

SEVENTH PROGRESS REPORT ON EXPERIMENTS AT UMFOLOZI.

By P. FOWLIE, N.D.A., N.D.D.

During the past season four experiments were reaped at Umfolozi, two at the usual age of about one year old and two which had been left over to be nearly two years old. When the results obtained from the canes of different ages are compared, they seem to show that it is very much more profitable to harvest canes at Umfolozi every season than to leave them over for two seasons.

This appears to be the case with all varieties, but

is specially important in the case of Co.301. This variety was better than Co.281 and Co.290 in Experiment 10 in the first two crops, each harvested at about a year old, but dropped badly in the second ratoons harvested at 20 months old in 1940. When this variety grows rapidly, as it does at Umfolozi, it becomes top-heavy and falls down at about one year old. When this happens it is best to harvest it as soon as possible.

TABLE I.

UMFOLOZI EXPERIMENTS 3 AND 4 NOW COMBINED AS A FERTILIZER EXPERIMENT ON OLD RATOONS.

Second Fertilized Ratoons harvested at 20 months old, 6th to 19th August, 1940.
Variety P.O.J.2725.

	Control. No fertilizer.	400 lbs. per acre ammonium sulphate in two top dressings.	800 lbs. per acre ammonium sulphate in two top dressings.
Tons cane per acre	56.86	65.00	67.71
Increase tons cane per acre over controls	—	8.14	10.85
Percentage tons cane per acre compared with controls	100.00	114.32	119.08
Tons pol. (sucrose) per acre	7.73	8.80	9.12
Increase tons pol. per acre compared with controls	—	1.07	1.39
Percentage tons pol. per acre compared with controls	100.00	113.84	47.98
Pol. (sucrose) per cent. cane	13.59	13.54	13.46
Fibre per cent. cane	12.23	11.96	11.84
Juice: Brix	18.5	18.3	18.1
Pol. (sucrose) per cent.	16.70	16.59	16.44
Purity	90.1	90.5	90.5
Reducing sugar ratio	2.30	2.32	2.21
Total values of sucrose per acre at £5.71 per ton... ..	£44 2 9	£50 5 0	£52 1 6
Value of gain compared with controls for this crop	—	6 2 3	7 18 9
Cost of ammonium sulphate at £16 per ton... ..	—	3 4 0	6 8 0
Net gain over controls in this crop	—	2 18 3	1 10 9
General mean yield tons sucrose per acre 8.5485 tons.			
Percentage of general mean	90.43	102.94	106.69

Significant error of difference between treatments at 19:1 odds = 0.4193 tons sucrose per acre.

Significant error of difference between treatments at 99:1 odds = 0.5596 tons sucrose per acre.

Percentage significant error of difference between treatments at 19:1 odds = 4.9 % of general mean.

Percentage significant error of difference between treatments at 99:1 odds = 6.55% of general mean.

Value of significant difference between treatments at 19:1 odds = £2 7s. 11d. per acre.

Value of significant difference between treatments at 99:1 odds = £3 3s. 11d. per acre.

800 lbs. ammonium sulphate per acre }
400 lbs. ammonium sulphate per acre } no fertilizer.

Summary of Yields of Two Top-dressed Ratoon Crops in Tons Sucrose per Acre.

	No Fertilizer.	400 lbs. per acre ammonium sulphate.	800 lbs. per acre ammonium sulphate.
First top-dressed crop (12 months old)	5.30	5.64	5.84
Second top-dressed crop (20 months old)	7.73	8.80	9.12
Total for two crops	13.03	14.44	14.96
Increase due to fertilizer for two crops	—	1.41	1.93
Percentage tons sucrose per acre compared with no fertilizer for two crops	100.00	110.82	114.81

Conclusions.

In this second top-dressed crop the increases in yield from the top-dressings were higher than those obtained from the first top-dressed crop harvested in 1938 and reported in our fifth progress report two years ago.

Statistically the increase from the application of 400 lbs. per acre of sulphate of ammonia was highly significant, and the further increase from 800 lbs.

over the yield from 400 lbs. per acre was only a little less than that required for significance at 19:1 odds. Both applications showed a profit on this crop after deducing the cost of sulphate of ammonia at £16 per ton. Had we been able to get this fertilizer at the old price the profits would have been higher by £1 10s. 0d. per acre in the case of the 400 lbs. per acre dressing and by £3 in the case of the 800 lbs. per acre dressing. This would have made both dressings practically equally profitable.

