7	18,7	18,0	17,6	16,6	18,2		1,6
Fibre % cane	B	12,3	12,6	12,7	12,7	12,5	12,9	12,6	***	1,4
	T	11,0	11,8	12,6	11,1	12,1	11,0	11,6	**	1,9
% Purity	B	74,6	76,4	78,2	80,5	75,7	74,3	76,6	-	-
	T	74,6	79,6	81,5	76,6	77,0	76,2	77,6	-	-
% Lodging	B	98	84	68	8	0	0	43	NS	19
	T	89	80	76	13	0	0	43		26
kg Cane/m^3 irrigation	B	7,58	9,92	10,54	8,70	5,57	3,69	7,67	*	1,05
	T	6,92	8,53	9,79	9,39	6,62	7,88	8,19		1,39
kg Cane/m^3 Total water	B	6,05	7,54	7,78	6,19	3,63	1,99	5,53	NS	0,68
	T	5,53	6,48	7,22	6,67	4,32	4,25	5,74		0,91
kg Sug./m^3 irrigation	B	0,86	1,20	1,32	1,11	0,60	0,32	0,90	NS	0,13
	T	0,80	1,05	1,24	1,03	0,71	0,80	0,94		0,17
kg Sug./m^3 Total water	B	0,69	0,91	0,98	0,79	0,39	0,18	0,66	NS	0,09
	T	0,64	0,92	0,79	0,73	0,47	0,43	0,66		0,12

Note

E.R.S.C. = Estimated Recoverable Sugar % Cane = S - 0,451 (B - S) - ,077 F
where S= Sucrose % cane, B= Brix and F= Fibre by direct analysis.
T.E.R.S.H. = Tons Estimated Recoverable Sug./ha = T.C.H. x E.R.S.C./100

Responses to Irrigation & Burning vs. Trashing

There was a very large response in Cane yield (Fig. 1) to irrigation, which was essentially linear up to an application of about 1200 mm (,84/,60 treatment), after which there was a much smaller increment. The response to irrigation was much greater under burnt conditions (from 19 to 136 tons/ha) than under trash (40 to 120 tons/ha). The trash treatment gave higher yields with low levels of irrigation due to the moisture conservation by the trash blanket. However, at the high levels of irrigation, burning gave consistently

higher yields of some 10-15 tons/ha. This was at least partly due to the higher stalk population (Fig. 2) in the burnt treatments which contained some 30 000 stalks/ha more than the trashed treatments in spite of careful trash parting in the trash treatments. Only at the W6 level (513 mm irrigation) did the trash treatments have a higher stalk population than the burnt. Increasing irrigation levels in burnt cane resulted in a curvilinear increase from 125 to 195 000 stalks/ha, with little difference between ,68 Pan and 1,0 x Pan.

Stalk diameter (Fig. 2) showed the same interesting and significant differences as in the 3rd ratoon viz. at all levels of irrigation, trashing resulted in thicker stalks than burning. The three intermediate treatments (,84; ,84/,60 & ,68) produced significantly thicker stalks than the two driest treatments (,37 & ,53), and also thicker than the 1,0 treatment in burnt cane.

Stalk height showed similar trends to cane yield.

Sucrose % cane (Fig. 3) peaked at the intermediate levels of irrigation (1 100-1 200 mm water or ,68 to ,84/,60 treatments), being significantly depressed at both higher and especially at lower levels. These effects were very large in the case of burnt cane, ranging from sucrose content of 11,6% for 0,37 x Pan to 15,5% for 0,84/,60 x Pan down to 14,5% for 1,0 x Pan. Brix % cane (Fig. 3) also peaked at the 0,84/,60 treatment in burnt cane, but with a very slight fall off at the higher level. Purity (Fig. 4) showed a fairly sharp peak with burnt cane at the 0,68 x Pan treatment and at 0,84/,60 with trashed cane. Both wetter and drier treatments resulted in much lower purities. Fibre % cane (Fig. 3), unlike in previous seasons, did not show up any significant effect of irrigation, but the C.V.% was disappointingly high. Burnt cane was significantly higher in fibre than trashed cane.

The Estimated Recoverable Sugar % Cane (Fig. 4) showed similar trends to sucrose with a peak at ,68 (burnt) or ,84/,60 (trashed) and a significant reduction with both wetter and drier treatments. There was no difference between the E.R.S.%C. of burnt and trashed cane at most levels of irrigation, however at ,37 x Pan trashed was significantly higher and at ,68 x Pan significantly lower than burnt cane.

Tons Recoverable Sugar/hectare (Fig. 1) showed a tremendous increase with increasing irrigation from 2 tons at ,37 x Pan (burnt) to a peak of 16 tons at ,84 x Pan (burnt). At the drier levels, trashing produced significantly more sugar than burning (2,4 tons/ha) while at ,84 x Pan, burning produced significantly more than trashing (1,9 tons/ha).

Crop water use efficiency (Fig. 2), expressed as kg sugar produced per m^3 irrigation water applied, showed a sharp peak at the ,84/,60 treatment with an application of 1 200 mm water net. There was a marked reduction in efficiency with both wetter and drier treatments. Efficiencies were higher with trashed treatments at the dry end of the scale only; they were higher with burning at the wet end of the scale.

Lodging showed a sharp increase with increasing levels of irrigation, from zero below levels of ,68 x Pan to fairly high levels with ,84/,60 and wetter treatments.

In summary, burning was superior to trashing at all commercially acceptable levels of irrigation; the optimum level of irrigation was 0,84 for cane yield and Tons Estimated Recoverable Sugar/hectare; 0,84/,60 for crop water use efficiency and sucrose, and ,68 for purity and Estimated Recoverable Sugar % Cane.

Urea vs. Ammonium nitrate

There were no significant differences between urea and ammonium nitrate in cane yield, E.R.S. % C. or tons E.R.S./ha. However, urea had an advantage which was very nearly significant in all cases. Urea in fact produced significantly more stalks/ha and also a significantly higher sucrose % cane than ammonium nitrate. There were no other differences of interest between the carriers, and no significant interactions.

There is thus the distinct impression that urea was somewhat better utilized by the crop than ammonium nitrate.

Table 3. UREA vs. AMMONIUM NITRATE

	Urea	A/N	L.S.D. 5%	L.S.D. 1%	Signif.
Tons Cane/hectare	93,2	90,5	4,2	5,6	NS
E.R.S. % Cane	11,52	11,28	0,25	0,33	NS
T.E.R.S.H.	11,09	10,59	0,57	0,76	NS
Stalk Count	168,1	163,3	3,9	5,1	*
Stalk Diameter	20,4	20,6	0,3	0,4	NS
% Lodging	42	44	8	11	NS
Sucrose % Cane	14,4	14,1	0,3	0,3	*
Brix % Cane	18,6	18,3	0,5	0,6	NS
Fibre % Cane	12,1	12,0	0,6	0,8	NS
% Purity	77,1	77,1	-	-	-
kg Cane/m^3 irrig.	8,00	7,86	0,43	0,57	NS
kg Cane/m^3 Tot. Water	5,70	5,57	0,28	0,37	NS
kg Sug./m^3 irrig.	0,94	0,90	0,05	0,07	NS
kg Sug./m^3 Tot. Water	0,67	0,65	0,04	0,05	NS

FOLIAR ANALYSIS

Pan Factor	1,0	0,84	,84/,60	0,68	0,53	0,37
%N	1,78	1,84	1,78	1,72	1,74	1,77
%P	,185	,187	,188	,182	,184	,196
%K	1,48	1,48	1,48	1,36	1,36	1,46
%Ca	,239	,244	,240	,249	,296	,290
%Mg	,171	,178	,190	,175	,184	,172
mm Water applied	1727	1372	1219	1067	813	508
Days after irrigation	7	9	9	3	17	29
Deficit (mm)	42,0	52,1	52,1	18,0	92,0	102,5

No consistent effect of irrigation level could be detected on N,P,K, or Mg foliar levels. The Ca level decreased with increasing levels of irrigation. The Ca content was also consistently higher with burnt than with trashed cane as shown below.

FOLIAR ANALYSIS (Sampled 23/4/71)

BURNING x TRASH MANAGEMENT INTERACTION

Pan Factor		1,0	,84	,84/,60	,68	,53	,37	MEAN
N%	B	1,79	1,88	1,84	1,69	1,71	1,82	1,79
	T	1,78	*1,80	1,70	1,76	1,75	1,72	1,75
P%	B	0,184	0,189	0,194	0,190	0,185	0,198	0,188
	T	0,186	0,185	0,181	0,185	0,184	0,195	0,186
K%	B	1,45	1,50	1,43	1,51	1,32	1,46	1,61
	T	1,51	1,47	1,52	1,44	1,39	1,47	1,47
Ca%	B	0,250	0,254	0,246	0,269	0,308	0,320	0,274
	T	0,229	0,234	0,232	0,239	0,286	0,259	0,245
Mg%	B	0,171	0,175	0,189	0,172	0,186	0,181	0,179
	T	0,171	0,185	0,190	0,179	0,181	0,164	0,178

