

THE REPLACEMENT OF UBA BY NEW VARIETY CANES FROM 1936 TO 1944

By G. S. MOBERLY.

Up to and including the year 1932 all the cane crushed in our factories, with very few exceptions, was Uba. During the three following years small but increasing quantities of Co.290 and various P.O.J. varieties were crushed, together with an insignificant quantity of CH.64/21. Unfortunately no proper record was kept of these varieties. In many cases, they were lumped together under such general headings as "New Canes" or "Soft Canes." From the 1936 season onwards careful distinction was made between the varieties in all the records of the Central Board's Cane Testing Service, with the exception that all the Java varieties were grouped together under the general heading of P.O.J. These consisted originally of P.O.J.2714, P.O.J. 2725, P.O.J.2727 and P.O.J.2878. To-day almost all the cane listed as P.O.J. is P.O.J.2725.

The records relate only to those factories at which a Cane Testing Service is operated by the Central Board, viz:—

Empangeni	Gledhow
Entumeni	Melville
Felixton	Chaka's Kraal
Amatikulu	Illovo
Darnall	Esperanza,
New Guelderland	Sezela
Doornkop	

Though incomplete, this group of factories represents a very good cross-section of the industry, including as it does factories of all sizes and in all of the principal cane-growing areas. During the period under review the above factories dealt with 59.4 per cent. of the total cane crushed. The only respect in which the sample is not well representative is in regard to P.O.J. canes, since Umfolozi, which is not represented in these figures, crushes a far larger proportion of these canes than does any other factory.

SPREAD OF NEW VARIETIES.

The year 1936, when our records start, marks the first appearance of Co.281 cane which has since expanded steadily until it now represents over 70 per cent. of all cane crushed.

Co.290, which constituted nearly one quarter of the crop in 1936, continues to increase until 1938, when it represented nearly 38 per cent. Since then it has decreased steadily until it represented only 7.33 per cent. of the crop in 1944.

Co.301 made its first appearance in 1937 and has since expanded slowly and steadily to a figure of 16.90 per cent. in 1944.

Co.331 made its first appearance in 1943 and was still represented by only a very few tons in 1944.

P.O.J. canes were 9.40 per cent. in 1936. Since then they have fallen off until they represented only 1.88 per cent. in 1944.

Uba as a consequence of this replacement has declined throughout these years from 63.85 per cent. in 1936 to 3.13 per cent. in 1944. The biggest decrease was from 1937 to 1938 when it fell from 53.43 per cent. to 28.54 per cent. Of the remaining Uba cane a large proportion is delivered by Indian and Native growers.

These figures are given in full in the table below, and are represented graphically in Fig. 1:—

TABLE I.—DISTRIBUTION OF VARIETIES.

Year.	Uba.	Co.281	Co.290	Co.301	Co.331	P.O.J.	Total Cane in Tons.
1936	63.85	2.40	24.35	—	—	9.40	2,447,644
1937	53.43	12.44	27.91	0.01	—	6.21	2,788,399
1938	28.54	24.30	37.89	0.39	—	8.88	2,836,936
1939	27.44	30.61	32.78	2.68	—	14.49	3,380,809
1940	21.66	40.53	29.96	3.00	—	4.85	3,525,440
1941	15.04	44.85	28.64	6.05	—	5.42	2,378,562
1942	10.60	55.05	20.18	10.13	—	4.04	2,860,212
1943	5.68	67.18	11.76	13.29	trace	2.09	3,290,124
1944	3.13	70.66	7.33	16.90	0.10	1.88	3,364,729

SUCROSE PER CENT. CANE.

The average percentage of sucrose in each variety of cane each year is shown in the following table and is represented graphically in Fig. 2:—

TABLE II.—SUCROSE PER CENT. CANE.

Year.	Uba.	Co.281	Co.290	Co.301	Co.331	P.O.J.
1936	12.75	13.27	13.57	—	—	14.74
1937	13.35	14.42	14.20	13.16	—	15.22
1938	12.92	14.26	13.86	13.48	—	15.05
1939	12.73	13.71	13.41	13.46	—	14.49
1940	12.37	13.55	13.01	13.10	—	13.87
1941	13.63	14.30	13.99	14.12	—	14.76
1942	13.01	13.66	13.24	13.41	—	13.96
1943	12.49	13.34	12.78	13.15	—	13.63
1944	12.69	13.70	13.38	13.70	13.27	13.89

It will be noted that all varieties follow the same trend of the annual variation in sucrose, the slight discrepancies of the early years of Co.281 and Co.301 being due to the very small quantities of cane then represented.

