FIFTH PROGRESS REPORT ON EXPERIMENTS AT UMFOLOZI

BY THE EXPERIMENT STATION STAFF

During the year 1938 a new experiment (No. 11) was laid down at Umfolozi. It is designed on modern lines to enable information to be obtained on the following questions:—

1. A comparison of the four varieties P.O.J. 2725, Co.281, Co.290, and Co.301.
2. A comparison of spacing the lines 4ft., 5ft., 6ft., and 7ft. apart.
3. A comparison of top-dressing with 300lbs. ammonium sulphate per acre against no fertilizer.

This experiment has made an excellent start and it is hoped it will yield valuable information.

The old line spacing experiment, No. 6, and also the variety trial, No. 8, have had to be abandoned because of damage to the standard of cane by flood waters.

Four experiments were reaped in 1938, three variety trials and one to test the effect of top-dressing with ammonium sulphate on old ratoons. The results obtained are given in detail below:—

UMFOLOZI EXPERIMENT No. 2.—VARIETY TRIAL. FOURTH RATOON CROP.
Harvested at 12 months old, 1st to 3rd December, 1938.

	P.O.J. 2725.	Co. 290.	P.O.J. 2878.	P.O.J. 2727.	CH. 64/21.	UBA.	P.O.J. 2714.
Tons cane per acre	27.24	37.50	28.45	28.45	35.09	30.79	21.78
Increase tons cane per acre over Uba	−3.55	6.71	−2.34	−2.34	4.30	—	−9.01
Percentage tons cane per acre compared with Uba	88.5	121.8	92.4	92.4	114.0	100.0	70.7
Tons pol (sucrose) per acre	4.40	5.35	4.31	4.34	4.31	4.20	3.36
Increase tons pol per acre over Uba	0.20	1.15	0.11	0.14	0.11	—	−0.84
Percentage tons pol per acre compared with Uba	104.8	127.6	102.6	103.3	102.6	100.0	80.0
Pol (sucrose) % cane...	16.16	14.28	15.15	15.26	12.28	13.63	15.42
Fibre % cane	12.22	12.21	12.18	12.15	12.13	11.60	12.47
Juice: Brix	21.0	19.5	20.2	20.8	17.6	18.3	20.5
Pol (sucrose) %	19.51	17.22	18.17	18.34	15.41	16.46	18.76
Purity	93.0	88.2	89.7	88.2	87.5	90.0	91.3
Mgms. per 100 ml. Phosphate content	37.5	47.6	38.1	33.8	56.6	47.2	53.3
,, ,, Potash content ...	147.7	274.7	137.0	246.2	211.7	209.2	166.0
,, ,, Chlorides content.	95.9	173.9	106.5	103.0	149.1	127.2	85.2
Reducing sugar ratio...	1.41	2.93	2.52	2.39	3.20	3.28	2.78
Total value of sucrose per acre at £5.42 per ton	£23 16 11	£28 19 11	£23 7 3	£23 10 6	£23 7 3	£22 15 3	£18 4 3
Value of gain or loss compared with Uba for this crop...	£1 1 8	6 4 8	0 12 0	0 15 3	0 12 0	—	−4 11 0
General mean = 4.32428 tons sucrose per acre.							
Percentage of general mean... ...	101.8	123.7	99.7	100.4	99.7	97.1	77.7

Umfolozi Experiment No. 2—continued.

Significant error of difference between varieties at 19 : 1 odds = 0.557 tons sucrose per acre.
" " " " " 99 : 1 " = 0.755 " "
Percentage significant error of difference between varieties at 19 : 1 odds = 12.9% of general mean.
" " " " " " 99 : 1 " = 17.5% " "
Value of significant difference between varieties per acre at 19 : 1 odds = £3 0s. 4d.
" " " " " " 99 : 1 " = £4 1s. 10d.

Gain or loss compared with Uba.

	P.O.J. 2725.	Co. 290.	P.O.J. 2878.	P.O.J. 2727.	CH. 64/21.	P.O.J. 2714.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Plant cane	38 15 10	27 11 6	27 11 6	20 1 5	1 4 2	7 15 5
First ratoon	15 19 11	14 18 9	7 8 11	8 18 4	2 15 2	—1 14 0
Second ratoon	11 6 2	11 13 1	6 10 5	9 10 5	3 15 0	2 13 1
Third ratoon	14 6 3	10 6 2	6 10 3	7 8 2	0 9 9	—0 2 4
Fourth ratoon	1 1 8	6 4 8	0 12 0	0 15 3	0 12 0	—4 11 0
Total gain or loss compared with Uba over five crops	£81 9 10	70 14 2	48 13 1	46 13 7	8 16 1	4 1 2