Cat. No.: 105

FIG. 1 CANE & RECOVERABLE SUGAR YIELDS 4200/1/4R

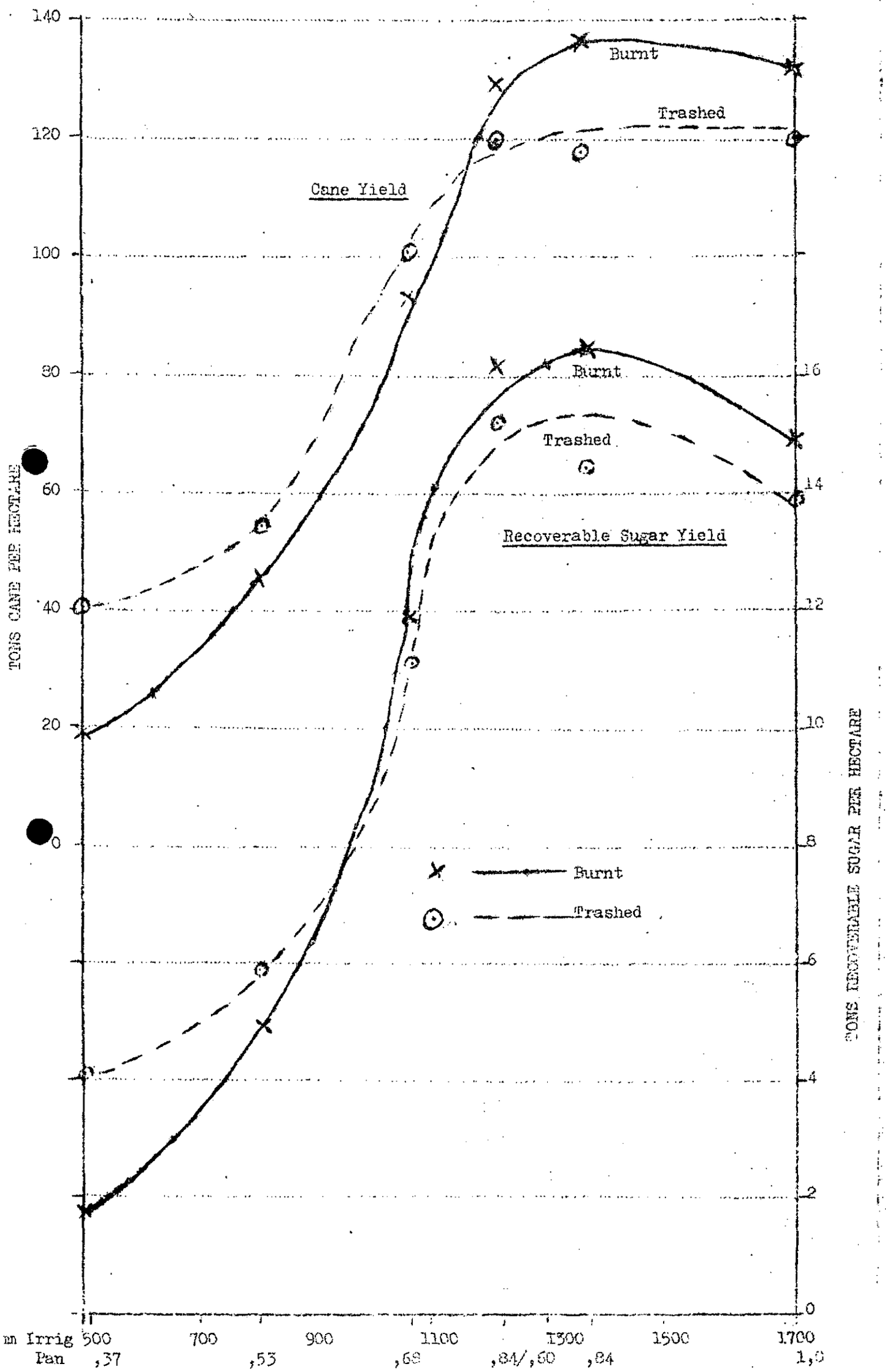


FIG. 2 STALK DIAMETER, POPULATION & CROP WATER USE EFFICIENCY 4200/ 1/4h

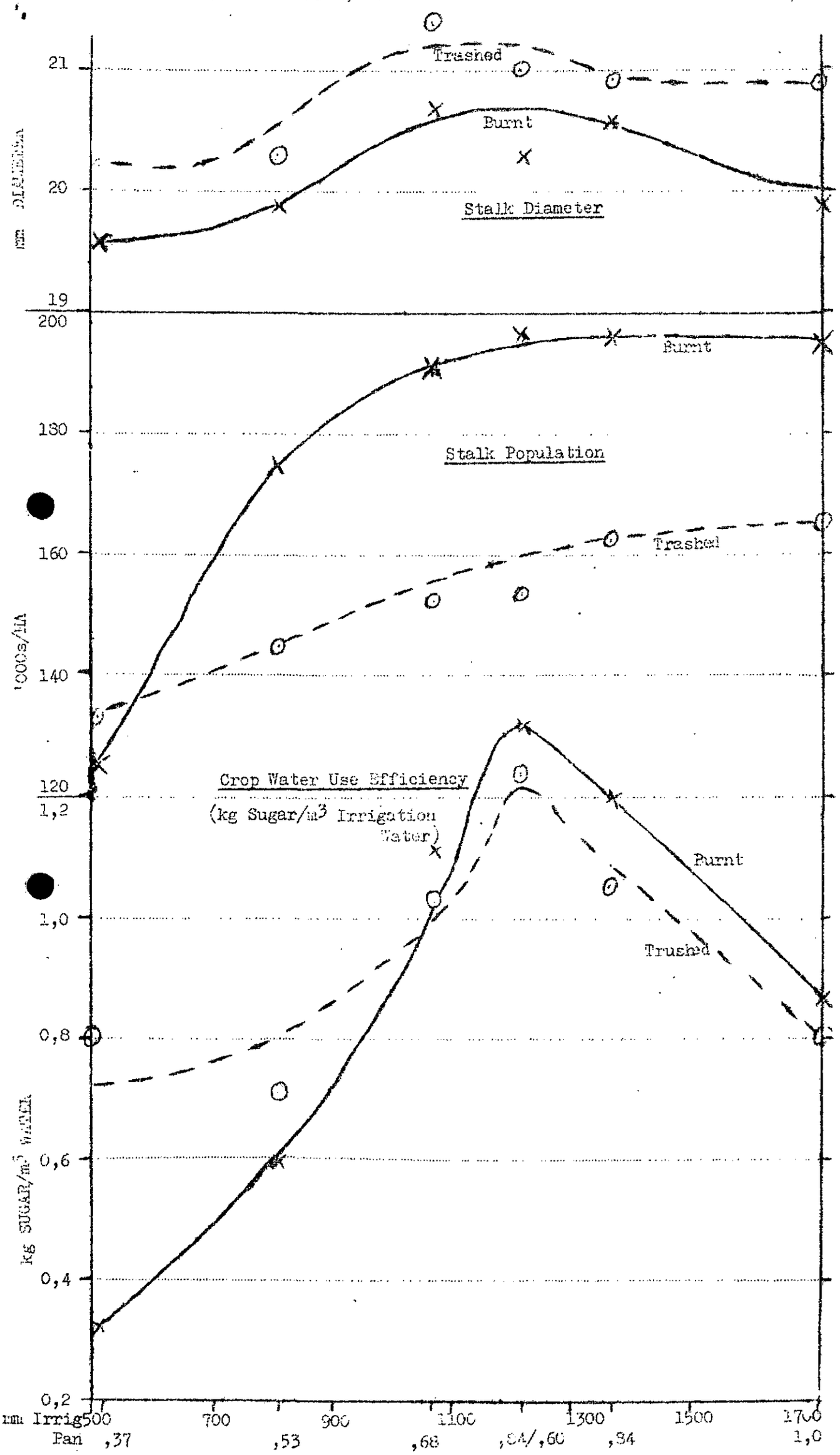
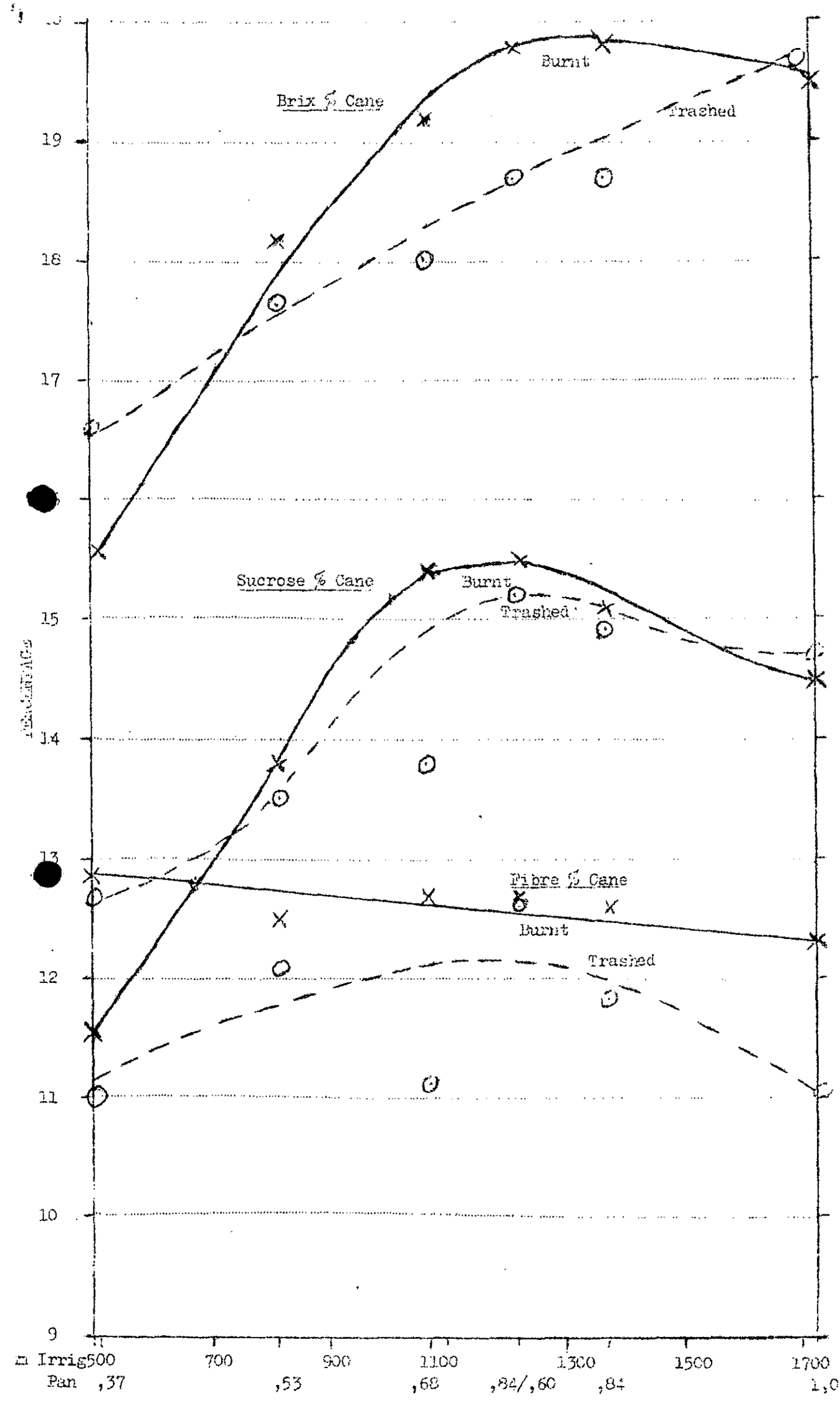
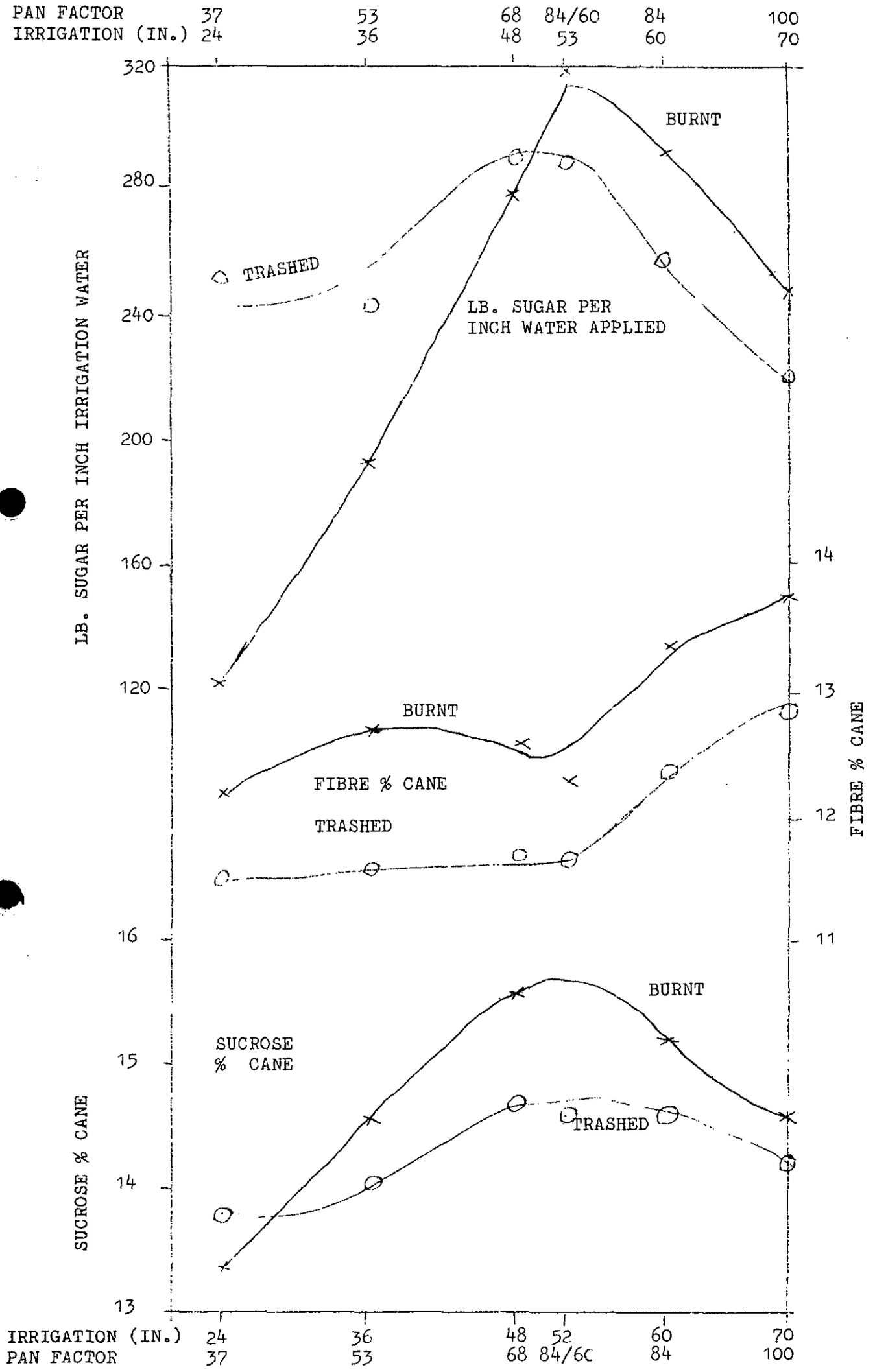