TABLE II.

**UMFOLOZI EXPERIMENT No. 7 (A and B).—VARIETY TRIAL, FIFTH RATOON CROP.
Harvested 17th and 18th December, 1940, at 12 months old.**

	Uba.	Co.281.	Co.290.	P.O.J. 2878.	P.O.J. 2725.
Tons cane per acre	37.38	41.10	46.48	38.57	38.89
Increase tons cane per acre compared with Uba ...	—	3.72	9.10	1.19	1.51
Percentage tons cane per acre compared with Uba	100.00	109.95	124.34	103.18	104.04
Tons pol. (sucrose) per acre	4.12	5.18	6.06	5.39	5.65
Increase tons pol. per acre over Uba	—	1.06	1.94	1.27	1.53
Percentage tons pol. per acre compared with Uba .	—	125.73	147.09	130.83	137.14
Pol. (sucrose) per cent. cane	11.01	12.60	13.04	13.98	14.53
Fibre per cent. cane	15.27	15.84	13.14	11.84	11.93
Juice: Brix	15.84	17.86	18.02	18.48	19.13
Pol. (sucrose) per cent.	13.88	16.13	16.10	16.95	17.72
Purity	87.6	90.0	89.5	91.9	92.3
Reducing sugar ratio	3.73	2.73	2.79	1.78	1.78
Total value of sucrose per acre at £5.71 per ton ...	£23 10 6	£29 11 6	£34 12 0	£30 15 6	£32 5 3
Gain compared with Uba for this crop	—	6 1 0	11 1 6	7 5 0	8 14 9
General mean yield 5.27883 tons sucrose per acre.					
Percentage of general mean	78.05	98.13	114.80	102.11	107.03

Significant error of difference between varieties at 19:1 odds = 0.34 tons sucrose per acre.

Significant error of difference between varieties at 99:1 odds = 0.45 tons sucrose per acre.

Percentage significant error of difference between varieties at 19:1 odds = 6.44% of general mean.

Percentage significant error of difference between varieties at 99:1 odds = 8.52% of general mean.

Value of significant difference between varieties per acre at 19:1 = £1 18s. 10d. per acre.

Value of significant difference between varieties per acre at 99:1 = £2 11s. 5d. per acre.

Co.290 > P.O.J.2725 >> Co.281 >> Uba.

Co.290 >> P.O.J.2878 >> Uba.

Summary of Yields of Six Crops in Tons Sucrose per Acre.

	Age of crop.	P.O.J.2725.	Co.290.	Co.281.	P.O.J.2878.	Uba.
Plant cane	19 months	11.00	9.73	9.34	8.80	5.72
First ratoons	15 months	8.20	7.69	7.16	6.67	4.93
Second ratoons	13½ months	6.96	6.79	6.47	5.74	4.72
Third ratoons	11 months	6.29	6.18	5.53	5.63	4.82
Fourth ratoons	12 months	4.98	5.45	5.45	5.45	4.46
Fifth ratoons	12 months	5.65	6.06	5.18	5.39	4.12
Total for six crops		43.08	41.90	39.19	37.68	28.77
Increase over Uba for six crops		14.31	13.13	10.42	8.91	—
Percentage tons sucrose compared with Uba for six crops		149.74	145.64	136.22	130.97	100.00

Conclusions.

The average yields from this crop were fractionally higher than those of the previous crop harvested in 1939. Co.290 and P.O.J.2725 showed increases, whilst the others showed decreases. The increases for the new varieties over Uba were higher than for the previous two crops. Co.290 came out with the

highest yield for this crop, but over the whole series of six crops P.O.J.2725 still leads. Statistically Co.290 was better than P.O.J.2725 at 19:1 and highly significantly better than all the others. P.O.J.2725 was not significantly better than P.O.J.2878, but both the P.O.J. varieties were highly significantly better than Co.281, which in turn was highly significantly better than Uba.

TABLE III.

UMFOLOZI EXPERIMENT No. 10.—VARIETY TRIAL, SECOND RATOONS.

Harvested at 20 months old, 20th and 21st August, 1940.

