SECOND PROGRESS REPORT ON EXPERIMENTS AT UMFOLOZI SUB-STATION

By P. FOWLIE, N.D.A.

In a paper given last year six experiments were described and the results from the crops harvested during the 1934 milling season were recorded. Five of these were harvested again in 1935, and four others were harvested for the first time. This paper summarises the results to date and will endeavour to show what conclusions it is permissible to draw from them. Those relating to trials of cane varieties will be taken first and then those dealing with the use of fertilisers.

As these experiments were laid out in randomised blocks it has been possible to work out the experimental error by Fisher's method for the experiments reaped in 1935. The experimental error of difference between varieties or fertiliser treatments, as the case may be, at 19 to 1 odds is given for each experiment. This is an arbitrary standard which has been adopted throughout the world for deciding what difference between the yields from any two of the varieties or fertiliser treatments in an experiment shall be considered sufficient to enable the experimentalist to say that one of these varieties or treatments is significantly better than the other.

In the notes on the following experiments this standard is applied and only in those cases where a variety gave an increase at least equal to the standard error of difference at 19 to 1 odds is it said to be significantly better than the variety with which it is being compared. If the difference between the yields of two varieties is only slightly less than that required for significance by this standard it undoubtedly has some value as an indication which is the better of the two, but such indications have to be treated with great caution as the odds quickly shorten for smaller differences.

UMFOLOZI EXPERIMENT No. 1.—VARIETY TRIAL. FIRST RATOONS CROP.
Harvested at 18 months' old, August - September, 1934.

	P.O.J.2725.	Co.290.	P.O.J.2878.	P.O.J.2727.	P.O.J.2714.	CH. 64/21.	UBA.
Tons cane per acre	86.43	85.65	71.44	75.10	59.03	50.05	43.16
Increase tons cane per acre over Uba	43.27	42.49	28.28	31.94	15.87	6.89	—
Percentage tons cane per acre compared with Uba	200.0	198.4	165.5	174.0	136.7	116.0	100.0
Tons pol (sucrose) per acre	11.42	9.97	9.24	7.23	7.21	3.87	3.58
Increase tons pol per acre over Uba	7.84	6.39	5.66	3.65	3.63	0.29	—
Percentage tons pol per acre compared with Uba	319.0	278.0	258.0	202.0	201.0	108.0	100.0
Pol (sucrose) % cane	13.21	11.64	12.93	9.63	12.22	7.71	8.31
Fahey scale bonus or penalty	—	—	—	−0.50	—	−2.60	−0.12
Corrected pol % cane	13.21	11.64	12.93	9.13	12.22	5.11	8.19
Tons corrected pol per acre	11.42	9.97	9.24	6.85	7.21	2.56	3.53
Increase or decrease tons corrected pol per acre over Uba	7.89	6.44	5.71	3.32	3.68	−0.97	—
Percentage tons corrected pol per acre compared with Uba	321.0	280.0	260.0	194.0	202.0	72.5	100.0
Purity of juice	86.4	88.4	88.0	81.0	87.0	78.4	82.4
Total value of sucrose per acre at £5.470729	£62 9 6	£54 10 10	£50 11 0	£37 9 8	£39 8 11	£14 0 0	£19 6 3
Value of sucrose gain or loss over Uba	43 3 3	35 4 7	31 4 9	18 3 5	20 2 8	−5 6 3	—

General mean = 7.31.

Percentage of general mean on tons corrected sucrose per acre	156.2	136.3	126.4	93.7	98.6	35.0	48.3

Experimental error of difference between varieties at 19 : 1 odds = 1.49 tons corrected sucrose per acre.
Percentage experimental error of difference between varieties at 19 : 1 odds = 19.8 %.
Value of significant difference between varieties per acre at 19 : 1 odds = £8 3s. 0d.

UMFOLOZI EXPERIMENT No. 1.—VARIETY TRIAL. SECOND RATOONS CROP.
Harvested 18th October, 1935, as 14 months' old.

	P.O.J.2725.	Co.290.	P.O.J.2878.	P.O.J.2727.	P.O.J.2714.	CH. 64/21.	UBA.
Tons cane per acre	55.40	59.57	43.12	43.31	21.39	32.01	31.46
Increase tons cane per acre over Uba	23.94	28.11	11.66	11.85	—10.07	0.55	—
Percentage tons cane per acre compared with Uba	176.1	189.4	137.1	137.7	68.0	101.7	100.00
Tons pol (sucrose) per acre.. ..	8.07	8.17	6.23	5.71	3.08	4.09	4.13
Increase or decrease tons cane per acre compared with Uba ..	3.94	4.04	2.10	1.58	—1.05	—0.04	—
Percentage tons pol per acre compared with Uba	195.4	197.8	150.8	138.3	74.6	99.0	100.0
Pol (sucrose) % cane	14.58	13.71	14.44	13.19	14.39	12.79	13.13
Fahey scale bonus or penalty ..	0.28	—	0.16	—	—	—	0.26
Corrected pol % cane	14.86	13.71	14.60	13.19	14.39	12.79	13.39
Tons corrected pol per acre ..	8.23	8.17	6.30	5.71	3.08	4.09	4.21
Increase or decrease tons corrected pol per acre over Uba	4.02	3.96	2.09	1.50	—1.13	—0.12	—
Percentage tons corrected pol per acre compared with Uba ..	195.5	194.1	150.1	135.6	73.2	97.1	100.0
Purity of juice	90.4	88.85	89.8	86.6	88.7	88.2	90.3
Total value of sucrose per acre at £4.59689	£37 16 8	£37 11 1	£28 19 2	£26 5 0	£14 3 2	£18 16 0	£19 7 1
Value of sucrose gain or loss over Uba	18 9 7	18 4 0	9 12 1	6 17 11	—5 3 11	—0 8 11	—
Value of sucrose gain or loss over Uba, First Ratoons	43 3 3	35 4 7	31 4 9	18 3 5	20 2 8	—5 6 3	—
Total value of sucrose gain or loss over Uba—two crops	61 12 10	53 8 7	40 16 10	25 1 4	14 18 9	—5 15 2	—
General mean = 5.70.							
Percentage of general mean on tons corrected sucrose per acre ..	144.4	143.3	109.3	100.2	54.6	71.8	74.6

Experimental error of difference between varieties at 19 : 1 odds = 1.62 tons corrected sucroes per acre.
Percentage experimental error of difference between varieties at 19 : 1 odds = 28.4 %.
Value of significant difference between varieties per acre at 19 : 1 = £7 8s. 11d.