FIG. 3 SUCROSE, BRIX & FIBRE % CANE




PAN FACTOR 37 53 68 84/60 84 100
IRRIGATION (IN.) 24 36 48 53 60 70
320
280
240
200
160
120
16
15
14
13
LB. SUGAR PER INCH IRRIGATION WATER
SUCROSE % CANE
BURNT
TRASHED
LB. SUGAR PER INCH WATER APPLIED
BURNT
FIBRE % CANE
TRASHED
SUCROSE % CANE
BURNT
TRASHED
14
13
12
11
FIBRE % CANE
IRRIGATION (IN.) 24 36 48 52 60 70
PAN FACTOR 37 53 68 84/60 84 100

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

IRRIGATION X TRASH X N-CARRIER TRIAL 4200/1/5R

Catalogue No.: 105

This crop : 5th Ratoon

Site : Experiment Station

Altitude : 410 m

Soil : P B 1 sandy clay loam

Variety : NCo 376

Design : Split plot

Fertilizer:	N	P_2O_5
Level (kg/ha)	174	84
Carrier	Treatment	Single supers

Rainfall on crop: 597 mm

Soil Analysis

pH	($CaCl_2$)	5,5
O.M.%		1,3
Cond.	(mmhos/cm)	284
Ex. K	(m.e.%)	0,90
Ex. Ca	(m.e.%)	6,7
Ex. Mg	(m.e.%)	2,26
Ex. Na	(m.e.%)	0,76

Age: 11,7 months (1.12.71-21.11.72)

Object : To determine the effect of various irrigation regimes on cane yield and recoverable sugar. To compare the effects of burning with a trash blanket and any interaction with levels of irrigation. To compare urea with ammonium nitrate as N-carrier.

Results :

TABLE 1 Irrigation Levels

IRRIGATION TREATMENTS	W1	W3	W2*	W4	W5	W6	L.S.D. 5%	L.S.D. 1%	C.V. %	SIGNIF. LEVEL
PAN FACTOR (NET)	1,0	0,84	0,84/ 0,6	0,68	0,53	0,37	-	-	-	-
IRRIGATION (MM)	1224	1020	867	714	510	306	-	-	-	-
TOTAL PRECIPITATION	1821	1617	1464	1311	1107	903	-	-	-	-
Tons cane/ha.	120,3	120,5	113,3	108,3	88,5	65,7	6,8	9,4	6,0	***
E.R.S. % Cane	12,09	11,84	12,87	12,78	12,86	11,17	0,81	1,12	7,1	**
T.E.R.S.H.	14,51	14,26	14,58	13,82	11,24	7,32	1,19	1,65	8,3	***
Stalk count '000s/hectare	181,7	178,3	172,0	180,0	173,4	156,1	12,8	17,8	8,1	**
Stalk diameter (mm)	20,3	20,4	20,8	20,3	20,5	21,0	0,4	0,5	3,2	**
% Lodging	98	92	97	59	3	0	24	33	19	*
Sucrose % cane	14,8	14,8	15,7	15,6	16,0	14,5	0,7	0,9	5,2	***
Brix % cane	18,6	19,4	20,1	19,9	21,0	20,0	1,7	2,3	8,4	N S
Fibre % cane	12,8	11,6	11,4	11,3	10,7	10,7	1,6	2,2	14,9	N S
% Purity	79,6	76,3	78,1	78,4	76,2	72,5	-	-	-	-
kg Cane/m^3 irrigation	9,83	11,81	13,07	15,17	17,16	21,48	1,65	2,28	7,3	***
kg Cane/m^3 total water	6,60	7,45	7,74	8,26	7,91	7,28	0,64	0,89	6,7	**
kg Sugar/m^3 irrigation	1,19	1,40	1,68	1,94	2,20	2,39	0,22	0,31	8,8	***
kg Sugar/m^3 Total water	0,80	0,88	1,00	1,05	1,02	0,81	0,10	0,14	8,2	***

*In treatment W2, 0,84 x Pan was applied for the first $3\frac{1}{2}$ months while 0,60 Pan was applied for the last $3\frac{1}{2}$ months.

TABLE 2. Trash Management x Irrigation Interaction

TREATMENTS		W1	W3	W2	W4	W5	W6	MEAN	SIGNIFICANCE MEAN	L.S.D. 5%; 1% BODY OF TABLE
Tons cane per hectare	B	126,9	129,7	118,1	113,4	89,7	62,7	106,8	**	6,2
	T	113,7	111,3	108,5	103,3	85,3	68,8	98,5		8,2
E.R.S.C.	B	11,63	11,87	13,03	12,83	13,12	10,79	12,21	NS	0,9
	T	12,56	11,81	12,71	12,73	12,61	11,54	12,33		1,2
T.E.R.S.H.	B	14,75	15,38	15,37	14,50	11,74	6,77	13,08	***	1,05
	T	14,27	13,13	13,80	13,14	10,75	7,88	12,16		1,40
Stalk count '000s/ha	B	200,6	200,1	184,7	208,0	191,8	171,0	192,7	NS	14,0
	T	162,8	156,5	159,3	152,0	155,0	141,2	154,5		18,7
Stalk diameter (millimeters)	B	20,1	20,6	20,4	20,0	19,8	20,8	20,3	*	0,6
	T	20,6	20,3	21,2	20,6	21,3	21,3	20,9		0,9
Sucrose % cane	B	14,6	14,7	15,8	15,6	15,8	14,0	15,1	NS	0,8
	T	15,1	14,9	15,7	15,6	16,1	15,0	15,4		1,1
Brix % cane	B	18,8	18,8	19,8	19,8	19,8	18,9	19,3	NS	1,7
	T	18,4	20,0	20,5	20,0	22,3	21,1	20,4		2,2
Fibre % cane	B	12,9	12,5	12,6	11,8	12,3	12,0	12,4	NS	1,7
	T	12,7	10,8	10,1	10,8	9,2	9,4	10,5		2,3
% Purity	B	77,7	78,2	79,8	78,8	79,8	74,1	78,1	-	-
	T	82,1	74,5	76,6	78,0	72,2	71,1	75,8	-	-
% Lodging	B	99	95	96	56	12	0	60	NS	11
	T	98	88	98	62	44	0	65		14
kg Cane/m^3 irrigation	B	10,37	12,72	13,63	15,88	17,59	20,48	15,11	***	1,16
	T	9,29	10,91	12,52	14,47	16,73	22,48	14,40		1,54
kg Cane/m^3 total water	B	6,97	8,02	8,07	8,65	8,10	6,94	7,79	***	0,51
	T	6,24	6,88	7,41	7,88	7,71	7,62	7,29		0,68
kg Sugar/m^3 irrigation	B	1,21	1,51	1,77	2,03	2,30	2,21	1,84	***	0,16
	T	1,17	1,29	1,59	1,84	2,11	2,58	1,76		0,21
kg Sugar/m^3 total water	B	0,81	0,95	1,05	1,11	1,06	0,75	0,96	***	0,08
	T	0,73	0,81	0,94	1,00	0,97	0,87	0,90		0,10
Smut(whips'000s/ ha during season)	B	15,6	14,1	16,9	21,9	36,1	10,9	19,3	-	-
	T	15,2	17,6	18,4	31,4	57,9	28,7	28,2	-	-