P.O.J. appears as outstandingly the richest canes, followed by Co.281, Co.301 and Co.290 in that order, Uba being outstandingly the lowest. It must be borne in mind that throughout the years Uba is represented by an increasingly larger proportion of later ratoons, but from the fact that it so closely follows the year-to-year trend of other varieties it would not appear that its standard of sucrose content has fallen off at all from this cause.

P.O.J. does show a marked falling off in comparison with the year-to-year trend. Possibly this is due to the fact that when first released it was planted fairly widely in all localities including high and drier areas where it attained a high sucrose but a comparatively poor growth. It has since been largely abandoned in those areas and retained only in lower alluvial areas where the growth is heavier but the sucrose content not so good. Possibly also the later ratoons during the period of abandonment may have shown a tendency to decrease in sucrose.

Ignoring its earlier years when there was very little of it, Co.301 has shown a tendency to improve somewhat. In 1944 it equalled Co.281.

Under the terms of the 1936 Agreement these percentages of sucrose are calculated by giving to P.O.J. and Co.290 Java Ratios 4.0 and 2.0 higher than those given to other varieties. How accurate this differentiation is, it is hard to say, but it may partly account for the very high ranking of P.O.J. Had no differentiation been made the percentages of sucrose would have been approximately as given in the following table (shown graphically in Fig. 3.):—

TABLE III.

Year.	Uba.	Co.281	Co.290	Co.301	Co.331	P.O.J.
1936	12.91	13.42	13.38	—	—	14.18
1937	13.48	14.58	13.99	13.31	—	14.63
1938	13.10	14.46	13.71	13.68	—	14.53
1939	12.88	13.87	13.23	13.61	—	13.95
1940	12.51	13.68	12.81	13.23	—	13.32
1941	13.76	14.44	13.77	14.26	—	14.18
1942	13.10	13.76	13.00	13.50	—	13.37
1943	12.52	13.39	12.51	13.20	—	13.01
1944	12.73	13.74	13.08	13.74	13.31	13.25

Under these conditions Co.281 appears as outstandingly the richest cane, followed in the later years by Co.301 and P.O.J. in that order, with Co.290 and Uba alternating for the lowest place. Of course there is no reason to assume that these figures must be more accurate than those of Table II. Possibly the truth lies somewhere between the two extremes. In any case Fig. 3 gives a true reflection of the variations in sucrose per cent. crusher juice.

SEASONAL TREND OF SUCROSE.

Calculations have been made of the average percentage of sucrose for each variety for each month of the season. The figures from which these averages are compiled date only from 1937 and do not, as in the case of the other tables, include 1936.

TABLE IV.—SEASONAL TREND OF SUCROSE.

Month.	Uba.	Co.281	Co.290	Co.301	P.O.J.
May	11.49	12.47	12.17	12.65	12.76
June	12.27	12.97	12.85	12.86	13.62
July	13.05	13.58	13.52	13.46	14.15
August	13.77	14.16	14.05	13.92	14.65
September	14.19	14.40	14.30	14.02	15.00
October	13.89	14.23	14.15	13.82	14.98
November	13.38	13.84	13.71	13.27	14.86
December	12.26	13.17	12.84	12.90	14.20
January	11.38	12.77	12.10	12.64	13.52

The above figures are represented graphically in Fig. 4. All varieties appear to have a peak in September, though the peak for P.O.J. is not very clearly marked. Actually the peak for this variety occurs more often in October than in September, and in one year it was in November. This variety falls off much less rapidly in the second half of the season than any other variety. The peak for Co.301 is rather flat and actually it is liable to occur in August, September or October. Apart from these facts all varieties appear to mature about the same time.

It should be remembered that these figures are averages of years in which the different varieties are not equally represented for every month, and might be somewhat in error for this reason. However, graphs have been prepared, though they are not reproduced here, which give the weekly sucrose levels for each variety for every year. These confirm the general observations based on Fig. 4, and show that the peaks usually occur all in the same week, being more governed by fluctuations in rainfall than by the maturity of the cane.

PURITY.