In this experiment P.O.J.2725 was significantly better than Co.290 in the first ratoon crop, but in the second ratoon crop there was practically no difference between them. In the first ratoon crop Co.290 was not significantly better than P.O.J.2878, but in the second ratoon crop Co.290 had increased its lead and was significantly better.

These three varieties were all significantly better than the remaining four; P.O.J.2727 and P.O.J.2714 were better than Uba and CH64/21 in the first ratoon crop, but in the second ratoon crop the difference in favour of P.O.J.2727 was just a few shillings below the amount required for significance.

Taking the two crops together, P.O.J.2727 is clearly significantly better than Uba and CH64/21. In the second ratoon crop P.O.J.2714 gave a very much reduced yield due to poor ratooning and actually gave a lower yield than Uba and CH64/21 so the difference between these three varieties is not enough to be significant.

UMFOLOZI EXPERIMENT No. 2.—VARIETY TRIAL. PLANT CANE CROP.
Harvested as 21 months' old in August, 1934.

	P.O.J.2725.	Co.290.	P.O.J.2878.	P.O.J.2727.	P.O.J.2714.	CH. 64/21.	UBA.
Tons cane per acre	95.26	90.43	78.74	70.40	54.63	65.48	59.16
Increase or decrease tons cane per acre over Uba	36.10	31.27	19.58	11.24	—4.53	6.32	—
Percentage tons cane per acre compared with Uba	161.0	152.9	133.1	119.0	92.3	110.7	100.0
Tons pol (sucrose) per acre.. ..	12.40	10.35	10.35	7.25	6.73	5.93	5.36
Increase tons pol per acre over Uba	7.04	4.99	4.99	1.89	1.37	0.57	—
Percentage tons pol per acre compared with Uba	231.34	193.0	193.0	135.3	125.6	110.6	100.0
Pol (sucrose) % cane	13.06	11.44	13.15	10.30	12.32	9.05	9.06
Fahey scale bonus or penalty ..	—	—	—	—0.14	—	—0.60	—0.09
Corrected pol % cane	13.06	11.44	13.15	10.16	12.32	8.45	8.98
Tons corrected pol per acre ..	12.40	10.35	10.35	7.15	6.73	5.53	5.31
Increase corrected tons pol per acre	7.09	5.04	5.04	1.84	1.42	0.22	—
Percentage corrected tons pol compared with Uba	233.15	194.9	194.9	134.7	126.7	104.1	100.0
Purity of juice	87.3	88.7	87.9	82.3	85.8	80.8	82.6
Total value of sucrose per acre at £5.470729	£67 16 9	£56 12 5	£56 12 5	£39 2 4	£36 16 4	£30 5 1	£29 0 11
Value of sucrose gain over Uba ..	38 15 10	27 11 6	27 11 6	20 1 5	7 15 5	1 4 2	—
General mean = 8.35.							
Percentage of general mean on tons corrected sucrose per acre ..	148.5	124.0	124.0	85.6	80.6	66.2	63.6

Experimental error of difference between varieties at 19 : 1 odds = 1.774 tons corrected sucrose per acre.
Percentage experimental error of difference between varieties at 19 : 1 odds = 21.25 %.
Value of significant difference between varieties per acre at 19 : 1 odds = £9 14s. 1d.

UMFOLOZI EXPERIMENT No. 2.—VARIETY TRIAL. FIRST RATOONS CROP.
Harvested as 14 months' old, 12th October, 1935.

	P.O.J.2725.	Co.290.	P.O.J.2878.	P.O.J.2727.	P.O.J.2714.	CH.64/21.	UBA.
Tons cane per acre	47.36	49.16	37.66	42.72	25.33	34.99	30.07
Increase or decrease tons cane per acre over Uba	17.29	19.09	7.59	12.65	—4.74	4.92	—
Percentage tons cane per acre compared with Uba	157.5	163.5	125.2	142.1	84.2	116.4	100.0
Tons pol (sucrose) per acre.. ..	7.32	7.26	5.63	5.95	3.64	4.61	4.01
Increase or decrease tons pol per acre compared with Uba ..	3.31	3.25	1.62	1.94	—0.37	0.60	—
Percentage tons pol per acre compared with Uba	182.5	181.0	140.4	148.4	90.8	115.0	100.0
Pol (sucrose) % cane	15.46	14.76	14.96	13.93	14.38	13.17	13.35
Fahey scale bonus or penalty ..	0.36	—	—	—	—	—	—
Corrected pol % cane	15.82	14.76	14.96	13.93	14.38	13.17	13.35
Corrected tons pol per acre.. ..	7.49	7.26	5.63	5.95	3.64	4.61	4.01
Increase or decrease corrected tons pol per acre over Uba	3.48	3.25	1.62	1.94	—0.37	0.60	—
Percentage corrected tons pol per acre compared with Uba ..	186.78	181.0	140.4	148.4	90.8	115.0	100.0

Experiment No. 2—Continued.

