

ESTIMATION OF CANE TO SUGAR RATIO.

By G. S. MOBERLY.

The operation of the quota provision of the present Agreement necessitates a periodical estimation of the tonnage of cane which will be required to make the sugar quota.

During the 1938 Conference of this Association, Mr. C. L. Waters presented a short paper entitled "Conversion Ratios"¹ in which he suggested that the cane to sugar ratio for the season might be estimated by averaging the ratios of the 9th, 10th, and 11th weeks and then averaging this figure with the ratio for the week ending nearest to the 1st of August. Some information from chemists as to how nearly this agreed with actual results during the past two seasons would be of interest.

The Committee of the International Society of Sugar Cane Technologists for Uniformity in Reporting Factory Data in their report to the Sixth International Conference referred to, though they did not recommend, the general adoption of, a figure known as the Demerara Index². This has been defined by Follet-Smith & Williams³ as the sum of the sucrose per cent. cane and the tons of cane per ton of sugar. This figure remains fairly constant for any one factory, though it tends to decrease over a series of years as manufacturing efficiency improves. At present it varies from 21.8 to 22.8 for our factories.

If at any period of the season an estimate can be made of the probable sucrose per cent. cane for the season, it is possible to estimate with reasonable accuracy the tons of cane which will be required per ton of sugar. It is preferable to use the figure tons cane per ton of sugar on the basis of 96° pol. sugar.

For both Natal and Trinidad the correlation coefficient is $r=0.97$, and for British Guiana $r=0.98$.

The attached table for the proceedings shows the way in which the Demerara Index keeps fairly constant with large fluctuations of sucrose per cent. cane.

It will be observed that the Demerara Index was not very greatly affected by the unusual conditions prevailing in the locust year of 1934.

A similar table for British Guiana factories is given in the International Sugar Journal for July, 1937 (p. 271).

For any month at any factory the Demerara Index to date will be a figure approximating to, but not quite equalling, the Demerara Index for the whole crop. The variation of the monthly to-date figure from the crop figure has been recorded for nine factories for five years, and from these forty-five instances, the mean variation and the standard variation from the mean has been calculated. From these figures the following formulae have been prepared for the estimation of the Demerara Index for the whole season at various times during the season.

End of July	Index = $D + 0.06 \pm 0.32$
End of August	Index = $D + 0.05 \pm 0.24$
End of September	Index = $D + 0.03 \pm 0.18$
End of October	Index = $D - 0.01 \pm 0.12$
End of November	Index = $D - 0.01 \pm 0.09$

Where D is the Demerara Index to date at the period stated. The final figure after the + sign represents the probable degree of accuracy at 19 to 1 odds.

The tons of cane required to make a ton of sugar for the whole season are estimated by deducting the predicted sucrose per cent. cane from the estimated Demerara Index.

For instance, at the end of October it might be estimated that the sucrose per cent. cane for the whole season will be 13.80; the Demerara Index to date at the same time is 22.66. Then the tons of cane required to make a ton of sugar would be:—

$$22.66 - 0.01 \pm 0.12 = 13.80.$$

i.e., would be expected to be between 8.73 and 8.97.

This is for 96° pol. sugar, and would have to be corrected for the expected average pol. of sugar produced. If this were 98.5 the conversion ratio would be expected to be between 8.96 and 9.20. If the mean value of 9.08 were taken, the error in a crop of 30,000 tons of sugar would probably not amount to more than 3,600 tons of cane. This sounds a lot, but it is probably at least as close, as could be estimated by any other means two months before the close of the season. In any case, it is very difficult to estimate the probable percentage of sucrose in the cane for the balance of the season.