The most noticeable thing about the results of the 4th ratoon crop harvested in 1938 is the drop in yield of P.O.J.2725. Over the five crops it is still ahead of all the other varieties, but in this crop it yielded almost a ton less sucrose per acre than Co.290 and was only practically equal to P.O.J.2878, P.O.J.2727, C.H.64/21, and Uba, all of which were definitely lower in previous crops. The explanation for this seems to lie in the fact that the P.O.J.2725 cane flowered more profusely and possibly also earlier than it had done in previous seasons. This checked its growth and adversely affected the weight of cane though the sucrose at 16.16 per cent. was higher than that for any other variety. 1938 was a season when canes flowered to a greater extent than usual and P.O.J. 2725 is a free flowering cane so this appears to be the cause of its falling off in yield. Assuming this to be the reason it may be expected to resume its former position in the lead at the next crop unless another season of heavy flowering again checks it, otherwise the results of the 4th ratoon crop are very similar to those of previous crops.

UMFOLOZI EXPERIMENTS Nos. 7A and 7B.—VARIETY TRIALS. THIRD RATOON CROP.

Harvested at 11 months old, 19th to 22nd November, 1938.

	Uba.	Co. 281.	Co. 290.	P.O.J. 2878.	P.O.J. 2725.
Tons cane per acre	37.73	41.02	44.20	37.28	39.04
Increase tons cane per acre over Uba	—	3.29	6.47	—0.45	1.31
Percentage tons cane per acre compared with Uba ...	100.0	108.7	117.1	98.8	103.5
Tons pol (sucrose) per acre	4.82	5.53	6.18	5.63	6.29
Increase tons pol per acre over Uba	—	0.71	1.36	0.81	1.47
Percentage tons pol per acre compared with Uba ...	100.0	114.7	128.2	116.8	130.5
Pol (sucrose) % cane	12.77	13.48	13.99	15.11	16.11
Fibre % cane	12.15	14.99	12.98	11.48	12.14
Juice: Brix	17.6	18.8	19.3	19.7	20.9
Pol (sucrose) %	15.62	17.05	17.18	17.96	19.22
Purity	88.9	90.1	89.2	91.2	91.9
Mgms. per 100 ml. Phosphate content...	55.6	54.7	40.7	49.7	55.3
" " Potash content	249.9	213.4	239.1	186.8	259.4
" " Chlorides content	195.3	172.2	241.4	111.9	131.4

Umfolozi Experiments Nos. 7A and 7B—continued.

	UBA.	Co. 281.	Co. 290.	P.O.J. 2878.	P.O.J. 2725.
Reducing sugar ratio	3.36	2.65	1.79	2.48	2.11
Total value of sucrose per acre at £5.42 per ton ...	£26 · 2 6	£29 19 5	£33 9 11	£30 10 4	£34 1 10
Value of gain or loss compared with Uba for this crop	—	3 16 11	7 7 5	4 7 10	7 19 4
General mean = 5.6905 tons sucrose per acre.					
Percentage of general mean	84.7	97.2	108.6	98.9	110.5

Significant error of difference between varieties at 19 : 1 odds = 0.335 tons sucrose per acre.
" " " " " 99 : 1 " = 0.451 " "
Percentage significant error of difference between varieties at 99 : 1 odds = 5.9% of general mean.
" " " " " " 99 : 1 " = 7.9% " "
Value of significant difference between varieties per acre at 19 : 1 odds = £1 16s. 4d.
" " " " " " 99 : 1 " = £2 8s. 11d.

Gain or loss compared with Uba.

	Co. 281. £ s. d.	Co. 290. £ s. d.	P.O.J. 2878. £ s. d.	P.O.J. 2725. £ s. d.
Plant cane	16 18 9	18 8 8	15 14 4	25 19 0
First ratoon	15 6 11	12 17 3	10 0 9	18 17 4
Second ratoon	9 15 0	11 12 1	6 2 4	12 16 7
Third ratoon	3 16 11	7 7 5	4 7 10	7 19 4
Total loss or gain compared with Uba over four crops	£45 17 7	£50 5 5	£36 5 3	£65 12 3

As was explained in last year's report these two experiments are now treated as one, giving 12 replications of each variety.

The results of this crop are very similar comparatively to those obtained from the 2nd. ratoon crop in 1937, being just over 7 per cent lower on the average all round. P.O.J.2725 dropped to 10 per cent below its yield in 1937 so it probably suffered from excessive flowering to some extent though not as much as it did in experiment No. 2.

P.O.J.2725 and Co.290 were significantly better than P.O.J.2878 and Co.281 which in turn were significantly better than Uba.

UMFOLOZI EXPERIMENT No. 10.—VARIETY TRIAL. FIRST RATOONS.
Harvested at 12 months old, 3rd December, 1938.