	P.O.J.2725.	Co.290.	P.O.J.2878.	P.O.J.2727.	P.O.J.2714.	CH.4/21.	UBA.
Purity of juice	90.8	87.7	89.0	87.6	88.2	86.9	86.9
Total value of sucrose per acre at £4.59689	£34 8 7	£33 7 5	£25 17 7	£27 7 0	£16 14 8	£21 3 10	£18 8 8
Value of sucrose gain over Uba ..	15 19 11	14 18 9	7 8 11	8 18 4	−1 14 0	2 15 2	—
Value of sucrose gain in plant crop	38 15 10	27 11 6	27 11 6	20 1 5	7 15 5	1 4 2	—
Total value of sucrose gain in 2 crops	54 15 9	42 10 3	35 0 5	28 19 9	6 1 5	3 19 4	—
General mean = 5.55.							
Percentage of general mean in tons corrected sucrose per acre ..	135.0	130.8	101.4	107.2	65.6	83.1	72.3

Experimental error of difference between varieties at 19 : 1 odds = 0.815 tons corrected sucrose per acre.
Percentage experimental error of difference between varieties at 19 : 1 odds = 14.68 %.
Value of significant difference between varieties at 19 : 1 odds = £3 14s. 11d.

The results of this experiment confirm the findings in experiment No. 1 in almost every case. There was no significant difference between P.O.J.2725, Co.290 and P.O.J.2878 in the plant cane crop. The first two were significantly better than the third in the first ratoons and the indications were that they are correctly placed in the above order. These three were all significantly better than the remaining four. P.O.J.2727 was significantly better than Uba, but P.O.J.2714 and CH64/21 were not.

The following two experiments, 7a and 7b were planted in December, 1933, alongside of each other on as even a piece of land as possible. The soil was a deep fairly heavy silt and the situation close to the river. 7a was to be irrigated and 7b left without irrigation. However, no irrigation was applied to either of them until the canes were 14 or 15 months old. Then 7a was irrigated three times before being allowed to dry off for harvesting. It will be seen from the following tables that the yield from 7a was only a very little more than that from 7b.

UMFOLOZI EXPERIMENT No. 7A.—VARIETY TRIAL. PLANT CANE CROP.
Harvested July, 1935, at 19 months' old.

	P.O.J. 2725.	Co. 290.	Co. 281.	P.O.J. 2878.	UBA.
Tons cane per acre	80.30	74.70	69.98	63.95	48.74
Increase tons cane per acre over Uba	31.56	25.96	21.24	15.21	—
Percentage tons cane per acre compared with Uba ..	164.8	153.3	143.6	131.3	100.0
Tons pol (sucrose) per acre	11.39	10.19	9.19	8.97	5.61
Increase tons pol per acre over Uba	5.78	4.58	3.58	3.36	—
Percentage tons pol per acre compared with Uba ..	203.0	181.6	163.8	159.9	100.0
Pol (sucrose) % cane	14.19	13.64	13.13	14.02	11.51
Fahey scale bonus or penalty	0.55	—	0.12	0.38	—
Corrected pol % cane	14.74	13.64	13.25	14.40	11.51
Tons corrected pol per acre	11.84	10.19	9.27	9.21	5.61
Increase tons corrected pol per acre over Uba ..	6.23	4.58	3.66	3.60	—
Percentage tons pol per acre compared with Uba ..	211.1	181.7	165.2	164.2	—
Fibre % cane	10.01	10.82	12.68	10.49	11.91
Juice : Brix	18.0	18.2	18.4	18.0	15.8
Pol (sucrose) % juice	16.66	16.09	16.55	16.42	13.74
Purity	92.5	88.5	89.6	90.9	86.8
Reducing sugar ratio	1.44	0.73	0.66	1.96	1.32
Phosphate (P_2O_5) content	27.5	27.3	28.3	26.2	30.0
Potash (K_2O) content	197.4	281.8	201.7	183.7	188.8
Chloride content—mgms. per 100 ml.	94.8	190.6	142.0	139.1	165.6
Total value of sucrose per acre at £4.59689	£54 8 6	£46 16 10	£42 12 3	£42 6 9	£25 15 9
Gain or loss over Uba	28 12 9	21 1 1	16 16 6	16 11 0	—
General mean = 9.239.					
Percentage of general mean in tons sucrose per acre..	182.2	110.3	100.3	99.7	60.7

Experimental error of difference between varieties at 19 : 1 odds = 1.183 tons corrected sucrose per acre.
Percentage experimental error of difference between varieties at 19 : 1 odds = 12.80 %.
Value of significant difference between varieties per acre = £5 8s. 9d.

UMFOLOZI EXPERIMENT No. 7B. — VARIETY TRIAL. PLANT CANE CROP.
Harvested 17th July, 1935, at 19 months' old.

	P.O.J. 2725.	Co. 290.	Co. 281.	P.O.J. 2878.	UBA.
Tons cane per acre	74.18	69.39	70.77	62.66	49.70
Increase tons cane per acre over Uba	24.48	19.69	21.07	12.96	—
Percentage tons cane per acre compared with Uba	149.3	139.6	142.4	126.1	100.0
Tons pol (sucrose) per acre	10.60	9.26	9.48	8.80	5.82
Increase tons pol per acre over Uba	4.78	3.44	3.66	2.98	—
Percentage tons pol per acre compared with Uba	182.1	159.1	162.9	151.2	100.0
Pol (sucrose) % cane	14.29	13.35	13.39	14.04	11.71
Fahey scale bonus or penalty	0.38	—	0.08	0.42	—
Corrected pol % cane	14.67	13.35	13.47	14.46	11.71
Tons corrected pol (sucrose)per acre	10.88	9.26	9.53	9.06	5.82
Increase tons pol per acre over Uba	5.06	3.44	3.71	3.24	—
Percentage tons pol per acre compared with Uba	186.9	159.1	163.7	155.7	100.0
Fibre % cane	9.80	11.40	13.45	10.77	11.80
Juice: Brix	18.5	18.4	18.6	18.4	16.4
Pol (sucrose) %	16.80	15.94	16.65	16.81	14.36
Purity	90.9	86.8	89.4	91.2	87.5
Reducing sugar ratio	1.15	0.81	0.61	0.76	1.24
Phosphate (P_2O_5) content—mgms. per 100 ml.	31.8	29.9	28.4	29.5	28.4
Potash (K_2O) content—mgms. per 100 ml.	191.0	212.3	239.4	185.2	249.4
Chloride content—mgms. per 100 ml.	114.8	242.3	117.5	121.0	220.1
Total value of sucrose per acre at £4.59789	£50 0 3	£42 11 4	£43 16 2	£41 12 10	£26 15 1
Gain or loss over Uba	23 5 2	15 16 3	17 1 1	14 17 9	—
Percentage of general mean in tons sucrose per acre	122.0	103.9	106.9	101.6	65.3