Increasing the level of irrigation led to highly significant increases in the yield of both cane and sugar whether the cane was trashed or burnt. The response was, however, greater when the trash was burnt (Fig. I).

At optimum levels of irrigation burning was highly superior to trashing. At the lower and highest levels, however, there was little yield advantage to burning while at the lowest level, trashing was superior to burning.

If trash is burnt the optimum level of irrigation appears to be treatment W2 (a consumptive-use figure of 84% for the first 8½ months and 60 for the last 3½ months), although treatment W5 produced the highest yield of sugar per unit of irrigation water applied.

Increasing irrigation level increased stalk counts but tended to reduce diameter of canes. Similarly burning increased the number of canes but tended to reduce diameter particularly at the lower levels of irrigation (Fig. II).

Sucrose %, as in the past, peaked at the intermediate levels of irrigation and it is worth noting that the drying-off of treatment 2 resulted in a highly significant increase in the sucrose content. (The sucrose content of treatment 2 was 0,3% higher than that of treatment 3).

Although fibre content and purity tended to increase with burning, E.R.S.C., like sucrose %, was unaffected. Fibre content and purity both tended to be increas by increasing levels of irrigation.

Water use efficiency expressed as kg sugar produced per m^3 irrigation water applied, tended to peak with an application of 510 mm of water (net) where trash was burnt, and with 306 mm where it was not burnt.

TABLE 3. Urea vs. Ammonium Nitrate

	UREA	AMMONIUM NITRATE	L.S.D. 5%	L.S.D. 1%	SIGNIFICANCE
Tons cane/hectare	102,9	102,3	2,5	3,4	NS
Estimated recoverable sugar % cane	12,35	12,19	0,36	0,48	NS
Tons estimated recoverable sugar per hectare	12,80	12,44	0,43	0,57	NS
Stalk count '000s/hectare	172,0	175,2	5,7	7,6	NS
Stalk diameter (millimeters)	20,6	20,5	0,3	0,4	NS
% Lodging	55	61	4	6	**
Sucrose % cane	15,3	15,2	0,3	0,4	NS
Brix % cane	19,7	20,0	0,7	0,9	NS
Fibre % cane	11,9	11,6	0,7	0,9	**
% Purity	77,7	76,0	-	-	-
kg Cane/m^3 irrigation	14,81	14,70	0,47	0,70	NS
kg Cane/m^3 total water	7,57	7,52	0,21	0,28	NS
kg Sugar/m^3 irrigation	1,82	1,76	0,06	0,09	NS
kg Sugar/m^3 total water	0,94	0,91	0,03	0,04	NS
Smut (whips '000s/ha during season)	22,7	24,7	-	-	-

Lodging was apparently not affected by trash management although it was significantl affected by irrigation level, being considerably higher (than treatment 4) at the 3 highest levels of irrigation and negligible at the 2 lowest.

Nitrogen carrier

Only fibre content and lodging were affected by nitrogen carriers. The application of urea resulted in a higher fibre content which apparently resulted in less lodging than the application of ammonium nitrate.

Smut

The occurrence of smut was highest in cane irrigated according to a consumptive use factor of 0,53 (Fig. V) but was similar in the drier and wetter treatments.

Burning trash seems to reduce the occurrence of smut.

Foliar analysis

No consistent effect of irrigation level or trash management could be detected on any of the nutrients studied (Table 4).

TABLE 4. Foliar Analysis (Sampled 19/4/73)

NUTRIENT	B/T	PAN FACTOR						
		1,0	0,84	0,84/60	0,68	0,53	0,37	MEAN
N %	B	1,84	1,86	1,82	1,90	1,86	1,92	1,87
	T	1,92	1,87	1,90	1,85	1,90	1,87	1,89
P %	B	0,24	0,22	0,23	0,24	0,22	0,24	0,23
	T	0,24	0,22	0,23	0,24	0,22	0,24	0,23
K %	B	1,42	1,48	1,46	1,42	1,38	1,52	1,46
	T	1,46	1,52	1,51	1,56	1,43	1,50	1,50
Ca %	B	0,30	0,28	0,31	0,30	0,28	0,29	0,29
	T	0,28	0,23	0,29	0,28	0,28	0,26	0,28
Mg %	B	0,18	0,18	0,20	0,19	0,20	0,18	0,19
	T	0,20	0,21	0,21	0,19	0,19	0,20	0,20