The following table gives the average purity of crusher juice from each variety. The averages are arithmetic only and their accuracy cannot be guaranteed, but they are given for what they may be worth. They are shown graphically in Fig. 5. —

TABLE V.—PURITY OF CRUSHER JUICE.

Year.	Uba.	Co.281	Co.290	Co.301	Co.331	P.O.J.
1936	87.1	89.7	88.5	—	—	90.0
1937	88.0	90.0	89.1	—	—	90.5
1938	87.1	89.5	88.2	88.2	—	89.7
1939	87.5	89.7	88.3	88.5	—	89.6
1940	85.4	88.6	86.8	87.6	—	88.0
1941	86.4	89.0	87.9	88.2	—	88.8
1942	87.2	89.3	88.1	88.2	—	88.8
1943	87.2	89.4	87.5	88.5	85.7	88.4
1944	86.6	89.1	87.9	88.6	88.4	88.5

It is usually found that the trend of crusher juice purity follows very closely on the trend of sucrose per cent. cane. A comparison of Fig. 4 with Figs. 2 and 3 will show that this is the case, with the very marked exception that 1942 and 1943 were seasons of rapidly falling sucrose, but the purity during these years remained steady or rose slowly. It is also noticeable that the relative position of the P.O.J. curves in Fig. 5 agrees much more closely with Fig. 3 than with Fig. 2. The same is

true of Co.290 though not quite to the same extent. This would appear to be evidence against the use of the differential Java Ratio, but not conclusive evidence.

FIBRE PER CENT. CANE.

Unfortunately no figures are available for the fibre content of separate varieties. A study of the average fibre per cent. cane for the combined factories for each year shows that apart from year-to-year fluctuations, there has been a progressive rise in fibre during the period under review, despite the gradual replacement of the hard Uba cane. This gives rise to the suspicion that Co.281 may be an even harder cane than Uba when measured in terms of fibre per cent. cane. To test this theory I have arbitrarily assigned the following not improbable fibre percentages: Uba 15.5; Co.290 14.0; Co.301 14.5; P.O.J. 12.0; and to Co.281 the very high figure of 16.5. In conjunction with the known percentages of the varieties the figures in the following table are obtained:—

TABLE VI.—FIBRE PER CENT. CANE.

Year.	Fibre per cent. Cane.	Calculated Equivalent.
1936	15.06	14.92
1937	14.90	15.05
1938	14.43	14.95
1939	14.99	15.13
1940	15.64	15.29
1941	15.70	15.32
1942	15.38	15.55
1943	15.33	15.81
1944	15.95	15.88

It is true that this assumption of a very high fibre content for Co.281 is in contradiction to all evidence of tests carried out on field samples at the Experiment Station. Nevertheless the resultant curve (dotted line in Fig. 6) follows roughly the general trend of fibre increase, through the years, though it is presumably overlaid with sharp seasonal fluctuations due to climatic conditions. If this is not the cause of the fibre increase then there must be some progressive change taking place in the cane crop as a whole giving rise to general unexplained hardening. It may be added that the fibre percentages arbitrarily allotted to Co.290, Co.301 and P.O.J. do not greatly affect the shape of this dotted line, the factors mainly determining it being the replacement of Uba by Co.281, and their relative fibre percentage.

It is interesting to note the following comparisons:—

TABLE VII.—GENERAL COMPARISONS.

Year.	Fibre Per cent. Cane	Extraction	Purity Mixed Juice	BH Recovery	Overall Recovery
1936	15.01	91.08	85.43	87.44	79.64
1937	15.14	91.53	85.60	87.85	80.41
1938	14.51	91.90	86.36	88.48	81.31
1939	14.80	92.24	86.46	88.88	81.98
1940	15.56	91.91	85.34	87.98	80.86
1941	15.66	92.37	85.67	88.40	81.66
1942	15.24	92.69	85.96	88.98	82.48
1943	15.26	92.97	86.56	89.84	83.52
1944	15.83	93.13	86.19	89.27	83.14

The above figures are for all factories reporting to the Experiment Station, and not for the smaller group of factories considered elsewhere in this paper.