General mean = 8.916.

Experimental error of difference between varieties at 19 : 1 odds = 0.914 tons corrected sucrose per acre.
Percentage experimental error of difference between varieties at 19 : 1 odds = 10.25 %.
Value of significant difference between varieties per acre = £4 4s. 0d.

The yields from these two experiments which are duplicates of each other agree so closely that they can be best discussed together.

In both P.O.J.2725 was significantly better than Co.290, Co.281 and P.O.J.2878. There was no significant difference between these three, but they were all better than Uba.

Experiment No. 8 was planted at the same time as Nos. 7a and 7b. It was put on darker coloured soil about half way between the river and the main tramline. This situation appears to be typical of a larger area of the Umfolozi flats than the site nearer the river where experiments 7a and 7b are situated.

UMFOLOZI EXPERIMENT No. 8. — VARIETY TRIAL. PLANT CANE CROP.
Harvested 25th July, 1935, at 19 months' old.

	Co. 281.	P.O.J. 2725.	Co. 290.	P.O.J. 2878.	UBA.
Tons cane per acre	74.41	64.44	66.89	51.18	46.65
Increase tons cane per acre over Uba	27.76	17.79	20.24	4.53	—
Percentage tons cane per acre compared with Uba	159.5	138.1	143.4	109.7	100.0
Tons pol (sucrose) per acre	10.36	9.72	9.28	7.26	5.69
Increase tons pol per acre over Uba	4.67	4.03	3.59	1.57	—
Percentage tons pol per acre compared with Uba	182.1	170.8	163.1	127.6	100.0
Pol (sucrose) % cane	13.92	15.08	13.88	14.19	12.19
Fahey scale bonus or penalty	0.20	0.44	—	0.06	—
Corrected pol % cane	14.12	15.52	13.88	14.25	12.19

Experiment No. 8—Continued.

	Co. 281.	P.O.J.2725.	Co. 290.	P.O.J.2878.	UBA.
Tons corrected pol per acre	10.51	10.00	9.28	7.29	5.69
Increase tons pol per acre over Uba	4.82	4.28	3.59	1.65	—
Percentage tons pol per acre compared with Uba	184.7	175.7	163.1	128.1	100.0
Fibre % cane	12.12	9.89	10.21	10.04	11.47
Juice : Brix	19.3	18.8	18.8	18.5	17.5
Pol (sucrose) %	17.55	16.99	16.04	16.53	15.24
Purity	90.0	91.4	86.7	89.3	87.6
Reducing sugar ratio	0.55	0.72	1.20	0.69	1.54
Phosphate content—mgms. per 100 ml.	28.3	19.6	20.5	29.2	30.4
Potash content—mgms. per 100 ml.	215.5	272.2	217.8	250.3	217.4
Chloride content—mgms. per 100 ml.	207.1	71.1	142.0	85.2	205.9
Total value of sucrose per acre at £4.59689	£48 6 3	£45 19 4	£42 13 2	£33 10 3	£26 3 1
Value of increase over Uba	22 5 3	19 6 3	16 10 1	7 7 2	—
Percentage of general mean in tons sucrose per acre	122.8	116.8	108.4	85.2	66.5

General mean = 8.56.

Experimental error of difference between varieties at 19 : 1 odds = 0.820 tons corrected sucrose per acre.
Percentage experimental error of difference between varieties at 19 : 1 odds = 9.6 %.
Value of significant difference between varieties per acre = £3 15s. 6d.

The yields from the different varieties in this experiment compare fairly closely with the yields from the same varieties in experiments 7a and 7b.

The chief difference is that in this experiment the yield from Co.281 is better and that from P.O.J.2725 is worse than in Nos. 7a and 7b.

In this experiment Co.281 is not significantly better than P.O.J.2725, but is better than all the others. P.O.J.2725 is not significantly better than Co.290, but is better than P.O.J.2878 and Uba. P.O.J.2878 is significantly better than Uba.

GENERAL CONCLUSIONS REGARDING SUITABILITY OF VARIETIES FOR UMFOLOZI FLATS.

Comparing the general behavious of the varieties tested in these experiments it can be seen that P.O.J.2725 was best in all cases except in experiment No. 8, where it gave a smaller yield than Co.281. In experiment Nos. 1 and 2 P.O.J.2725 was well ahead of Co.290 in the crops harvested in 1934, but there was only a small difference between them in 1935. Therefore although it can be said that P.O.J.2725 has done best so far it may be wise to wait for further ratoon results before deciding that it is likely to retain that position.

The difference between Co.290 and Co.281 in the three experiments where they were compared was too small to be of any indication of which is best.