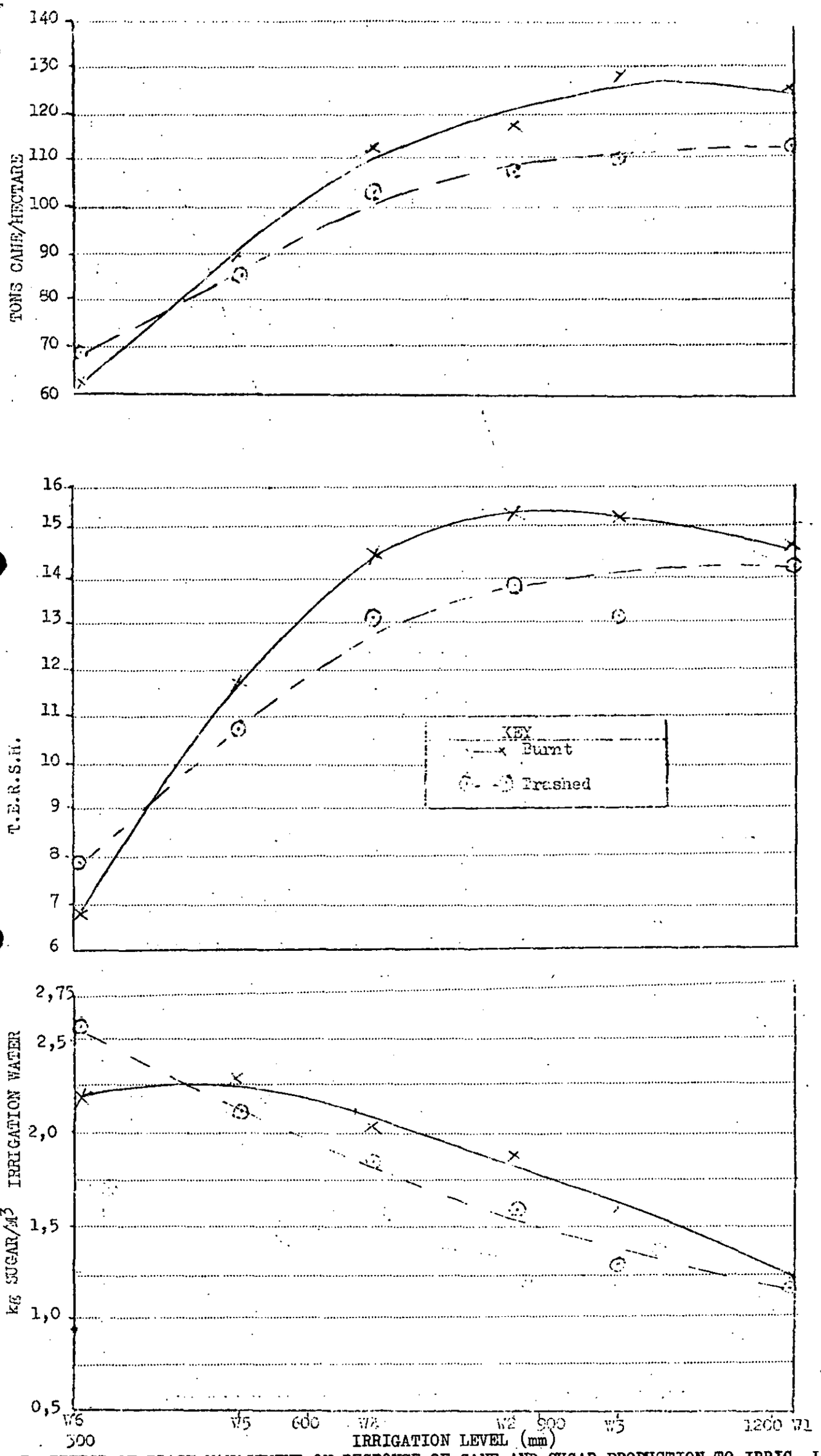


FIG. I. EFFECT OF TRASH MANAGEMENT ON RESPONSE OF CANE AND SUGAR PRODUCTION TO IRRIG. LEVEL

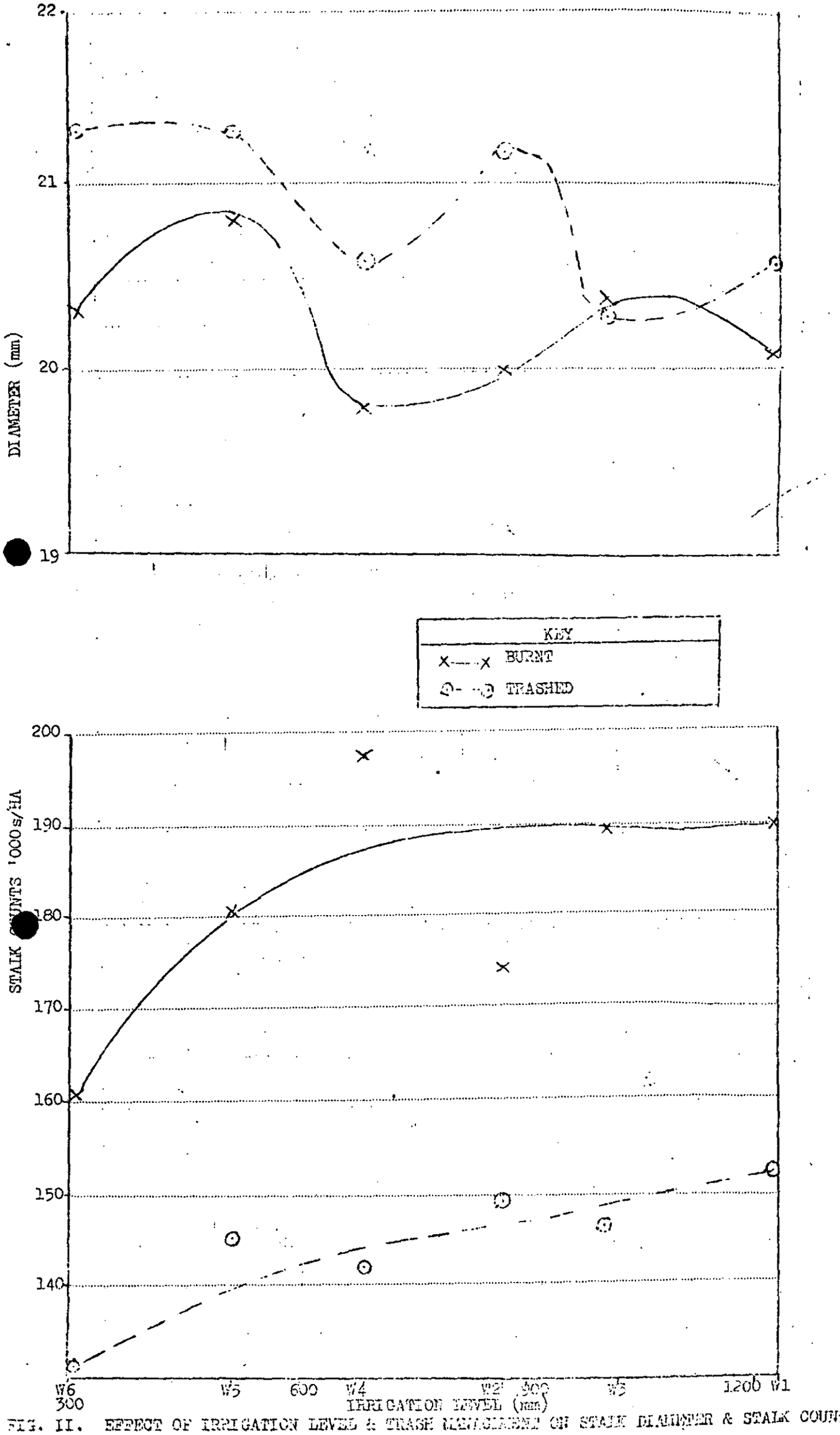


FIG. II. EFFECT OF IRRIGATION LEVEL & TRASH MANAGEMENT ON STALK DIAMETER & STALK COUNTS

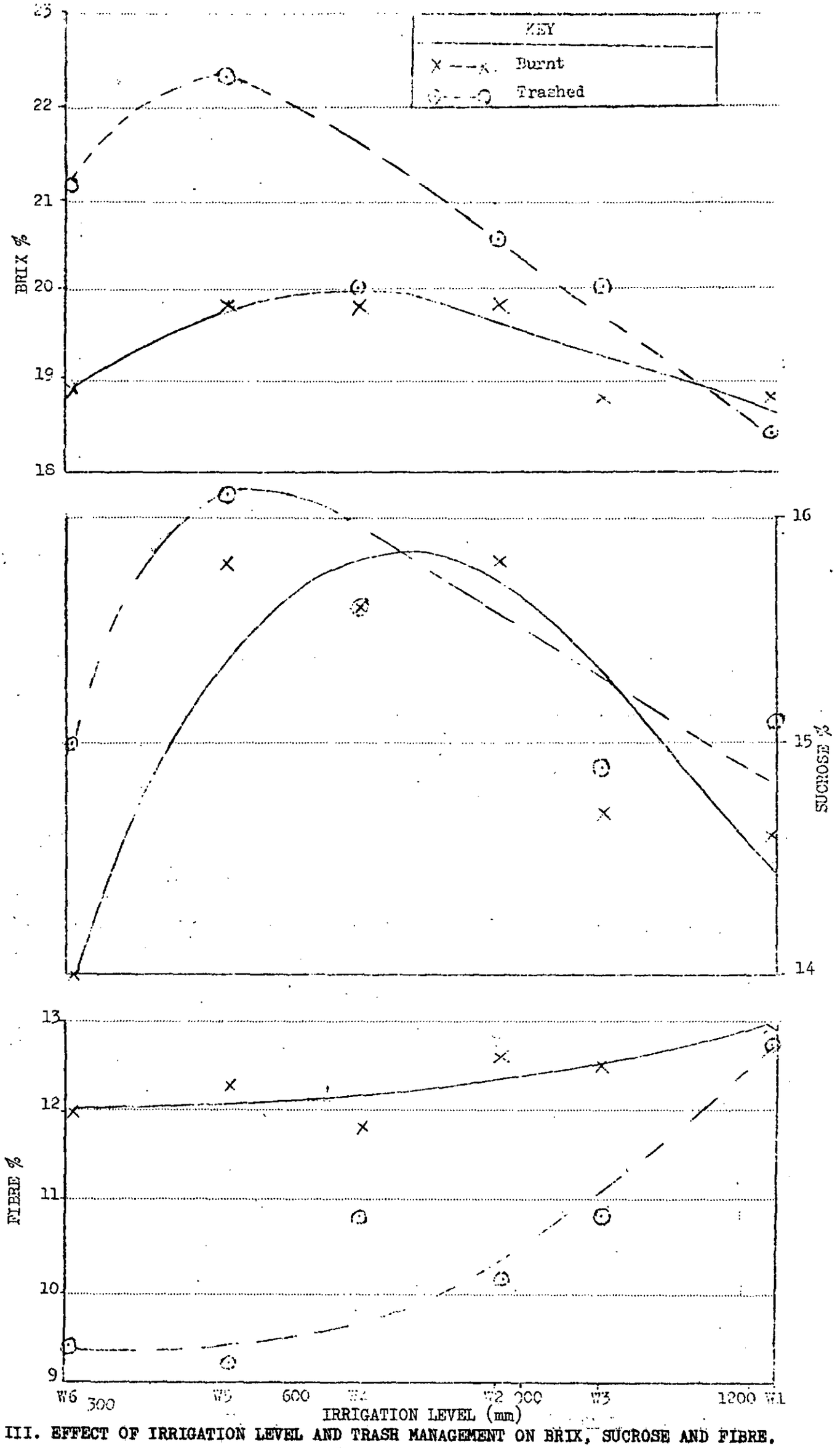


FIG. III. EFFECT OF IRRIGATION LEVEL AND TRASH MANAGEMENT ON BRIX, SUCROSE AND FIBRE.