	Co. 301.	Co. 290.	Co. 281.
Tons cane per acre	48.78	42.74	40.61
Increase tons cane per acre over Co.281	8.17	2.13	—
Percentage tons cane per acre compared with Co.281	120.1	105.2	100.0
Tons pol (sucrose) per acre	7.07	6.08	5.55
Increase tons pol per acre over Co.281	1.52	0.53	—
Percentage tons pol per acre compared with Co.281	127.4	109.6	100.0
Pol (sucrose) % cane	14.49	14.23	13.67
Fibre % cane	12.52	11.11	14.03
Juice: Brix	19.6	18.8	18.9
Pol (sucrose) %	17.66	16.83	16.96
Purity	90.4	89.6	89.7
Mgms. per 100 ml. Phosphate content...	56.6	45.8	47.4
" " Potash content	227.4	207.5	233.2
" " Chlorides content	127.8	287.6	181.6

Umfolozi Experiment No. 10—continued.

	Co. 301.	Co. 290.	Co. 281.
Reducing sugar ratio	1.68	2.14	1.91
Total value of sucrose per acre at £5.42 per ton	£38 6 5	£32 19 1	£30 1 8
Value of gain or loss compared with Co.281 for this crop	8 4 9	2 17 5	—

General mean = 6.232777 tons sucrose per acre.

Percentage of general mean	113.5	97.6	89.1

Significant error of difference between varieties at 19 : 1 odds = 0.396 tons sucrose per acre.
" " " " " 99 : 1 " = 0.563 " "
Percentage significant error of difference between varieties at 19 : 1 odds = 6.35% of general mean.
" " " " " " 99 : 1 " = 9.03% " "
Value of significant difference between varieties per acre at 19 : 1 odds = £2 2s. 11d.
" " " " " " 99 : 1 " = £3 1s. 0d.

Gain or loss compared with Co.281.

	Co. 301.	Co. 290.
	£ s. d.	£ s. d.
Plant cane	2 8 8	0 12 7
First ratoon	8 4 9	2 17 5
Total gain or loss compared with Co.281 over two crops	£10 13 5	£3 10 0

In this 1st ratoon crop Co.301 was highly significantly better than the other two varieties whilst Co.290 was significantly better than Co.281 at 19:1 odds. This is the same order in which these canes came out when harvested as plant cane in 1937 only the differences were more pronounced in 1938 than in 1937.

No very great significance can be attached to the difference in sucrose per cent cane between Co.301 and Co.290 but it will be noted that Co.301 was the higher of the two. It is interesting to find that Co.301 can give a good sucrose at 12 months old on the Umfolozi flats when the crop is as heavy as it was in this case, because it looks as if well grown Co.301 cane ought to be cut after one season's growth and not left to be two years old.

UMFOLOZI EXPERIMENTS Nos. 3 and 4.—FERTILIZER TRIAL. OLD RATOONS NOT PREVIOUSLY TOP-DRESSED.

Harvested at 12 months old, 23rd to 29th November, 1938.

	Control. No fertiliser.	400 lbs. per acre ammonium sulphate.	800 lbs. per acre ammonium sulphate.
Tons cane per acre	32.54	35.49	36.84
Increase tons cane per acre over controls	—	2.95	4.30
Percentage tons cane per acre compared with controls	100.0	109.1	113.2
Tons pol (sucrose) per acre	5.30	5.64	5.84
Increase tons pol per acre over controls	—	0.34	0.54
Percentage tons pol per acre compared with controls	100.0	106.4	110.2
Pol (sucrose) % cane	16.28	15.90	15.84
Fibre % cane	11.63	11.51	11.61
Juice: Brix	21.3	20.8	20.9
Pol (sucrose) %	19.44	18.97	18.97
Purity	91.2	91.2	90.8

Umfolozi Experiments Nos. 3 and 4—continued.

	Control. No fertiliser.	400 lbs. per acre ammonium sulphate.	800 lbs. per acre ammonium sulphate.
Mgms. per 100 ml. Phosphate content...	42.1	42.9	37.8
,, ,, Potash content ...	180.3	171.4	214.2
,, ,, Chlorides content ...	118.1	110.1	124.3
Reducing sugar ratio ...	1.77	1.80	1.85
Total value of sucrose per acre at £5.42 per ton ...	£28 14 7	£30 11 5	£31 13 1
Value of gain or loss compared with controls for this crop	—	1 16 10	2 18 6

General mean = 5.59236 tons sucrose per acre.

Percentage of general mean ...	94.8	100.9	104.0

Significant error of difference between treatments at 19 : 1 odds = 0.083 tons sucrose per acre.
,, ,, ,, ,, ,, 99 : 1 ,, = 0.112 ,, ,,
Percentage significant error of difference between treatments at 99 : 1 odds = 2% of general mean.
Value of significant difference between treatments per acre at 19 : 1 odds = 9s.
,, ,, ,, ,, ,, ,, 99 : 1 ,, = 12s. 2d.