P.O.J.2878 comes fourth. It is clearly not so good as the three varieties already mentioned but is significantly better than all the others. The difference between Uba and the best variety P.O.J.2725 was striking. P.O.J.2725 averaged 10.4 tons of sucrose per acre over 38 plots harvested in 1934 and 1935, while 38 plots of Uba treated in all respects in the same way yielded 5.1 tons of sucrose per acre, giving a ratio of 204 to 100 in favour of P.O.J.2725.

It was observed that P.O.J.2878 and Co.290 had a good many stools uprooted by the wind, whilst P.O.J.2725 and Co.281 did not suffer any noticeable damage from wind.

FERTILISER EXPERIMENTS.

The following tables give the yields from three fertiliser experiments harvested as plant cane in 1934, and as first ratoons in 1935.

Experiments Nos. 3 and 4 are on heavy silt fairly near the river, and No. 5 is on dark coloured soil further away from the river.

Experiment No. 3 was planted with P.O.J.2714 cane, experiment No. 4 with P.O.J.2725, and experiment No. 5 with Co.290. These experiments again give a rough comparison of the three varieties and further confirm the results of the variety trials.

UMFOLOZI EXPERIMENT No. 3. — SUPERPHOSPHATE TRIAL, P.O.J. 2714 CANE.

Harvested as 21 months' old Plant Cane, August, 1934.

	Controls.	N.K.	300lbs. Super N.K.	600lbs. Super N.K.	900lbs. Super N.K.	1,200lbs. Super N.K.
Tons cane per acre	57.68	66.60	59.70	65.21	60.58	58.97
Increase or decrease over controls	—	8.92	2.02	7.53	2.90	1.29
Percentage increase over controls	100.00	115.50	103.50	113.00	105.00	102.20
Tons pol (sucrose) per acre	6.92	8.05	7.19	7.78	7.34	6.96
Increase over controls	—	1.13	0.27	0.86	0.42	0.04
Percentage increase over controls	100.00	116.30	103.90	112.40	106.00	100.60
Pol (sucrose) % cane	12.00	12.08	12.05	11.92	12.11	11.81
Fahey scale bonus or penalty for purity	—	—	—	—	—	—
Corrected pol (sucrose) % cane	12.00	12.08	12.05	11.92	12.11	11.81
Tons corrected pol (sucrose) per acre	6.92	8.05	7.19	7.78	7.34	6.96
Increase over controls	—	1.13	0.27	0.86	0.42	0.04
Percentage increase over controls	100.00	116.30	103.90	112.40	106.00	100.60
Juice: Pol (sucrose) %	—	—	—	—	—	—
Brix	—	—	—	—	—	—
Purity	87.1	86.6	86.7	87.2	86.4	85.7
Fibre % cane	11.31	10.83	11.06	10.96	11.38	10.94
Value (total) sucrose per acre at £5,470729 per ton	£37 17 1	£44 0 9	£39 6 8	£42 11 3	£40 3 1	£38 1 6
Value of increase over controls	—	6 3 8	1 9 7	4 14 2	2 6 0	0 4 5
Cost of fertilizer treatment	—	1 2 0	1 11 9	2 1 6	2 11 3	3 1 0
Nett gain or loss over controls	—	+5 1 8	−0 2 2	+2 12 8	−0 5 3	−2 16 7

UMFOLOZI EXPERIMENT No. 3. — PHOSPHATE TRIAL, P.O.J. 2714 CANE.

Harvested as 14 months' old First Ratoons, 8th October, 1935.

	Controls.	N.K.	300lbs. Super N.K.	600lbs. Super N.K.	900lbs. Super N.K.	1,200lbs. Super N.K.
Tons cane per acre	28.68	29.34	25.41	31.73	26.07	24.65
Increase or decrease over controls	—	0.66	−3.27	3.05	−2.61	−4.03
Percentage increase or decrease over controls	100.00	102.30	88.60	110.60	90.90	85.90
Tons pol (sucrose) per acre	4.10	4.22	3.61	4.78	3.78	3.48
Increase or decrease over controls	—	0.12	−0.49	0.68	−0.32	−0.62
Percentage increase or decrease over controls	100.00	102.90	88.00	116.60	92.20	84.90
Pol (sucrose) % cane	14.29	14.40	14.21	15.06	14.49	14.13
Fahey scale bonus or penalty for purity	0.20	0.24	0.14	0.43	0.04	—
Corrected pol (sucrose) % cane	14.49	14.64	14.35	15.49	14.53	14.13
Tons corrected pol (sucrose) per acre	4.16	4.30	3.65	4.91	3.79	3.48
Increase or decrease over controls	—	0.14	−0.51	0.75	−0.37	−0.68
Percentage increase or decrease over controls	100.00	103.40	87.70	118.00	91.10	83.70
Juice: Brix	19.20	19.12	19.09	19.64	19.55	19.39
Pol (sucrose) %	17.23	17.17	17.10	17.87	17.49	17.21
Purity	90.0	90.2	89.7	91.3	89.2	88.5

Experiment No. 3—Continued.

	Controls.	N.K.	300lbs. Super N.K.	600lbs. Super N.K.	900lbs. Super N.K.	1,200lbs. Super N.K.
Phosphate content—mgms. per 100 ml.	16.4	19.6	21.6	16.8	15.2	23.6
Potash content—mgms. per 100 ml. ..	140.3	149.4	149.4	125.3	140.3	147.7
Chlorides—mgms. per 100 ml.	92.3	81.7	71.0	88.8	74.6	74.6
Fibre % cane	11.19	12.03	11.44	10.82	11.34	11.41
Value (total) of sucrose per acre at £4.59689 per ton .. .. ..£	19 2 5	19 15 4	16 15 7	22 11 5	17 8 5	16 0 0
Value of increase or decrease over controls—this crop	—	0 12 11	−2 6 10	3 9 0	−1 14 0	−3 2 5
Value of increase or decrease over Plant Cane crop	—	5 1 8	−0 2 2	2 12 8	−0 5 3	−2 16 7
Nett gain or loss over two crops ..	—	+5 14 7	−2 9 0	+6 1 8	−1 19 3	−5 19 0

General mean = 3.98 tons corrected sucrose per acre.