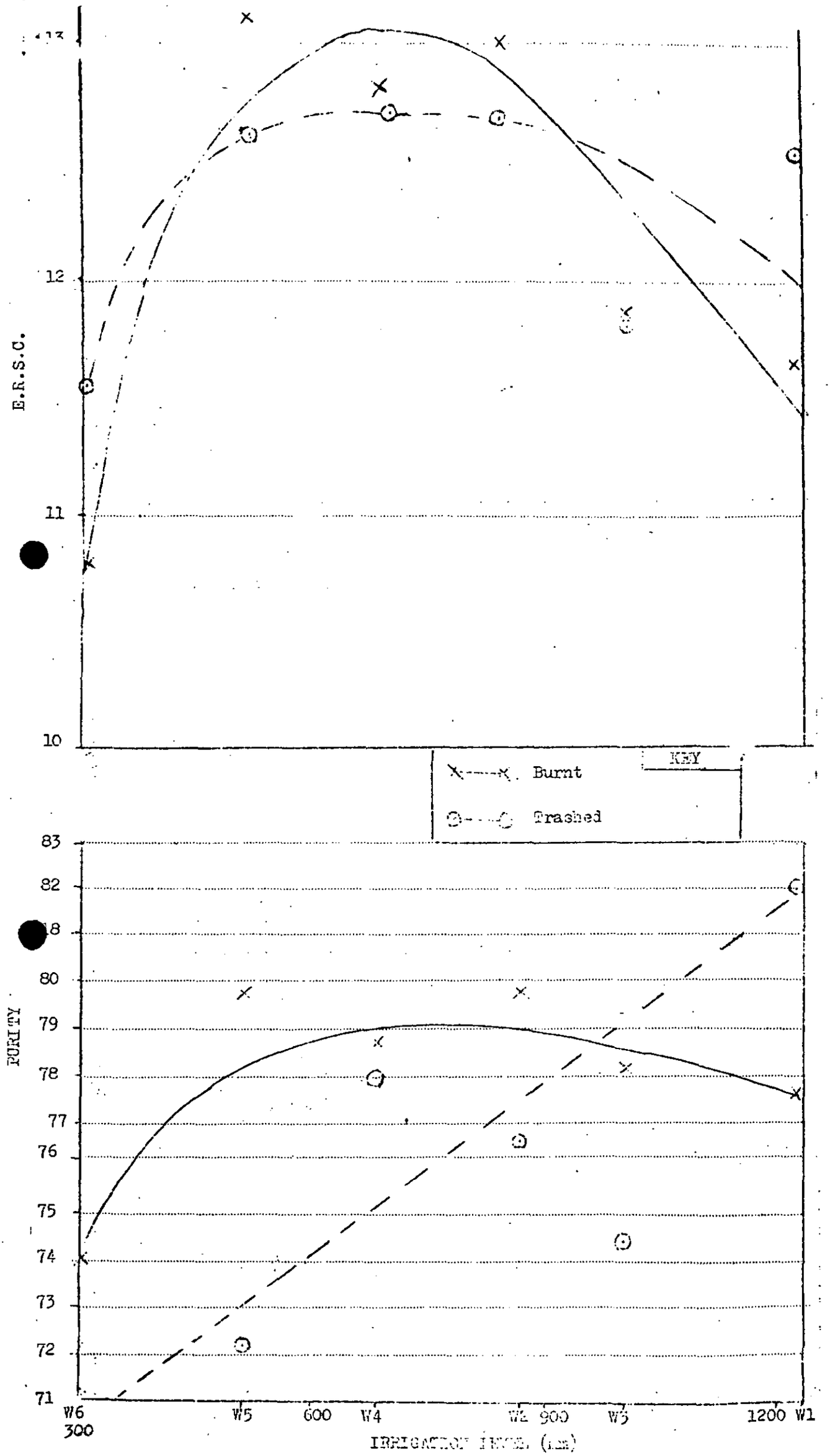


FIG. IV. EFFECT OF IRRIGATION LEVEL AND TRASH MANAGEMENT ON E.R.S.C. AND PURITY

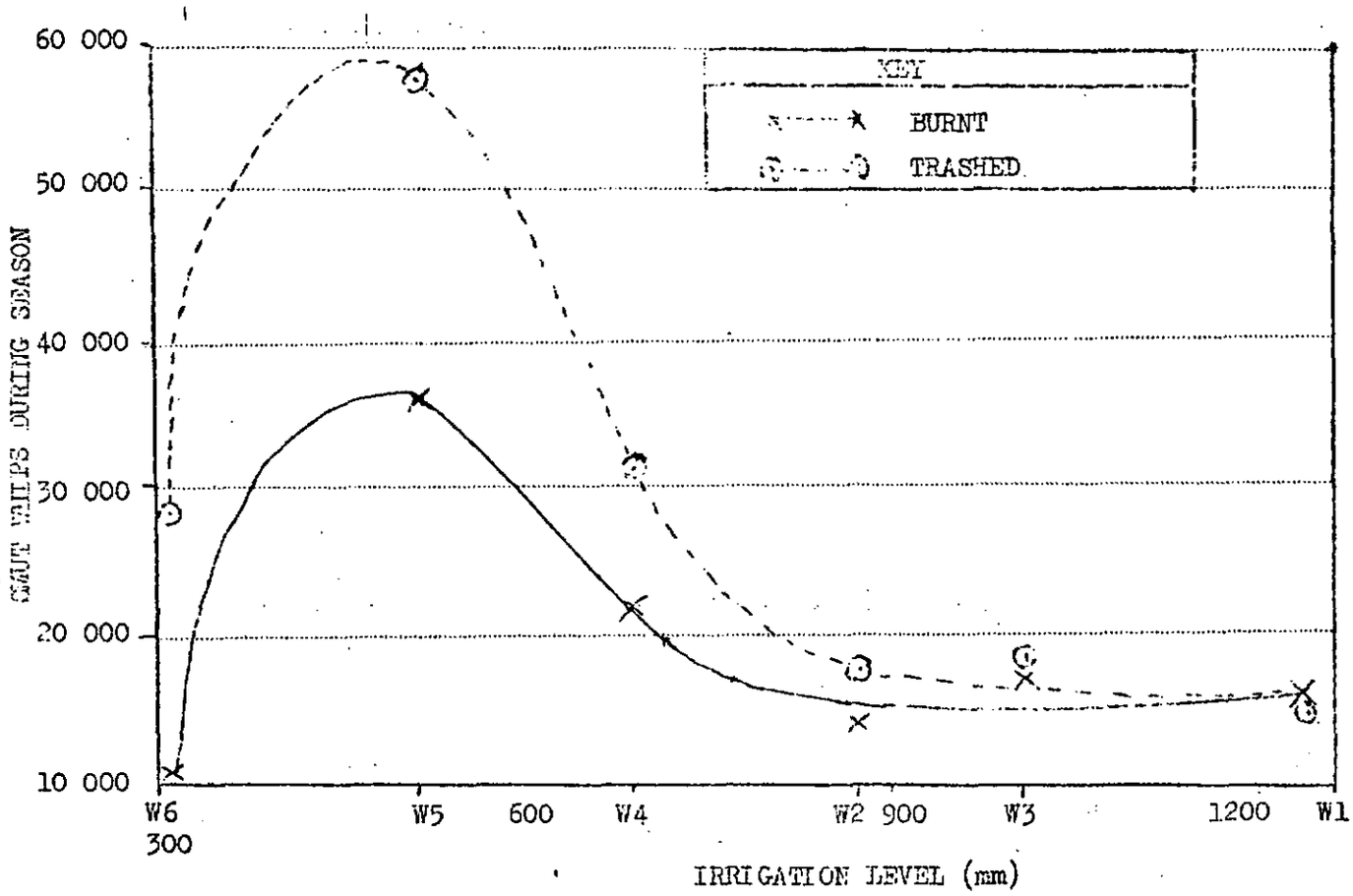


FIG. V. EFFECT OF IRRIGATION LEVEL AND TRASH MANAGEMENT ON THE OCCURRENCE OF SMUT

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

IRRIGATION X TRASH X N-CARRIER TRIAL 4200/1/5R

Catalogue No:	105		Soil analysis:		
This crop:	5th ratoon		pH	($CaCl_2$)	5,5
Site:	R.S.A. Expt. Station		O.M.%		1,3
Altitude:	410 m		Cond.	(mmhos/cm)	284
Soil:	P E 1 sandy clay loam		Ex K	(m.e.%)	0,90
Variety:	NCo 376		Ex Ca	"	6,7
Design:	Split plot		Ex Mg	"	2,26
Fertlizer:	N	P_2O_5	Ex Na	"	0,76
Level (kg/ha)	174	84	Age: 11,7 months		
Carrier	Treatment	S.supers	(1.12.71 - 21.11.72)		
Rainfall on crop:		597 mm			

Object: To determine the effect of various irrigation regimes on cane yield and recoverable sugar. To compare the effects of burning with a trash blanket and any interaction with levels of irrigation. To compare urea with ammonium nitrate as N-carrier.

Results :

TABLE 1 Irrigation Levels

IRRIGATION TREATMENTS	W1	W3	W2*	W4	W5	W6	L.S.D. 5%	L.S.D. 1%	C.V. %	SIGNIF. LEVEL
PAN FACTOR (NET)	1,0	0,84	0,84/ 0,6	0,68	0,53	0,37	-	-	-	-
IRRIGATION (MM)	1224	1020	867	714	510	306	-	-	-	-
TOTAL PRECIPITATION	1821	1464	1617	1311	1107	903	-	-	-	-
Tons cane/ha.	120,3	120,5	113,3	108,3	88,5	65,7	6,8	9,4	6,0	***
E.R.S. % Cane	12,09	11,84	12,87	12,78	12,86	11,17	0,81	1,12	7,1	**
T.E.R.S.H.	14,51	14,26	14,58	13,82	11,24	7,32	1,19	1,65	8,3	***
Stalk count '000s/hectare	181,7	178,3	172,0	180,0	173,4	156,1	12,8	17,8	8,1	**
Stalk diameter (mm)	20,3	20,4	20,8	20,3	20,5	21,0	0,4	0,5	3,2	**
% Lodging	98	92	97	59	3	0	24	33	19	*
Sucrose % cane	14,8	14,8	15,7	15,6	16,0	14,5	0,7	0,9	5,2	***
Brix % cane	18,6	19,4	20,1	19,9	21,0	20,0	1,7	2,3	8,4	N S
Fibre % cane	12,8	11,6	11,4	11,3	10,7	10,7	1,6	2,2	14,9	N S
% Purity	79,6	76,3	78,1	78,4	76,2	72,5	-	-	-	-
kg Cane/m^3 irrigation	9,83	11,81	13,07	15,17	17,16	21,48	1,65	2,28	7,8	***
kg Cane/m^3 total water	6,60	7,45	7,74	8,26	7,91	7,28	0,64	0,89	6,7	**
kg Sugar/m^3 irrigation	1,19	1,40	1,68	1,94	2,20	2,39	0,22	0,31	8,8	***
kg Sugar/m^3 Total water	0,80	0,88	1,00	1,05	1,02	0,81	0,10	0,14	8,2	***

*In treatment W2, 0,84 x Pan was applied for the first 8½ months while 0,60 Pan was applied for the last 3½ months.

significant cubic function. This was due to a relatively small increase in tons cane per inch water applied from W6 to W5 and from W3 to W1. Larger increases were obtained from W5 to W4 and from W4 to W3. This is shown below.

Treatment	Tons Cane/acre Increment	Additional Water (in.)	Tons Cane/inch Water Increment
W1 - W3	0.9	8	0.1
W3 - W4	10.8	8	1.4
W4 - W5	7.1	6	1.2
W5 - W6	3.5	6	0.6

The small increment from W1 to W3 is evidently an example of the law of diminishing returns. On the other hand, the small increment from W5 to W6 is probably due to the fact that the high degree of stress imposed on the crop resulted in such a degree of foliage destruction that each irrigation was followed by a period of canopy renewal before additional cane could be formed. This is evident from weekly height measurement graphs which show a time-lag following each irrigation in W6 before growth is resumed. This was not observed in the wetter treatments.

The selection of the most economic level of irrigation can be determined from the data on tons cane/inch water. Although W6 (0.37 pan) actually gave the highest yields per inch of irrigation water (1.37 tons/inch) this was due to the fact that there was a good rainy season (23.6 in. on the crop) and most of the growth was made on rain. W3 (0.84 pan) followed by W4 (0.68 pan) gave the highest yields per inch total water (rain + irrigation): 0.85 and 0.79 tons cane per inch total water. W3 (0.84 pan) thus appears to be the most economic treatment.