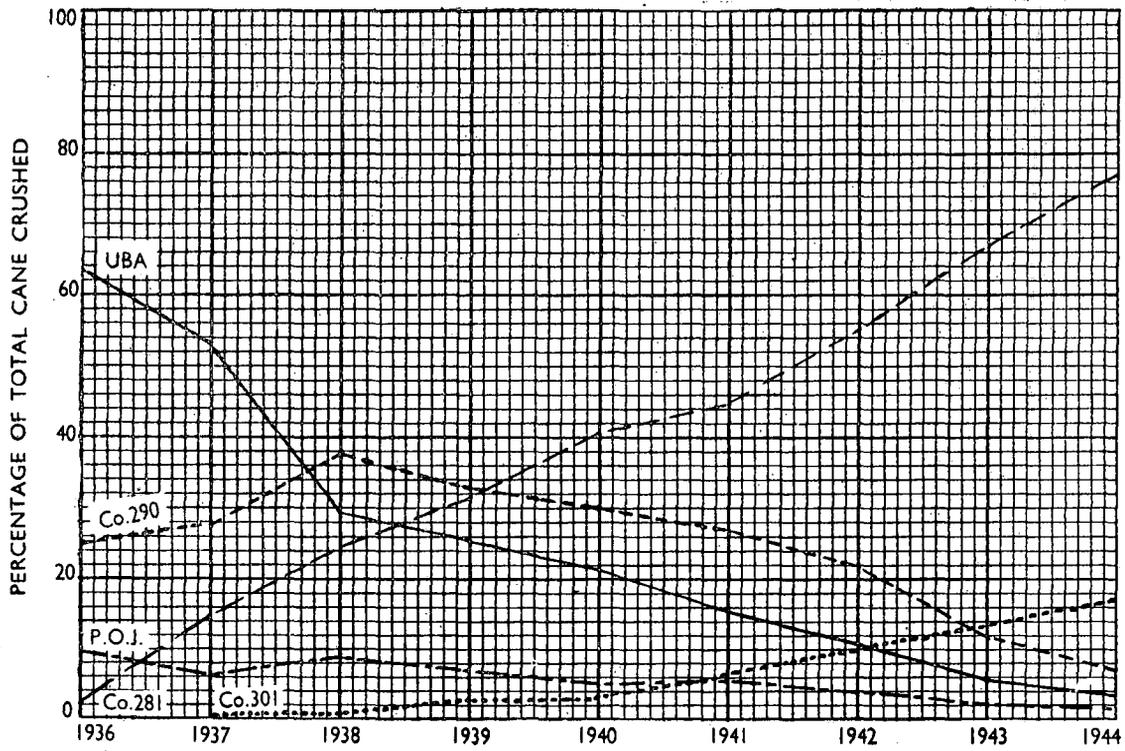


Fig. 1. VARIETY PERCENTAGE

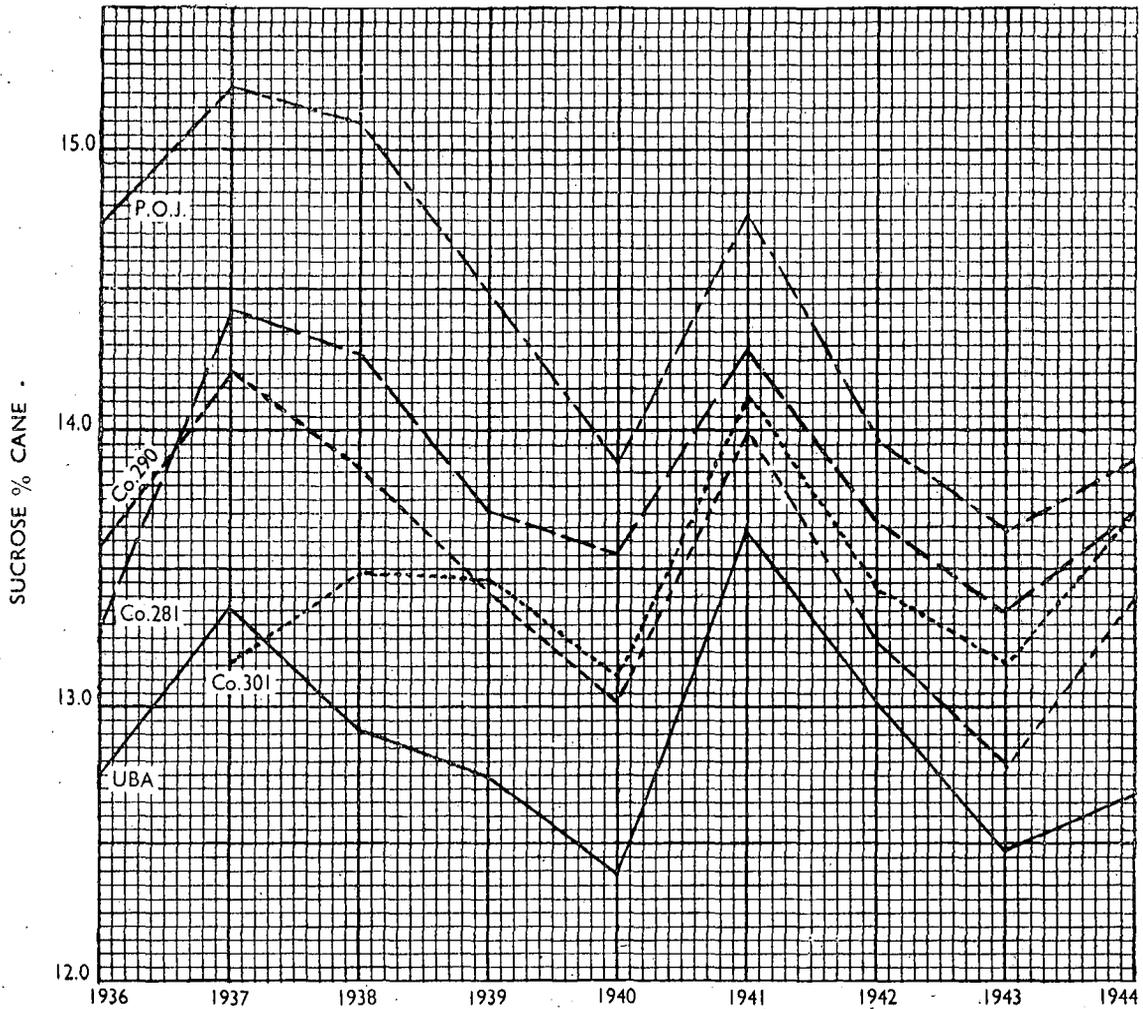


Fig. 2. SUCROSE PER CENT CANE

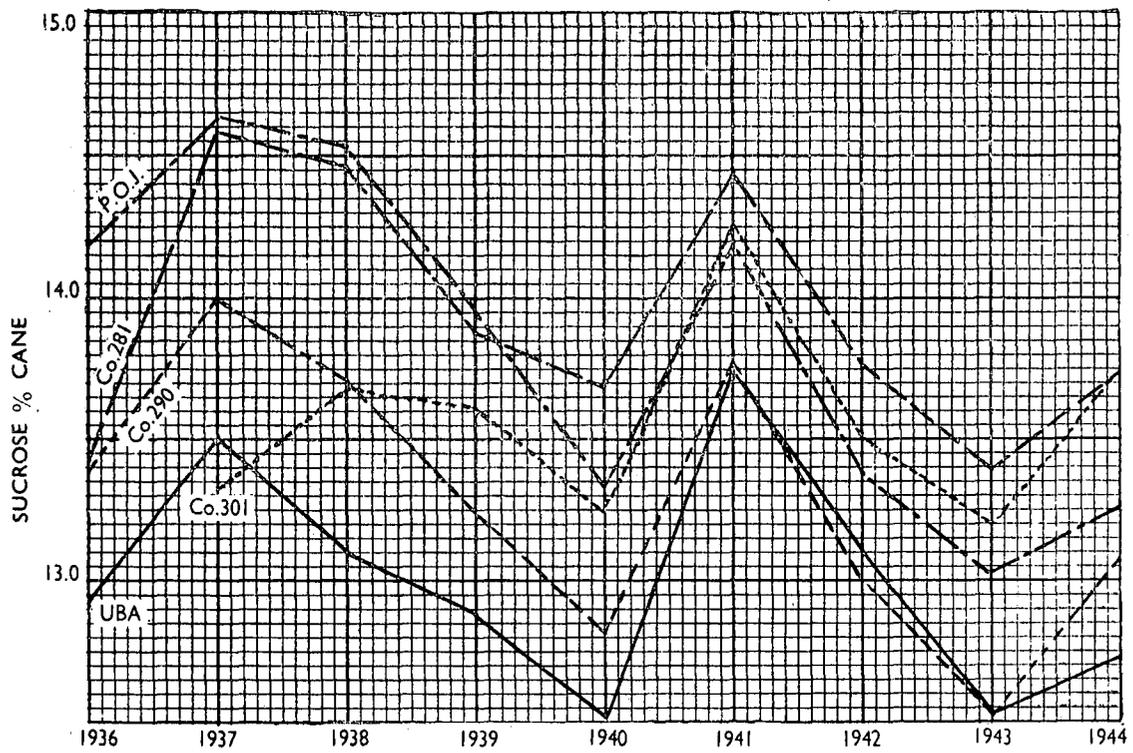


Fig. 3. RE-ADJUSTED SUCROSE PER CENT. CANE

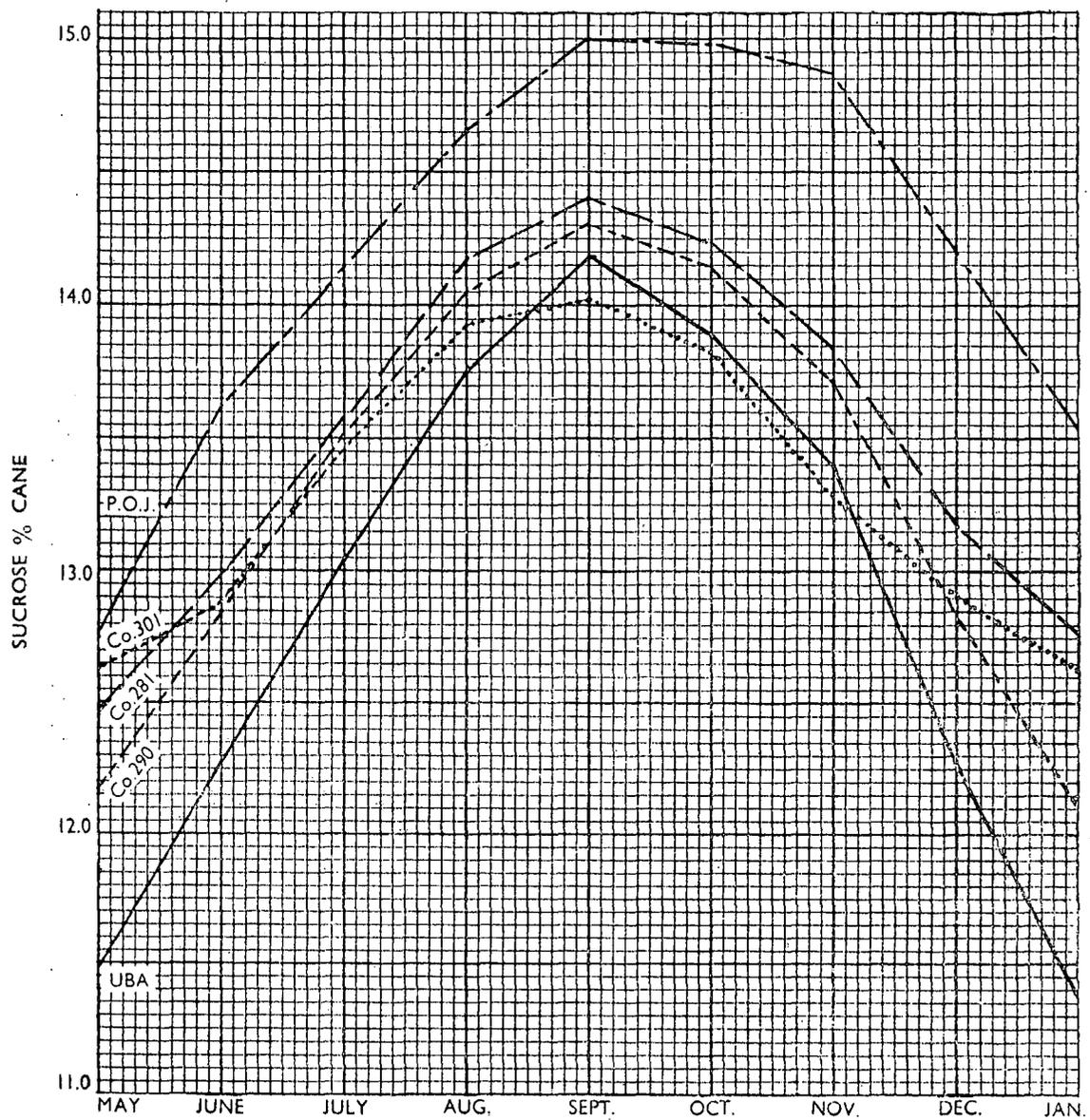


Fig. 4. MONTHLY SUCROSE PER CENT. CANE

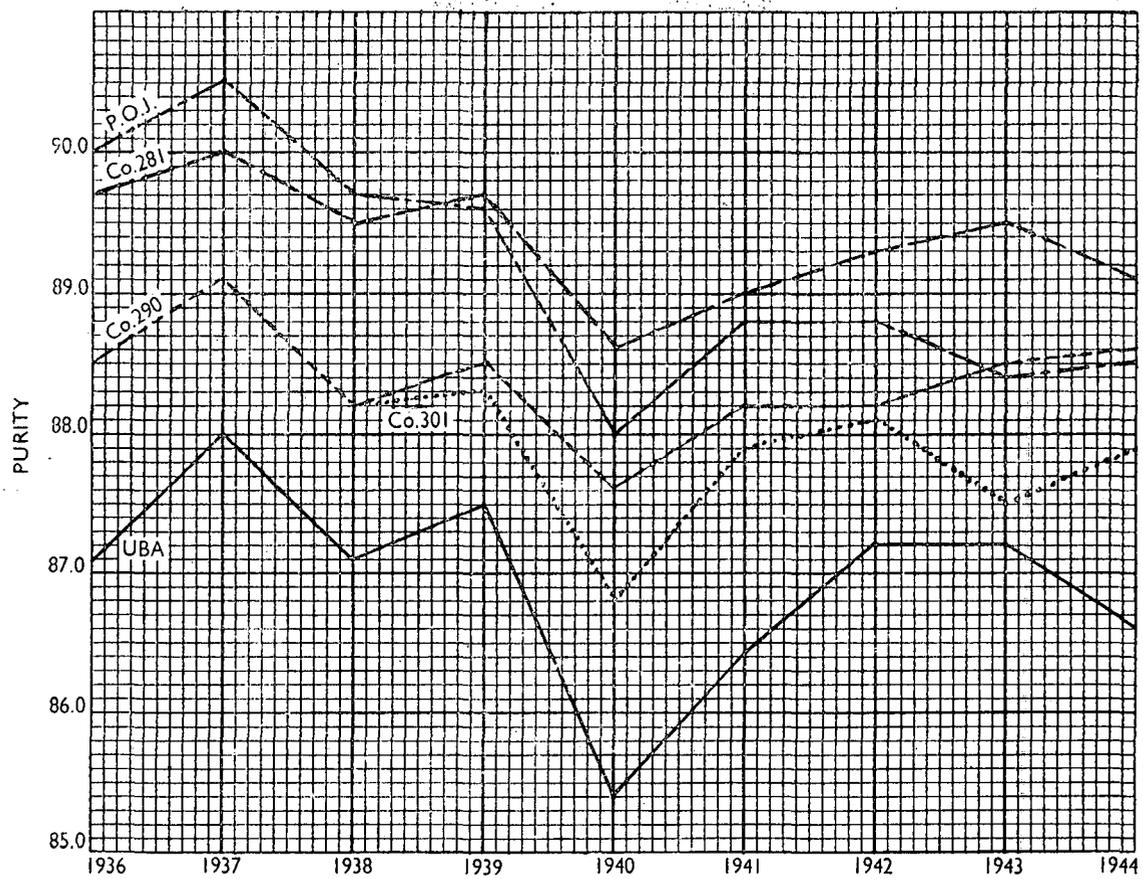


Fig. 5. PURITY OF CRUSHER JUICE

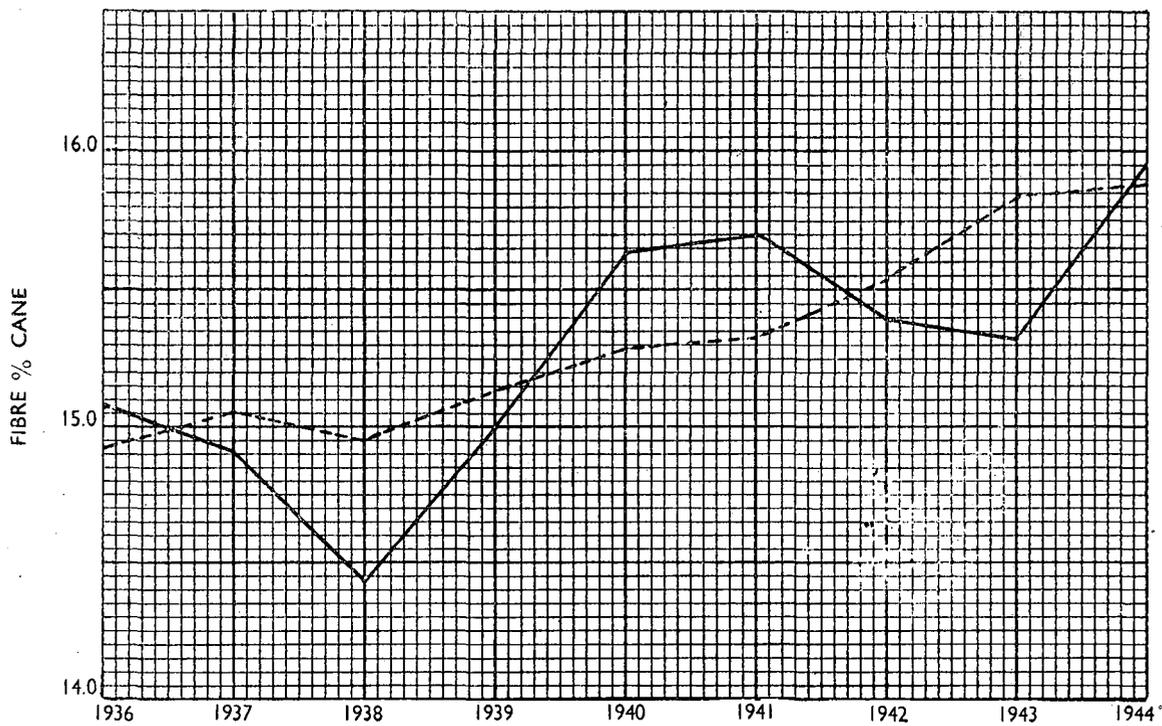


Fig. 6. FIBRE PER CENT. CANE

Dr. DODDS said that Uba cane was slow in ripening and went off again very early so that the variety had only a short period from August