Percentage of general mean on corrected sucrose per acre	105.3	108.0	89.4	123.4	95.2	87.4

Standard error of difference between treatments at 19 : 1 odds = 0.987 tons corrected sucrose per acre.
Percentage standard error of difference between treatments at 19 : 1 odds = 24.8 %.
Value of significant difference between treatments at 19 : 1 odds = £4. 10s. 9d.

UMFOLOZI EXPERIMENT No. 4.—NITROGEN TRIAL. P.O.J. 2725 CANE.
Harvested as 21 months' old Plant Cane, August, 1934.

	Controls.	600lbs. Super.	600lbs. Super. and 75lbs. Pot. Chloride.	150lbs. Amm. Sulph., 600lbs. Super. and 75lbs. Pot. Chloride.	300lbs. Amm. Sulph., 600lbs. Super. and 75lbs. Pot. Chloride.	200lbs. Nit. of Soda (top dressed), 600lbs. Super. and 75lbs. Pot. Chloride.
Tons cane per acre	100.37	99.50	102.50	100.00	93.55	98.76
Increase or decrease over controls	—	−0.87	2.13	−0.37	−6.82	−1.61
Percentage increase or decrease over controls	100.00	99.10	102.10	99.60	93.20	98.40
Tons pol (sucrose) per acre ..	12.09	12.39	12.13	12.42	11.67	11.90
Increase or decrease over controls	—	0.30	0.04	0.33	−0.42	−0.19
Percentage increase or decrease over controls	100.00	102.50	100.30	102.70	96.50	98.40
Pol (sucrose) % cane	12.06	12.45	11.83	12.42	12.47	12.05
Fahey scale bonus or penalty for purity	—	0.14	—	—	0.12	—
Corrected pol (sucrose) % cane..	12.06	12.59	11.83	12.42	12.59	12.05
Tons corrected pol (sucrose) per acre	12.09	12.53	12.13	12.42	11.78	11.90
Increase or decrease over controls	—	0.44	0.04	0.33	−0.31	−0.19
Percentage increase or decrease over controls	100.00	103.60	100.30	102.70	97.40	98.40
Juice : Purity	87.8	89.7	86.8	87.3	89.6	87.2
Fibre % cane	10.97	11.78	11.90	10.98	11.34	11.06
Value (total) of sucrose per acre at £5.470729 per ton.. ..£	66 2 10	68 11 0	64 14 4	67 18 11	64 8 11	65 2 0
Value of increase or decrease over controls	—	2 8 2	−1 8 6	1 16 1	−1 13 11	−1 0 10
Cost of fertilizer treatment ..	—	0 19 6	1 8 9	2 1 6	2 13 4	2 2 10
Nett gain or loss over controls ..	—	+1 8 8	−0 0 3	−0 5 5	−4 7 3	−3 3 8

UMFOLOZI EXPERIMENT No. 4. — NITROGEN TRIAL. P.O.J. 2725 CANE.

Harvested as 14 months' old First Ratoons, 16th/28th October, 1935.

	Controls.	600lbs. Super.	600lbs. Super. and 75lbs. Pot. Chloride.	150lbs. Amm. Sulph., 600lbs. Super. and 75lbs. Pot. Chloride.	300lbs. Amm. Sulph., 600lbs. Super. and 75lbs. Pot. Chloride.	200lbs. Nit. of Soda (top dressed), 600lbs. Super. and 75lbs. Pot. Chloride.
Tons cane per acre	52.64	55.45	54.26	55.39	50.16	54.39
Increase or decrease over controls	—	2.81	1.62	2.75	—2.48	1.75
Percentage increase or decrease over controls	100.00	105.30	103.10	105.20	95.30	103.30
Tons pol (sucrose) per acre ..	7.85	8.10	8.29	8.33	7.68	8.13
Increase or decrease over controls	—	0.25	0.44	0.48	—0.17	0.28
Percentage increase or decrease over controls	100.00	103.20	105.60	106.10	97.80	103.60
Pol (sucrose) % cane	14.92	14.61	15.28	15.03	15.32	14.95
Fahey scale bonus or penalty for purity	0.06	0.10	0.18	0.06	—	0.04
Corrected pol (sucrose) % cane..	14.98	14.71	15.46	15.09	15.32	14.99
Tons corrected pol (sucrose) per acre	7.89	8.16	8.39	8.37	7.68	8.15
Increase or decrease over controls	—	0.27	0.50	0.48	—0.2	0.26
Percentage increase or decrease. over controls	100.00	103.40	106.30	106.10	97.30	103.30
Juice : Purity	89.3	89.5	89.9	89.3	88.8	89.2
Phosphate content—mgms. per 100 ml...	35.2	28.0	23.0	21.6	24.8	23.6
Potash content—mgms. per 100 ml.	217.5	228.3	204.2	130.3	252.3	150.2
Chlorides—mgms. per 100 ml. ..	298.2	188.2	174.0	127.8	120.7	174.0
Fibre % cane	10.43	11.04	10.35	9.82	10.63	9.84
Value (total) of sucrose per acre £4.59689 per ton	£36 5 4	£37 10 2	£38 11 4	£38 9 6	£35 6 1	£37 9 3
Value of increase or decrease over controls—this crop	—	1 4 10	2 6 0	2 4 2	—0 19 3	1 3 11
Value of increase or decrease, Plant Cane crop	—	1 8 8	—0 0 3	—0 5 5	—4 7 3	—3 3 8
Nett gain or loss over two crops..	—	+2 13 6	+2 5 9	+1 18 9	—5 6 6	—1 19 9
General mean = 8.13 tons corrected sucrose per acre.						
Percentage of general mean on corrected sucrose per acre ..	97.0	100.4	103.2	103.0	94.5	100.2

Standard error of difference between treatments at 19 : 1 odds = 0.728 tons corrected sucrose per acre.
Percentage standard error of difference between treatments at 19 : 1 odds = 8.95 %.
Value of significant difference between treatments at 19 : 1 odds = £3 6s. 11d.