Lodging increased markedly with increasing irrigation: from nil for W6 & 5, 4% for W4 to 34% for W3 and 61% for W1.

Nitrogen Carrier	Urea	Sulphate of Ammonia	C.V. %	L.s.d. 5%	L.s.d. 1%
Tons cane/acre	51.3	52.7	5.3	1.1	1.5
Sucrose % cane	14.4	14.0	5.5	0.3	0.4
Tons sucrose/acre	7.33	7.37	7.3	0.22	0.29
Stalk count ('000s/acre)	53.4	53.2	4.0	0.9	1.2
Lodging	13	20	95	6	9
Height	7.5	7.5	-	-	-

Sulphate of ammonia resulted in significantly higher cane yields (1.4 tons/acre) than urea but significantly lower sucrose content (0.4%) to give virtually identical yields of sucrose per acre with urea. Carrier had no effect on stalk count but urea produced significantly less lodging than sulphate of ammonia (Experiment 6400/2 also showed identical trends in the comparison of urea and sulphate of ammonia).

Interaction: Irrigation x Carrier.

	W1	W2	W3	W4	W5	W6	Mean
			TONS CANE/ACRE				
Urea	61.7	49.9	61.1	50.9	44.0	40.0	51.3
Sulphate of Ammonia	64.1	52.3	62.8	51.5	44.2	41.2	52.7
Mean	62.9	51.1	62.0	51.2	44.1	40.6	
	L.s.d.: body of table (5%) 2.8 (1%) 3.7						
			SUCROSE % CANE				
Urea	13.9	13.9	13.9	14.7	15.4	14.2	14.4
Sulphate of Ammonia	14.3	13.2	14.0	13.8	14.8	13.7	14.0
Mean	14.1	13.5	14.0	14.3	15.1	14.0	
	L.s.d.: body of table (5%) 0.8 (1%) 1.0						
			TONS SUCROSE/ACRE				
Urea	8.60	6.94	8.48	7.48	6.77	5.72	7.33
Sulphate of Ammonia	9.17	6.86	8.81	7.14	6.54	5.68	7.37
Mean	8.88	6.90	8.65	7.31	6.65	5.10	
	L.s.d.: body of table (5%) 0.54 (1%) 0.72						
			STALK COUNT				
Urea	52.1	54.6	51.1	54.9	52.4	55.5	53.4
Sulphate of Ammonia	54.9	52.3	53.2	53.3	51.8	54.1	53.3
Mean	53.5	53.5	52.2	54.1	52.1	54.8	
	L.s.d.: body of table (5%) 2.1 (1%) 2.8						
				LODGING			
Urea	51	1	24	3	0	0	13
Sulphate of Ammonia	71	1	44	5	0	0	20
Mean	61	1	34	4	0	0	
	L.s.d.: body of table (5%) 16 (1%) 21						

The interaction Irrigation x Carrier was significant for stalk count only; however, the linear function of Irrigation x Carrier interaction was significant for all factors except cane yield. Details of this interaction are as follows:

Although there was no overall difference between urea and sulphate of ammonia in sucrose yield/acre, sulphate of ammonia significantly outyielded urea at the highest level of water application. At lower water applications, differences were not significant, but tended in the opposite direction, as shown on the graph. These trends are brought out even more markedly in the stalk count plots, where the sulphate of ammonia treatments had a higher stalk count in the wet treatments, but urea higher in the dry treatments. It is difficult to visualize this as a genuine effect and it is probable that the variable stand originally obtained in the experiment (due to planting under excessively hot conditions) resulted in the variable populations obtained.

SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

Cat. No: 105

Irrigation x trash x N carrier trial 4200/1/6R

This crop:	6th Ratoon		Soil Analysis:	
Site:	Experiment Station		pH ($CaCl_2$)	5,5
Altitude:	410m		O.M. %	1,3
Soil:	P E 1 sandy clay loam		Cond. (mmhos/cm)	284
Variety:	NCo 376		Ex. K (m.e.%)	0,90
Design:	Split plot		Ex. Ca (m.e.%)	6,70
Fertilizer:	N	P_2O_5	Ex. Mg (m.e.%)	2,26
Level (kg/ha)	174	84	Ex. Na (m.e.%)	0,76
Carrier	Treatment	Single supers	Age: 12 months	
Rainfall on crop:	416,7 mm		(21/11/72-23/11/73)	

Object: To determine the effect of various irrigation regimes on cane yield and recoverable sugar.

To compare the effects of burning with a trash blanket and any interaction with levels of irrigation.

To compare urea with ammonium nitrate as N carrier.

Results:

Table 1 Irrigation levels

IRRIGATION TREATMENTS	W1	W3	W2+	W4	W5	W6	C.D. 5%	C.D. 1%	C.V.	Signif level
PAN FACTOR (NETT)	1,0	0,84	0,84/ 0,6	0,68	0,53	0,37				
IRRIGATION (MM)	1581	1275	1173	1020	714	459				
TOTAL PRECIPITATION (MM)	1998	1692	1590	1437	1131	876				
Tonnes cane/ha	126,8	116,9	110,0	84,7	48,4	30,6	9,61	13,28	12,37	***
E.R.S. % Cane	13,12	12,82	13,01	11,72	11,82	9,34	1,16	1,61	8,40	***
T.E.R.S./ha	16,66	15,22	14,07	9,99	5,75	2,88	1,50	2,07	15,97	***
Stalk count '000s/hectare	171,2	169,0	167,4	171,6	160,9	135,9	12,82	17,73	7,11	***
% lodging	56,2	32,2	32,5	0	0	0	-	-	-	-
Sucrose % cane	15,1	14,9	14,8	13,7	13,8	11,4	1,11	1,54	6,48	***
Brix % cane	17,0	16,9	16,8	15,9	16,0	13,8	1,01	1,40	4,27	***
Fibre % Cane	13,8	13,6	13,3	12,7	12,9	11,7	0,59	0,81	6,90	***
% Purity	88,5	88,3	87,6	86,0	86,2	82,2	2,24	3,10	3,32	***
kg cane/m^3 irrigation	8,02	9,17	9,38	8,30	6,78	6,67	-	-	-	-
kg cane/m^3 total water	6,35	6,91	6,92	5,89	4,28	3,49	-	-	-	-
kg sugar/m^3 irrigation	1,06	1,19	1,20	0,98	0,81	0,63	-	-	-	-
kg sugar/m^3 total water	0,84	0,90	0,89	0,70	0,51	0,33	-	-	-	-

+In treatment W2, 0,84 x Pan was applied for the first 8½ months while 0,60 Pan was applied for the last 3½ months.

Sucrose % cane tended to be highest at the high levels of irrigation (Fig. 2). Brix % and Fibre % showed the same trends and were increased by burning.

There was a decrease in purity with decreasing irrigation.

Lodging was increased by increasing irrigation.

Smut was apparently unaffected by irrigation or trashing.

Table 3. Urea vs. Ammonium nitrate

	Urea	Ammonium nitrate	C.D. 5%	C.D. 1%	SIGNIFICANCE
Tons cane/hectare	84,26	88,19	4,36	5,81	NS
Estimated recoverable sugar % cane	11,96	11,99	0,41	0,55	NS
Tons estimated recoverable sugar % cane	10,52	11,00	0,70	0,94	NS
Stalk counts '000's/hectare	162,71	162,71	4,73	6,30	NS
% Lodging	19,5	20,8	-	-	-
Sucrose % cane	13,93	13,94	0,37	0,49	NS
Brix % cane	17,1	16,1	0,28	0,37	NS
Fibre % cane	13,0	13,0	0,37	0,49	NS
% Purity	86,4	86,6	1,18	1,57	NS

Nitrogen carrier

There were no significant differences between nitrogen carriers (TABLE 3).

Foliar analysis

No consistent effect of irrigation level or trash management could be detected on any of the nutrients studied.

Table 4 Foliar analysis

NUTRIENT	B/T	PAN FACTOR						Mean
		1,0	0,84	0,84/0,6	0,60	0,53	0,37	
N %	B	1,85	1,81	1,84	1,84	1,82	1,83	1,84
	T	1,82	1,78	1,82	1,84	1,82	1,72	1,80
P %	B	0,22	0,22	0,22	0,21	0,22	0,22	0,22
	T	0,22	0,20	0,22	0,22	0,23	0,22	0,22
K %	B	1,36	1,42	1,45	1,34	1,26	1,37	1,37
	T	1,35	1,44	1,50	1,42	1,37	1,42	1,42
Ca	B	0,31	0,23	0,25	0,32	0,36	0,47	0,32
	T	0,29	0,23	0,28	0,28	0,36	0,42	0,31
Mg	B	0,20	0,18	0,18	0,19	0,21	0,18	0,19
	T	0,20	0,18	0,18	0,18	0,20	0,21	0,19