Period	No. 1			No. 6			No. 10		
	Suc. % Cane	Cane/Sugar	D.1	Suc. % Cane	Cane/Sugar	D.1	Suc. % Cane	Cane/Sugar	D.1
June, 1935	13.25	8.80	22.05	12.52	9.74	22.26	12.39	10.41	22.80
July, 1935	13.77	8.27	22.04	12.92	9.22	22.14	13.04	9.78	22.82
August, 1935	14.23	8.06	22.29	13.19	8.90	22.09	13.33	9.35	22.68
September, 1935	14.52	7.91	22.43	13.27	8.74	22.01	13.70	8.98	22.68
October, 1935	14.60	7.91	22.51	13.34	8.78	22.12	13.26	9.29	22.55
November, 1935	14.66	7.93	22.59	13.51	8.55	22.06	12.94	9.46	22.40
June, 1936	12.32	9.69	22.01	—	—	—	11.17	11.61	22.78
July, 1936	13.30	8.79	22.09	11.80	10.35	22.15	12.09	10.10	22.19
August, 1936	14.41	8.03	22.43	13.15	9.06	22.21	13.45	8.88	22.33
September, 1936	14.99	7.61	22.60	14.01	8.30	22.31	14.07	8.46	22.53
October, 1936	14.85	7.56	22.41	13.56	8.71	22.27	13.86	8.39	22.25
November, 1936	13.71	8.22	21.93	12.38	9.48	21.86	12.89	9.14	22.03
June, 1937	13.31	8.77	22.01	11.99	10.09	22.08	12.42	9.61	22.03
July, 1937	13.99	8.22	22.21	12.98	9.12	22.10	13.12	8.81	21.93
August, 1937	14.22	7.87	22.09	13.51	8.67	22.18	13.55	8.47	22.02
September, 1937	14.91	7.51	22.42	14.29	7.99	22.28	14.28	8.02	22.30
October, 1937	14.89	7.49	22.38	14.56	7.96	22.52	13.35	8.05	22.40
November, 1937	14.58	7.69	22.27	14.77	8.01	22.78	14.45	8.00	22.25
June, 1938	12.55	9.10	21.65	13.06	9.28	22.34	12.88	8.98	21.86
July, 1938	13.14	8.52	21.66	13.53	8.60	22.13	13.27	8.54	21.81
August, 1938	13.89	8.07	21.96	13.92	8.32	22.24	13.66	8.31	21.92
September, 1938	14.49	7.72	22.21	14.40	8.12	22.52	14.28	8.07	22.35
October, 1938	14.41	7.73	22.14	14.36	8.08	22.44	14.51	7.91	22.42
November, 1938	14.06	7.98	22.04	14.56	8.10	22.66	14.61	7.84	22.45
1930	13.80	8.74	22.54	14.19	8.62	22.81	13.03	9.77	22.80
1931	13.99	8.92	22.91	14.34	8.90	23.24	13.48	9.78	23.26
1932	13.94	8.81	22.75	13.81	9.40	23.21	13.05	9.50	22.55
1933	14.40	8.24	22.64	13.77	8.85	22.62	13.35	9.23	22.58
1934	12.96	8.99	21.95	11.50	10.51	22.01	10.67	11.65	22.32
1935	14.18	8.14	22.32	13.08	9.04	22.12	12.98	9.63	22.61
1936	13.94	8.23	22.17	12.76	9.25	22.01	12.88	9.29	22.17
1937	14.36	7.89	22.25	13.73	8.56	22.29	13.43	8.69	22.12
1938	13.73	8.18	21.90	13.93	8.45	22.38	13.74	8.39	22.13

The estimation of sucrose per cent. cane from precedent conditions of rainfall and sunshine offers a useful scope for investigation.

Expressions of opinion as to how this estimate might be made, as well as further suggestions for estimating the tons cane per ton of sugar are invited.

References.

1. Waters, C. L. (1938), Proc. S.A. Sugar Tec. Assoc. **12**, 63.
2. (1938) Proc. Sixth Congress Inter. Soc. Sugar Cane Tech., 854.
3. Follet-Smith, R. R. & Williams, J. E., (1936) Agr. Jnl. British Guiana, **7**, 231.

— ⊗ —

The PRESIDENT thanked Mr. Moberly for bringing forward this brief paper. He thought Mr. Moberly's method of arriving at the amount of cane at the beginning of the season would be very helpful.

Mr. DODDS drew attention to the Demarara Ratio which was considered some years ago for inclusion in the Annual Summary. He was glad Mr. Moberly had referred to it again and indicated its useful possibilities.

Mr. BIJOUX asked if the Experiment Station had drawn up any correlations between weather conditions and sucrose content, and mentioned also

that there was a formula known as Water's Formula for doing so.

Mr. MOBERLY did not think that the Demarara Ratio was of much comparative value between factories. Each factory would know its own, which would be sufficient. Referring to Mr. Bijoux, he said Mr. Beater had an interesting paper a few years ago on weather conditions. With these meteorological data a lot of useful investigation could be carried out with regard to estimation of sucrose per cent. cane from weather conditions.

A hearty vote of thanks was accorded to Mr. Moberly.