UMFOLOZI EXPERIMENT No. 5. — CONCENTRATED CANE FERTILIZER TRIAL.
Co. 290 Cane, Harvested as 18 months' Plant, August, 1934.

	400lbs. C. C. F.	520lbs. Super, 80lbs. Pot. Chloride, and 120lbs. Amm. Sulph.	520lbs. Super, 80lbs. Pot. Chloride, and 120lbs. Amm. Sulph. (top dressed).	520lbs. Super, and 80lbs. Pot. Chloride, 120lbs. Amm. Sulph. (top dressed).	Controls. No fertilizer.
Tons cane per acre	35.85	41.59	39.52	44.54	43.00
Increase or decrease over controls	−7.15	−1.41	−3.48	1.54	—
Percentage increase or decrease over controls	83.4	96.7	91.9	103.6	100.0
Tons pol (sucrose) per acre	4.82	5.63	5.31	5.85	5.71
Increase or decrease over controls	−0.89	−0.08	−0.40	0.14	—
Percentage increase or decrease over controls	84.4	98.6	93.0	102.5	100.0
Pol (sucrose) % cane	13.43	13.54	13.43	13.14	13.27
Fahey scale bonus or penalty for purity	—	—	—	—	—
Corrected pol (sucrose) % cane	13.43	13.54	13.43	13.14	13.27
Tons corrected pol (sucrose) per acre	4.82	5.63	5.31	5.85	5.71
Increase or decrease over controls	−0.89	−0.08	−0.40	0.14	—
Percentage increase or decrease over controls	84.4	98.6	93.0	102.5	100.0
Juice: Purity	87.71	88.67	88.91	87.88	—
Value (total) of sucrose per acre at £5.470729 per ton	£26 7 5	£30 16 0	£29 1 0	£32 0 1	£31 4 9
Value of increase or decrease over controls	−4 17 4	−0 8 9	−2 3 9	0 15 4	—
Cost of fertilizer treatment	4 2 0	1 17 1	1 17 1	1 17 1	—
Nett gain or loss over controls	−8 19 4	−2 5 10	−4 0 10	−1 1 9	—

UMFOLOZI EXPERIMENT No. 5. — CONCENTRATED CANE FERTILIZER TRIAL.

Co. 290 Cane, Harvested as 14 months' First Ratoons, 24th October, 1935.

	400lbs. C. C. F.	520lbs. Super, 80lbs. Pot. Ch.oride,and 120lbs. Amm. Sulph.	520lbs. Super, 80lbs. Pot. Chlori e, and 120lbs. Amm. Sulph. (top dressed).	520lbs. Super, and 80lbs. Pot. Chloride, 120lbs. Amm. Sulph. (top dressed).	Controls. No fertilizer.
Tons cane per acre	50.20	48.71	45.92	48.85	46.51
Increase or decrease over controls	3.69	2.20	—0.59	2.34	—
Percentage increase or decrease over controls	107.9	104.7	98.7	105.0	100.0
Tons pol (sucrose) per acre	7.22	6.90	6.59	7.17	6.71
Increase or decrease over controls	0.51	0.19	—0.12	0.46	—
Percentage increase or decrease over controls	107.6	102.8	98.2	106.9	100.0
Pol (sucrose) % cane	14.39	14.17	14.35	14.68	14.42
Fahey scale bonus or penalty for purity	—	—	—	—	—
Corrected pol (sucrose) % cane	14.39	14.17	14.35	14.68	14.42
Tons corrected pol (sucrose) per acre	7.22	6.90	6.59	7.17	6.71
Increase or decrease over controls	0.51	0.19	—0.12	0.46	—
Percentage increase or decrease over controls	107.6	102.8	98.2	106.9	100.0
Juice: Brix	20.20	19.90	20.23	20.50	20.33
Pol (sucrose) %	17.72	17.56	17.77	18.14	18.04
Purity	87.8	87.8	87.9	88.5	88.7
Phosphate content—mgms. per 100 ml.	13.6	20.8	20.0	17.6	21.2
Potash content—mgms. per 100 ml.	161.0	264.8	342.0	259.8	276.4
Chlorides—mgms. per 100 ml.	429.6	383.4	280.5	308.9	394.1
Fibre % cane	11.69	11.49	12.00	11.93	12.43
Value (total) of sucrose per acre at £4.59689 per ton	£33 3 9	£31 14 4	£30 5 10	£32 19 2	£30 16 11
Value or increase or decrease over controls	2 6 10	0 17 5	—0 11 1	2 2 3	—
Gain or loss—Plant cane crop	—8 19 4	—2 5 10	—4 0 10	—1 1 9	—
Total gain or loss over controls—two crops	—6 12 6	—£1 8 5	—£4 9 9	+£1 0 6	—
General mean = 6.964 tons sucrose per acre.					
Percentage of general mean on corrected sucrose per acre	103.7	99.1	94.6	103.0	96.3

Standard error of difference between treatments at 19 : 1 odds = 0.680 tons corrected sucrose per acre.
Percentage standard error of difference between treatments at 19 : 1 odds = 9.764 %.
Value of significant difference between treatments at 19 : 1 odds = £3 2s. 6d.

These experiments with fertilisers gave very contradictory results as can be seen from the figures above. In some cases there were small increases over the control plots without fertiliser, in other cases the controls gave higher yields than the fertilised plots. In no case was there any significant difference.