Table 2 Trash Management x Irrigation Interaction

TREATMENTS		W1	W3	W2	W4	W5	W6	Mean	Signif. Mean	C.D. 5%, 1%, Body of Table
Tonnes cane per hectare	B	131,3	121,1	109,9	31,0	43,2	24,9	85,2	NS	22,49
	T	122,4	112,7	110,0	38,4	53,5	36,4	87,2		29,94
E.R.S. % C.	B	13,28	13,40	12,90	11,70	11,62	9,33	12,04	NS	1,30
	T	12,97	12,60	12,73	11,74	12,02	9,35	11,90		1,74
T.E.R.S./ha	B	17,46	16,19	14,13	3,59	5,05	2,35	10,80	NS	3,59
	T	15,87	14,24	14,01	10,39	6,46	3,42	10,73		4,78
Stalk count '000s/hectare	B	188,0	183,7	187,7	191,1	173,2	135,4	176,7	***	26,34
	T	154,4	154,3	147,1	152,2	148,8	135,5	148,7		35,07
Sucrose % cane	B	15,31	15,33	14,92	13,60	13,68	11,38	14,07	NS	1,23
	T	14,82	14,54	14,62	13,58	13,92	11,32	13,30		1,63
Brix % cane	B	15,2	17,2	17,0	16,2	16,0	13,9	16,3	**	1,07
	T	16,6	16,6	16,5	15,6	16,0	13,8	15,9		1,43
Fibre % cane	B	14,1	13,8	13,6	13,2	13,4	12,0	13,4	***	0,84
	T	13,4	13,2	12,9	12,1	12,3	11,5	12,6		1,12
% Purity	B	88,0	89,0	86,6	85,0	85,5	82,0	86,1	NS	2,93
	T	89,0	87,7	88,0	87,1	86,8	82,4	86,8		3,90
Lodging %	B	56,9	28,8	22,5	0	0	0	18,0	-	-
	T	55,6	35,6	42,5	0	0	0	22,3		-
Smut whips '000s/ha	B	29,01	35,75	29,80	53,29	46,89	20,69	35,42	-	-
	T	41,10	33,68	45,57	65,02	60,44	36,69	47,08		-
kg cane/m^3 irrigation	B	8,30	9,50	9,36	7,94	6,05	5,42	7,76	-	-
	T	7,74	8,84	9,38	8,67	7,49	7,93	8,34		-
kg cane/m^3 total water	B	6,57	7,16	6,91	5,64	3,82	2,84	5,49		
	T	6,13	6,66	6,92	6,15	4,73	4,16	5,79		
kg sugar/m^3 irrigation	B	1,10	1,27	1,20	0,94	0,71	0,51	0,96	-	-
	T	1,00	1,12	1,19	1,02	0,90	0,75	1,00		-
kg sugar/m^3 total water	B	0,87	0,96	0,89	0,67	0,45	0,27	0,68	-	-
	T	0,79	0,84	0,88	0,72	0,57	0,39	0,70		-

Increasing the level of irrigation led to highly significant increases in the yields of both cane and sugar whether the cane was trashed or burnt. The response was, however, greater when the trash was burnt (Fig. 1).

At optimum levels of irrigation burning was highly superior to trashing except where cane was dried off (W2). Burning was most advantageous at the highest level of irrigation and trashing most advantageous at the lowest levels.

High levels of irrigation produced higher yields of sugar per unit irrigation water applied.

Irrigation had little influence on stalk counts except at the lowest level where counts were considerably lower. Trashing reduced stalk counts at high levels of irrigation.

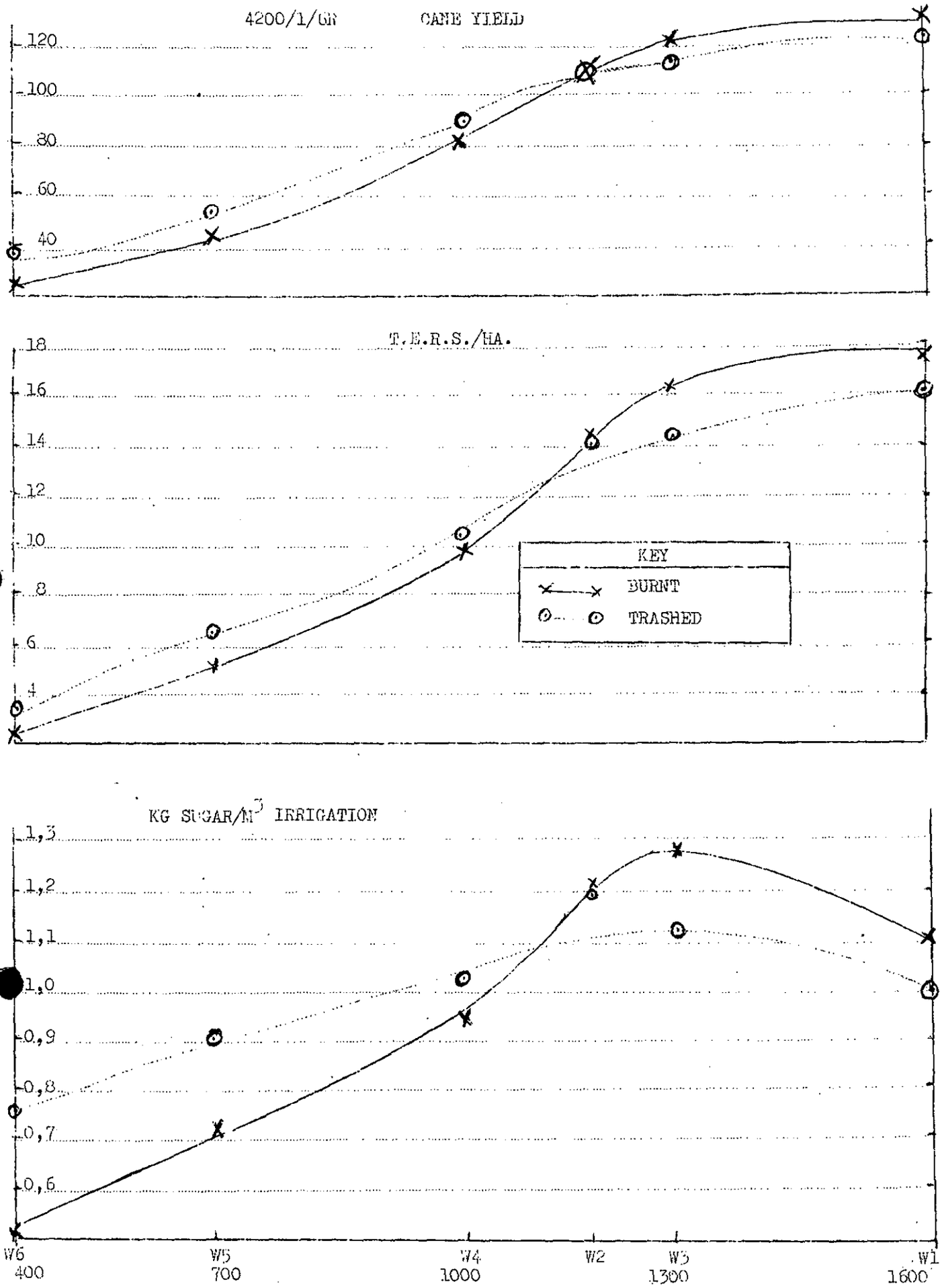


FIG. I EFFECT OF TRASH MANAGEMENT ON RESPONSE OF CANE AND SUGAR PRODUCTION TO IRRIGATION LEVEL

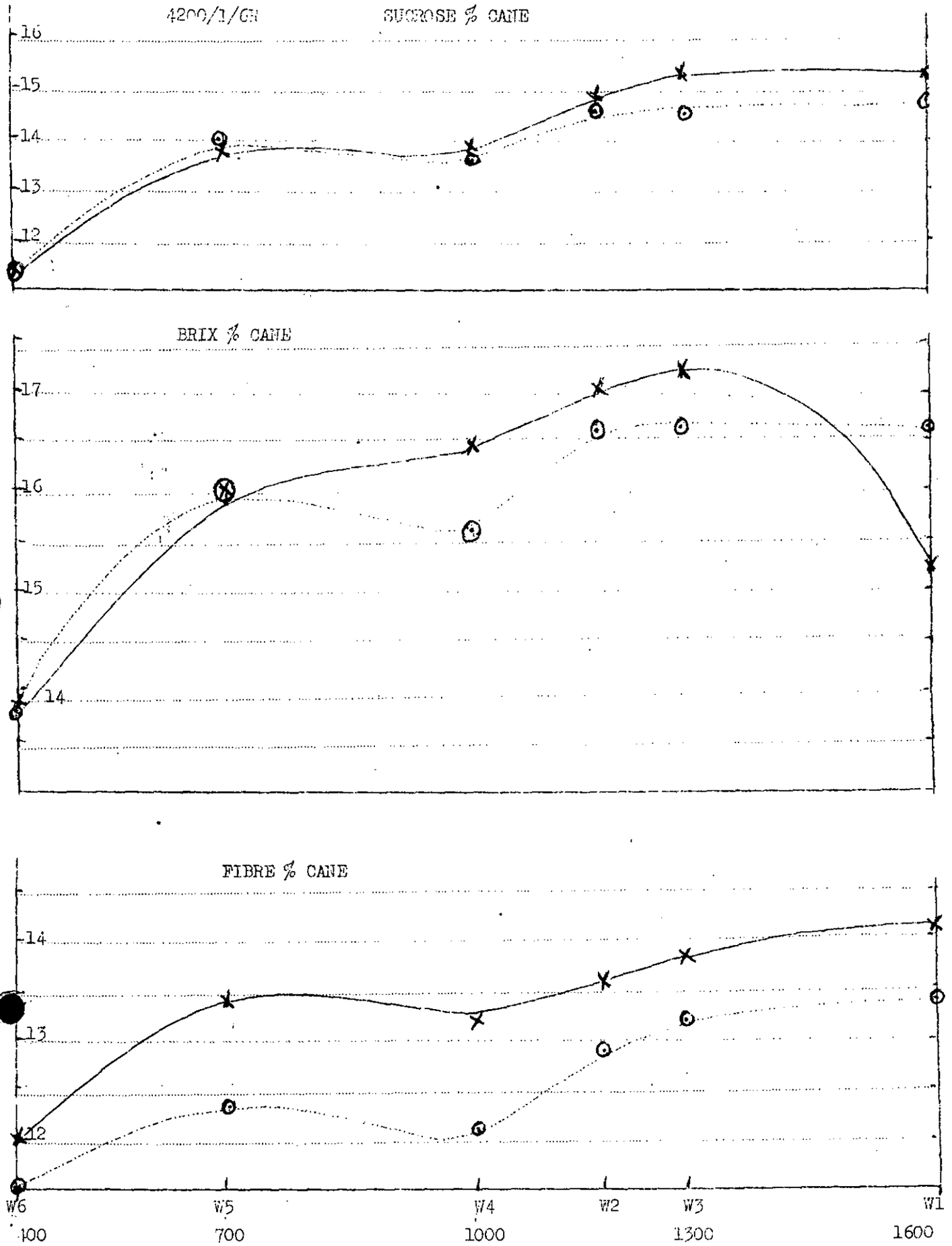


FIG. II EFFECT OF TRASH MANAGEMENT OF QUALITY OF CANE.