to September, during which its sucrose content was relatively high. Co.281 was an early ripening cane, but not a particularly good cane to cut early in the season; P.O.J.2725 was a late ripening cane but could hold its sucrose till very late in the season, whereas Co.290 ripened early and yet held its sucrose late as well. It could be said therefore that Uba had a very short peak period, and that might account for Mr. Dymond's observations that Uba was now cut at a time when it was not at its highest sucrose content.

Mr. du TOIT could not see the necessity for the author to apologise for using arithmetical averages for the purity of the juice of the different varieties. He thought arithmetical averages were in fact more correct in assessing the relative purities and sucrose contents of the various varieties. In using weighted averages in this paper the sucrose per cent. cane of the P.O.J. variety did not appear much higher than that of other varieties, and the reason for this was that the bulk of P.O.J. came from a factory where the sucrose content of all varieties was very low and the result was that the P.O.J. variety suffered as a result of the locality where it was mostly grown. If arithmetical

averages were taken, however, P.O.J. was found to be significantly higher in sucrose content than all other varieties, and Co.281 and Co.301 higher than Uba and Co.331, while Co.290 was significantly higher than Uba.

Mr. BECHARD said that one reason why Uba now had such a low sucrose content might well be due to the fact that it was now mainly grown by non-European planters.

Mr. MOBERLY said that while Uba was undoubtedly lower in sucrose content than the new varieties, it seemed rather a paradox that its replacement had not led to an increase sucrose per cent. cane. He suggested that seasonal fluctuations in sucrose content which were equal to, or of even greater magnitude than varietal differences might be obscuring the upward trend, and it might be possible that a longer cycle was necessary to demonstrate the improvement resulting from the new varieties in this respect.

Mr. CUTLER agreed with Mr. Moberly that in view of the varied factors and climatic effects it was necessary to have a longer period, probably a period twice as long, to come to any conclusions as to the effect of the replacement of Uba by new varieties on the average sucrose content.