	Co.301.	Co.290.	Co.281.
Tons cane per acre	69.66	79.74	71.87
Increase or decrease tons cane per acre compared with Co.281 ...	-2.21	7.87	—
Percentage tons cane per acre compared with Co.281	96.92	110.95	100.00
Tons pol. (sucrose) per acre	8.31	10.22	9.01
Increase or decrease tons sucrose per acre compared with Co.281 ...	-0.70	1.21	—
Percentage tons pol. per acre compared with Co.281	92.23	113.43	100.00
Pol. (sucrose) per cent. cane	11.93	12.82	12.54
Fibre per cent. cane	13.00	12.68	15.44
Juice: Brix	16.7	17.6	17.6
Pol. (sucrose)	14.78	15.52	15.84
Purity	88.2	87.6	89.4
Reducing sugar ratio	2.2	1.74	1.58
Total value of sucrose per acre at £5.71 per ton	£47 9 0	£58 7 1	£51 8 11
Value of gain or loss compared with Co.281 for this crop	-3 19 11	6 18 2	—
General mean yield tons sucrose per acre in this experiment 9.1817 tons.			
Percentage of general mean	90.5	111.3	98.1

Significant error of difference between varieties at 19:1 odds = 0.684 tons sucrose per acre.

Significant error of difference between varieties at 99:1 odds = 0.937 tons sucrose per acre.

Percentage significant error of difference between varieties at 19:1 odds = 7.45% of general mean.

Percentage significant error of difference between varieties at 99:1 odds = 10.21% of general mean.

Value of significant difference between varieties at 19:1 odds = £3 18s. 1d. per acre.

Value of significant difference between varieties at 99:1 odds = £5 7s. 0d. per acre.

Co.290 >> Co.281 > Co.301.

Summary of Yields of Three Crops in Tons Sucrose per Acre.

	Age of crop.	Co.301.	Co.290.	Co.281.
Plant cane	12 months	4.70	4.32	4.22
First ratoons	12 months	7.07	6.08	5.55
Second ratoons	20 months	8.31	10.22	9.01
Total tons sucrose from three crops		<u>20.08</u>	<u>20.62</u>	<u>18.78</u>

Conclusions.

In this crop Co.290 is highly significantly better than Co.281, which in turn is significantly better than Co.301. As mentioned earlier, this seems a

clear indication that Co.301 ought to be harvested each season. If it is found possible to harvest the third ratoons after one season's growth, the results will have special interest on this point.

EXPERIMENT No. 11.—FIRST RATOONS.

Harvested at 12 months old, 10th—15th December, 1940.

As described in previous reports, this experiment has been designed as three experiments in one, viz. :—

- (a) A comparison of four varieties of cane.
 (b) A fertilizer test.

(c) A comparison of the results to be obtained from four spacings of planting.

The results to date are given in the following tables.

TABLE IV.—Variety Trial.

	P.O.J.2725.	Co.301.	Co.281.	Co.290.
Tons cane per acre	37.88	42.76	41.07	43.55
Increase or decrease tons cane per acre compared with P.O.J.2725	—	+4.88	+3.19	+5.67
Percentage increase or decrease tons cane per acre compared with P.O.J.2725	100.00	112.88	108.42	114.97
Tons pol. (sucrose) per acre	5.79	5.68	5.37	6.02
Increase or decrease tons pol. per acre compared with P.O.J.2725	—	-0.11	-0.42	+0.23
Percentage increase or decrease tons pol. per acre compared with P.O.J.2725	100.00	98.10	92.75	103.97
Pol. (sucrose) per cent. cane	15.28	13.29	13.08	13.81
Fibre per cent. cane	11.92	13.09	15.56	13.04
Juice: Brix	19.6	18.0	17.9	18.4
Pol. (sucrose) per cent.	18.50	16.32	16.50	16.79
Purity	92.1	88.5	89.9	89.1
Reducing sugar ratio	1.48	2.34	1.84	1.76
Total value of sucrose per acre at £5.71 per ton	£33 1 3	£32 8 8	£30 13 3	£34 7 6
Gain or loss compared with P.O.J.2725 this crop	—	-0 12 7	-2 8 0	+1 6 3
General mean yield 5.7144 tons sucrose per acre.				
Percentage of general mean	101.32	99.4	94.0	105.35

Table IV.—Variety Trial.—Continued.

