GENERAL REPORT ON WEATHER CONDITIONS FOR THE YEAR 1940.

Rainfall.

The total rainfall for 1940 at the Experiment Station, Mount Edgecombe, was 37.31 ins., which is 0.30 ins. more than the average over the past 15 years at the Experiment Station, and 0.13 ins. more than the 54-year average for Mount Edgecombe.

It was, nevertheless, a most unsatisfactory year because of very abnormal and unfavourable distribution of rainfall. This was apparent from the very beginning of the year and continued until the end of September, only the last three months having normal seasonable weather.

Thus January, with a total of 1.35 ins., is the second lowest rainfall for that month ever recorded at Mount Edgecombe since records first began in 1887, the absolute minimum for January being 1.09 ins. in 1926. The respective totals from the beginning of the year at the end of February, March and April were each the lowest on record for Mount Edgecombe and were 41 per cent., 38 per cent. and 43 per cent. of normal respectively.

The total for the year at the end of April was only 7.11 ins., compared with a normal of 16.29 ins. for the period, which indicated a disastrous growing season, reflected in very poor growth of the cane crop. There were, however, heavy rains early in May, when a total of 9.14 ins. was recorded. This fell on three days only, the 1st, 4th and 5th.

This is the heaviest rainfall recorded for May at Mount Edgecombe, although under present day methods of recording the heavy rain that fell on the night of May 31st, 1905, would have been credited to that month and not June.

These rains in May came too late in the season to be of much advantage to the sugarcane crop.

The mean shade temperature for the month was 68.3°F., and there is reason to believe that sugarcane does not make vigorous growth at temperatures below 70°F., even with an abundant water supply. In any case, no more than light rains are required from May onwards to September, so as to enable cane due to be harvested to ripen properly, for which relatively dry weather is required.

The heavy rains in May and June of last year are no doubt largely responsible for the very low sugar content of cane throughout the 1940 crushing season.

The rainfall for June, 3.51 ins., was also much above normal and tended to aggravate the effect of the unseasonable May rains in postponing indefinitely the ripening of the cane.

There was very little rain in July and August, the total for these two months, 0.23 ins., being the lowest recorded for any two successive months at Mount Edgecombe.

The total rainfall for July was 0.02 ins., made up of 0.01 ins. each on the 2nd and 31st, which is, of course, practically nil, and is the lowest for any month recorded at this Experiment Station. However, Natal Estates, Ltd., recorded at Mount Edgecombe a total of only 0.01 ins. in June, 1899, and nil in August, 1925.

Between June 19th and September 13th, there were 85 days with a total of only 0.26 ins. of rain, the longest spell of very dry weather ever recorded here. However, thanks to the soaking rains of May and early June, the subsequent drought conditions did not become more than moderately severe, and the rainfall for September, 1.72 ins., although much below the average for that month, was sufficient to end the drought. It was not sufficient, however, to make practicable the beginning of the planting season for cane, which had therefore to be delayed to the following month.

The rainfall for the last three months of the year was on the whole very favourable for the planting and growth of young cane. The rainfall for October, 3.31 ins., though considerably below normal, was well distributed, and the total for November was 8.25 ins., of which 6.43 ins. fell during the week ending November 12th.

December, though having a fall of no more than 4.04 ins., which is below the normal for the month, had rain on as many as 22 days, the greatest number in any one month ever recorded here. Rain fell on 19 consecutive days from the 13th to the 31st.

The total number of rain days during the year were 108, which is 11 below the average at this station, and was lower only once, in 1937, when it was 101. The average rainfall per rain day, 0.345 ins., is appreciably above the normal, 0.314 ins., and was only exceeded in 1935 and 1936.

The heaviest fall for any single day was 5.77 ins. on Sunday, May 5th. This is the second highest rainfall for any single day every recorded at this station, the highest being 10.41 ins. on June 12th, 1935.

The total rainfall for May 4th and 5th of 8.12 ins. was also exceeded only once previously over any two or three successive days, namely, June 11th to 13th, 1935, when the total was 16.75 ins.

The heavy rains of May 4th and 5th were accompanied by a heavy south-easterly gale, so that much damage to trees and gardens and roads and power lines resulted, and considerable damage to buildings. The sustained violence of the storm made it a memorable week-end.

Besides May 4th, with 2.35 ins. of rain, and May 5th, noted above, there were two other days, November 8th and 11th, with a rainfall of over 2 ins., and five days, one in February, one in June, one in September and two in October, with a rainfall of over one inch.