It is only possible to say that these experiments have failed to show that the application of fertilisers is beneficial. It is found in practically every sugar country that some form of fertiliser gives returns so it seems highly necessary that further experiments should be carried out.

The fertiliser for these experiments was all applied to the plant cane crop and it is intended to take a second ratoon without any top dressing to see whether there is a possibility of a delayed result. After that it is possible the ratoons will be top dressed to test the effect of fertiliser on ratoons.

All these experiments at Umfolozi have been trashed when harvested as this has been the practice with all the experiments carried out under the supervision of the Experiment Station. Although the results of the first ratoons have been very satisfactory it has been suggested that it might be advisable to burn the cane before harvesting. The reasons given in favour of this course are:—

(1) It would prevent the young ratoons being smothered by the heavy volume of trash left by the heavy crops harvested on the flats.
(2) The removal of the trash by burning would allow the middles between the young ratoons to be cultivated. When the trash is left on the ground, no cultivation is possible because owing to the large volume of trash it has to be left in every middle between the rows of cane.
(3) Burnt cane is cheaper to harvest than unburnt cane.

Against the last advantage of burning there is the extra cost of cultivation and weeding where cane has been burnt.

It is hoped it may be possible to carry out at Umfolozi an experiment to test the relative advantages of burning versus trashing of cane.

The writer desires to thank the Umfolozi Co-operative Sugar Planters, Ltd., for help in connection with the transport and testing of the cane, Mr. E. Stanley Murphy for taking good care of the plots, and various members of the Experiment Station Staff for assistance in the work connected with these experiments.

Experiment Station,
South African Sugar Association,
Mount Edgecombe, Natal,
February, 1936.

Mr. FOWLIE read his paper. At the beginning of the first table he said: This experiment was described in my last year's paper, and I have not thought it necessary to say anything describing its laying down or anything like that. But I want to mention that this first table refers to the first ratoon crop. The plant cane crop from Experiment No. 1 was cut very young for planting, and the results were not taken from an experimental point of view, so that this is really the beginning of the experiment so far as it is recorded. Many values given in these tables are the values under the Fahey Conference Agreement, not the values as they would appear at the Umfolozi Mill. I think perhaps it is wise to mention that, because some people might jump to the conclusion that these are Umfolozi values.

The CHAIRMAN: Mr. Fowlie, in preparing this paper, which really constitutes a report on three fertilizer experiments and five variety trials in the Umfolozi district, has undoubtedly contributed a bit of very useful information on these two subjects, which, although the trials were conducted at Umfolozi, is no doubt going to be very useful to the agricultural side of the Industry in general. Perhaps, in opening the paper for discussion, it would be as well to take the variety trials and the fertiliser trials as two separate portions and discuss them separately.

There is one point that I would like to put forward and so perhaps start a discussion in connection with the variety trials. These trials have now run to first and second ratoon, and I would like to ask what provision has been made to eliminate any shortage of plant food from being a factor in the differential yields of the varieties. My point there is that an experiment which is designed to obtain the differential cropping capabilities of one variety against another, or a series of varieties. should not be interfered with by any other possible variable, such as irrigation. fertilizer and the like.

Mr. LINTNER: I would like to ask Mr. Fowlie whether a soil analysis has been carried out, because actually in the paper very little indication is given if there is any visible difference in the soil types.

Mr. FOWLIE: In my last year's paper there were three analyses of soil from the Umfolozi Flats, and I have got them here. If anybody would like to see them they can come and have a look at them, but I don't think it is going to suit the whole of the audience to read them out.

Mr. DODDS: Arising out of the relative superiority of the new varieties compared with Uba, I think it was probably stated in the first paper, but it is not expressly said in this that in some cases the growers of Uba were penalised through low sucrose and purity, according to the Fahey Conference Agreement, and that therefore there is an extra advantage to the new varieties on that account. That advantage will perhaps not be so great in the future as it would have been in the past, but there would still be a considerable advantage in favour of any cane capable of giving juice of a relatively high purity, since cane will probably be paid for in the future on recoverable sugar. That is a point, I think, that should be borne in mind in considering the relative merits of the varieties here and in other areas.

Mr. COIGNET: The value of this experiment is lessened to some extent because of the local conditions involved, such as on the Umfolozi Flats, which are moreover less favourable to the soft P.O.J. canes as against Uba and Co. 290, which thrive better on hillsides in sub-tropical climates than in places where the climate is more or less tropical. I fear that these experiments were marred by the climatic conditions involved.

Mr. FOWLIE: I would like to point out to our friend that these experiments were carried out at Umfolozi chiefly for Umfolozi, of course with the idea also of people in other parts of the country getting any benefit from them they can. But essentially, they are being carried out with the idea of

benefitting people under similar conditions. And so far as the varieties having a fair chance is concerned, we endeavour, in every way, to give them equal chances. If you take the results from Uba, you cannot say that Uba gave poor crops when it gave anything between 40 and nearly 60 tons per acre and yet, with these reasonably good crops, as we have always considered them, we find that the other varieties, especially 2725 and the Co. canes gave a very great deal more.

With regard to Mr. Dodds' reference to the penalties, if you look at the various experiments, you will find that the sucrose per cent. cane is given, first as pol (sucrose) per cent. cane, and then the Fahey bonus or penalty and the corrected pol. Then we get the corrected tons sucrose per acre underneath that, and higher up we have the tons of sucrose before the correction is made. If you take the uncorrected figures, which would be more in keeping with other sugar countries, it doesn't really alter the relative positions of the different canes by more than a few per cent.

CHAIRMAN: Any further questions or discussion? If not, I think we had better pass on to the next paper. Mr. Fowlie has given us a very interesting paper, and I would ask you to show your appreciation of it in the usual manner.