Significant error of difference between varieties at 19:1 odds = 0.338 tons sucrose per acre.
 Significant error of difference between varieties at 99:1 odds = 0.453 tons sucrose per acre.
 Percentage error of difference between varieties at 19:1 odds = 5.91% of general mean.
 Percentage error of difference between varieties at 99:1 odds = 7.93% of general mean.
 Value of error of difference between varieties at 19:1 odds = £1 18s. 7d. per acre.
 Value of error of difference between varieties at 99:1 odds = £2 11s. 9d. per acre.

Co.290 > $\begin{matrix} \text{Co.281} \\ \text{Co.301} \end{matrix}$ P.O.J.2725 > Co.281.

Summary of Yield of Two Crops in Tons Sucrose per Acre.

	P.O.J.2725.	Co.301.	Co.281.	Co.290.
Plant cane (20 months old)	9.50	9.37	8.80	8.74
First ratoon (12 months old)	5.79	5.68	5.37	6.02
Total for two crops	15.49	15.05	14.17	14.76
Percentage tons sucrose per acre compared with P.O.J. 2725 over two crops	100.00	97.16	91.48	95.29

Conclusions.

In this crop Co.290 gave a higher yield than P.O.J.2725, but the difference between them was not great enough for statistical significance.

Co.290 was significantly better than Co.281 and Co.301. P.O.J.2725 was significantly better than Co.281. P.O.J.2725 was still best over two crops.

TABLE V.—Fertilizer Trial.

Variety.	Treatment.	Tons cane per acre.	Sucrose per cent. cane.	Tons sucrose per acre.	Purity.	Fibre per cent. cane.	Reducing sugar ratio.
P.O.J.2725	No fertilizer	37.26	15.37	5.73	92.7	12.05	1.39
Co.301		44.11	13.32	5.88	88.5	13.17	2.25
Co.281		39.28	13.23	5.20	90.4	15.51	1.75
Co.290		43.25	13.89	6.01	89.0	12.90	1.58
Treatment average		40.97	13.91	5.70	90.2	13.41	1.74
P.O.J.2725	Fertilized with 600 lbs. per acre ammonium sulphate	38.51	15.19	5.85	91.5	11.80	1.57
Co.301		41.40	13.27	5.49	88.4	13.00	2.43
Co.281		42.85	12.93	5.54	89.3	15.61	1.94
Co.290		43.86	13.73	6.02	89.1	13.19	1.94
Treatment average		41.66	13.75	5.73	89.6	13.40	1.97

As was the case with the plant cane crop, the difference between the fertilized and unfertilized was too small to have any significance.

TABLE VI.—Spacing Trial.

Variety.	Spacing.	Tons cane per acre.	Sucrose per cent. cane.	Tons sucrose per acre.	Purity.	Fibre per cent. cane.	Reducing sugar ratio.
P.O.J.2725	4 ft. spacing	39.63	15.43	6.12	91.8	11.18	1.63
Co.301		46.22	13.36	6.18	88.3	12.75	2.60
Co.281		42.94	13.30	5.71	90.5	15.99	2.03
Co.290		43.19	13.74	5.94	88.5	13.67	1.91
	Average	42.99	13.92	5.98	89.8	13.40	2.04
P.O.J.2725	5 ft. spacing	39.03	15.15	5.91	92.4	12.21	1.25
Co.301		41.52	12.88	5.35	87.8	13.55	2.37
Co.281		42.73	12.63	5.40	88.0	15.25	1.75
Co.290		45.58	13.99	6.38	90.0	12.51	1.57
	Average	42.22	13.64	5.76	89.6	13.38	1.74
P.O.J.2725	6 ft. spacing	37.56	15.36	5.77	92.3	11.71	1.55
Co.301		42.33	13.48	5.71	89.0	12.91	2.37
Co.281		40.35	13.34	5.38	91.1	15.60	2.02
Co.290		43.44	13.51	5.87	88.5	12.97	1.60
	Average	40.92	13.88	5.68	90.2	13.30	1.88
P.O.J.2725	7 ft. spacing	35.31	15.16	5.36	91.9	12.60	1.49
Co.301		40.96	13.45	5.51	88.7	13.14	2.02
Co.281		38.26	13.04	4.99	89.9	15.41	1.57
Co.290		42.00	14.01	5.88	89.3	13.01	1.96
	Average	39.13	13.88	5.43	90.0	13.54	1.76

Conclusions.