Gain or loss compared with controls.

	400 lbs. per acre ammonium sulphate.	800 lbs. per acre ammonium sulphate.
	£ s. d.	£ s. d.
First crop	1 16 10	2 18 6
Less cost of fertilizer	1 14 0	3 8 0
Nett gain or loss compared with controls	£0 2 10 gain	£0 9 6 loss

In our earlier experiments at Umfolozi all the forms of fertilizer applied to the plant cane crop gave negative results. The present top-dressing experiment was designed to test the effect of a nitrogenous fertilizer on old ratoons. It was expected that the results might show only a rather small increase, if any, due to fertilizer so each treatment was replicated 24 times in an endeavour to obtain a low enough "Error of Difference" between treatments to make small differences statistically significant. In this we have been successful. The significant error of difference is only 2 per cent of the General Mean yield at 99:1 odds of all the plots in the experiment whilst the difference between no fertilizer and 400lbs. of ammonium sulphate is 6.1 per cent and between 400 and 800lbs. ammonium sulphate is 3.1 per cent. This means that both top-dressings gave a highly significant increase.

Turning to the financial aspect of the question these results show that the increase obtained from 400lbs. of ammonium sulphate was sufficient to pay for the fertilizer used, but that the additional return obtained from the 800lbs. dressing was not enough to cover the cost of the extra ammonium sulphate used. The same dressings have been applied to the following ratoons and it is hoped to continue them for some years as it is felt that the effect of weather conditions may cause considerable differences from season to season. There is also a possibility that such top-dressings may have a cumulative effect.

South African Sugar Association,
Experiment Station,
Mount Edgecombe,
March, 1939.

The PRESIDENT: We are indebted to Mr. Fowlie and the Experiment Station for these experiments continued at Umfolozi. They are very interesting to anyone connected with the running of a sugar estate. It gives us some idea of what canes to plant. I am surprised at the showing of Co.301. From any I have seen, it has not too good a record. Doornkop said to me they were going to plant nothing else but 281 cane. This paper is now open for discussion.

Mr. DODDS: I am sure you will not expect me to criticise this report in public, or to ask any

questions concerning it. All I can do is to express my approval of the excellent report that Mr. Fowlie has presented. There are one or two points I would like to emphasise, however. In the variety trial noted on the first page, I would not like it to be taken to mean that the growing of ratoons to the fourth ratoon at Umfolozi or anywhere else is recommended. It is done here for the sake of scientific interest to see how far these canes will ratoon. I think it is quite evident from these figures that it does not pay to ratoon, say, past the third ratoon, or even possibly the second ratoon. One is tempted to feel, sometimes, that the Umfolozi planters regard it as one of the principal assets of their wonderful soil that they can ratoon indefinitely on it. So they can, but certainly it would repay them much better to replant a little more often. P.O.J.2725 holds first place in nearly every experiment, although it may be that, comparing it with 301, that 301 might give it a good run. Even in our older experiments, Co.290 is by no means a bad second to 2725, so it is rather surprising to find that only 10 per cent of the cane milled at Umfolozi last season was 290. I think it is a cane that should be cultivated at Umfolozi, if only to have a stand-by established, not to depend too entirely on 2725, although that is an excellent cane. The fertiliser experiment is interesting. It shows that there is a response to fertiliser in the Umfolozi soil if only the right conditions can be found. I am sure if these experiments were continued, that fertiliser treatments could be developed to show a good profit.

Mr. BECHARD: There are some very interesting figures quoted in that report. I do not propose to discuss it from an agricultural standpont, but from the table of analyses I am surprised to see that the much-maligned Uba has still got a fibre of 11.6%. This is in experiment No. 2, whereas the soft canes have got fibres from 0.5% to nearly 1% higher.

Uba also got a purity at twelve months old of 90.0 In fact with the exception of P.O.J.2725 and P.O.J.2714 none of the others are quite as high. That shows the question of fibre depends so very much more on the soils, the age, and so forth, than on the variety of cane as in Experiments 7A and 7B.

The PRESIDENT: I think we should give a hearty vote of thanks to Mr. Fowlie for his paper. *(Applause).*

Mr. FOWLIE: I do not think there are any questions which require to be replied to. I was interested to find Mr. Bechard taking an interest in the chemical side, and I would like to remind people that the figures given in these tables are averages of various numbers of plots—in some cases twelve, in some cases six, and so on—so that they are not just isolated figures. On the other hand, we all know that figures taken such as these are from hand samples which are slightly different from the mill figures. That should be borne in mind in reading them.