In this crop 4 ft. spacing was not significantly better than 5 ft., but was significantly better than 6 ft. and 7 ft.; 5 ft. spacing was significantly better than 7 ft. In the plant cane crop reported last year there was no significant difference between the spacings.

In last year's report, it was mentioned that experiments with ten varieties of canes from Puerto Rico had been commenced on the estate of the U.L.O.A. These were not ready for harvesting during the 1940 milling season, but will be ready to harvest during the coming season. Unfortunately the larger of these experiments was badly damaged by water during the heavy rains in May, 1940, and the plots are so uneven that the weights to be got from them cannot be a reliable test of the cropping capacity of these canes. These experiments have just been visited and most of the Puerto Rico canes are looking well. The best of them show promise of being

at least as good yielders as P.O.J.2725 and have the advantage of not arrowing as P.O.J.2725 frequently does. It is intended to put down another experiment with them this year on a field which has grown very even stands of cane in the past. This field is on a part of the estate which has never suffered from water damage since it was first planted, and which is considered as safe from water damage as any on the estate.

The staff of the Umfolozi Co-operative Sugar Planters Ltd., Mr. E. Stanley Murphy and his Manager, Mr. Higgins, also Mr. Wm. Dick, Secretary and General Manager of the U.L.O.A. Estate, have rendered much assistance in connection with these experiments and deserve the hearty thanks of all connected with the industry.

Experiment Station,
South African Sugar Association,
Mount Edgecombe.
March, 1941.

The PRESIDENT, in opening the discussion, pointed out that at certain places at Umfolozi Co.290 had found an environment which suited it and did very well. He was particularly interested in the new varieties now being tried out at Umfolozi and looked forward to next year's report on them.

Mr. GARLAND said that his experience was that after Co.301 had lodged red rot set in, and he could not see how the sucrose of such cane can improve if left in the field for a couple of months.

Mr. DODDS said that he had examined Co.301 which had been blown over by wind. It received a severe shock, and naturally the sucrose content and the quality of the cane was inclined to go off very rapidly before the cane could be got to the mill, but if it was left to recover for about two months the cane apparently recovered to normal. There was perhaps a loss in actually broken cane, but that was very small. Canes that were merely bent grew up again.

Mr. GARLAND suggested that these experiments might have been done in small plots and that the tendency to lodge would be far greater in a big field, and the percentage of cane that would actually snap would be far bigger too. If cane were left for a few months under these conditions, it would have rotted as a result of cracking and inducing red rot.

Dr. McMARTIN said he could not see much difference between cane blown down in the field or in a smaller plot. At the Experiment Station some plots were blown down very badly. The cane was almost flat, and yet he had seen very little of the so-called red rot in it. The bottom joints were affected, but it did not spread. Age might, however, have something to do with it.

Mr. FOWLIE supported what Mr. Dodds had said. He referred to a field at the Experiment Station which had been blown down so badly that it looked

as if a wagon and oxen had driven over it. Samples were taken at fortnightly intervals for about two months, and the sucrose per cent. improved, as Mr. Dodds had pointed out. This crop averaged about 60 tons to the acre. His experience was that one might find a lot of cracked cane under these circumstances with red rot starting, but it did not spread rapidly and the number of dead sticks was usually small. There were, however, cases where the number of dead canes were considerable, and under those conditions he doubted whether the sucrose per acre would improve, and it might be better to cut such badly damaged cane as soon as possible.

Major MUNGLE said this discussion and controversy had interested him quite a lot. He had been trying to find the optimum time to cut Co.301. That it lodged badly was well known, and he had experiments on such a field to get the best time of cutting, but he had not been able to come to any definite conclusions. He thought, however, that this problem would solve itself in the next few years.

Major Mungle said, in reply to Mr. Dodds, that he had tried alternative rows of Co.301 and Co.281. This experiment was successful: The Co.301 and the Co.281 grew well together and did not affect each other adversely and the Co.281 prevented the Co.301 from lodging. Loading was also facilitated and a quarter of a ton more had been loaded on a lorry.

Mr. GARLAND suggested that the Experiment Station should carry out some sucrose determinations from a large field of lodged Co.301 cane.

The PRESIDENT said that this meeting at the Experiment Station had been very successful. It was not a convenient place in which to read engineering papers, but for agricultural subjects it was ideal.

Mr. Fowlie was accorded a hearty vote of thanks for his paper.