Following is the rainfall for the year by months compared with the 54-year average :—

Month.	1940. Total for month in inches.	1940. Aggregate from Jan. 1st inches.	1940. Per cent. of normal aggregate.	Mean 1887/1940 (inclusive) Total for month in inches.	Mean 1887/1940 (inclusive) Aggregate from Jan. 1st inches.	Mean 1887/1940 (inclusive) Average rainfall per day in inches.
January ..	1.35	1.35	32.2	4.14	4.14	0.134
February ..	2.25	3.60	41.3	4.49	8.63	0.159
March ..	1.64	5.24	38.4	4.87	13.50	0.157
April	1.87	7.11	43.6	2.63	16.13	0.088
May	9.14	16.25	89.5	1.99	18.12	0.064
June	3.51	19.76	101.4	1.38	19.50	0.046
July	0.02	19.78	95.9	1.13	20.63	0.036
August ..	0.21	19.99	91.6	1.17	21.80	0.038
September .	1.72	21.71	88.4	2.74	24.54	0.091
October ..	3.31	25.02	87.5	4.00	28.54	0.129
November .	8.25	33.27	101.9	4.13	32.67	0.138
December..	4.04	37.31	100.4	4.52	37.19	0.146
Totals ..	37.31			37.19	Mean	0.102

From the year 1926 inclusive the rainfall has been recorded at the Experiment Station. For the 39 years preceding this period the records of Natal Estates, Ltd., at Mount Edgecombe, have been used, applying a factor, 0.9259, that is indicated by the 15 years 1926 to 1940 inclusive as the ratio of the rainfall at the Experiment Station to that of Natal Estates, Ltd. According to this ratio the average rainfall at the Experiment Station site for these 39 years was 37.24 ins., Natal Estates average being 40.22 ins. at that date.

The annual rainfalls recorded at this Experiment Station to date are as follows :—

Year.	Rainfall in inches.	Calculated normal from 1887 at date in inches.	Per cent. of normal.	No. of rain days.	Average rainfall per rain day in inches.	Year.
1926	25.42	36.94	68.81	116	0.219	1926
1927	42.46	37.08	114.51	128	0.332	1927
1928	27.56	36.85	74.79	114	0.242	1928
1929	43.83	37.01	118.43	129	0.340	1929
1930	30.03	36.86	81.47	123	0.244	1930
1931	28.01	36.66	76.40	112	0.250	1931
1932	41.36	36.76	112.51	126	0.328	1932
1933	27.14	36.56	74.23	109	0.249	1933
1934	39.42	36.62	107.65	127	0.310	1934
1935	53.25	36.96	144.07	111	0.480	1935
1936	45.36	37.12	122.20	110	0.412	1936
1937	33.21	37.05	89.64	101	0.329	1937
1938	37.97	37.06	102.46	117	0.325	1938
1939	42.87	37.17	115.33	134	0.320	1939
1940	37.31	37.18	100.35	108	0.345	1940
Means	37.01	37.18	99.54	119	0.314	Means

It may be seen, therefore, that the lowest annual rainfall was recorded in the first year, 1926, with 25.42 ins., or only 68.81 per cent. of the presumed 40-year normal at that date. The highest rainfall was in 1935, when it was 53.25 ins. or 144.07 per cent. of the calculated normal at that date. This calculated annual normal was at its lowest at the end of 1933, when it was 36.56 ins., following on a cycle of eight years of deficient rainfall. The calculated annual normal now stands at 37.18 ins., the highest since the 37.24 ins. at which we began at the end of 1925. This rise in the annual normal is due to a cycle of years of rainfall above normal since the beginning of 1934.

It will be seen that this cycle of annual rainfalls greater than normal that has prevailed since 1934 shows so far no very definite signs of ending. During this period only one year, 1937, has had a rainfall below normal and the annual mean calculated from 1887 has risen from 36.56 ins. to 37.18 ins.

The average rainfall for the past seven years is 41.34 ins., while for the preceding eight years, 1926 to 1933, it was only 33.23 ins., a remarkable difference.

Whatever factors control these cycles, whether sunspot effects or other sources of extra-terrestrial energy affecting the intensity of the cosmic rays penetrating to the earth's surface, or whether it is due to some complex rhythm of terrestrial changes, cannot be decided with our present very limited and empirical knowledge of the ultimate causes governing the weather.

One lesson we may learn from the past, however, is that these favourable rainfall cycles may not be expected to continue indefinitely, since the climate over large areas does not change appreciably within the relatively brief period of human records. Con-

sequently we should be prepared for a less favourable cycle at any time, bringing years of severe drought such as we have fortunately not had since 1933.

Over the whole of the Natal coast the rainfall for 1940 was not only abnormal in its seasonal distribution, but also in its distribution by districts.

For the whole of the 35 rainfall stations reporting to us the average for the year is 44.80 ins., which is 3.88 per cent. above the mean of the past 12 years, 43.13 ins.

The nine South Coast stations south of the Umgeni, however, had without exception a rainfall much below normal, the average deficit being nearly 24 per cent.

The nine North Coast stations between the Umgeni and the Umvoti Rivers were slightly below normal, excepting Umhlali and Chakas Kraal, where there were deficiencies amounting to 6 ins., and Tongaat and Riet Valley, where the rainfall was slightly above normal.

All the 14 Zululand stations (with the doubtful exception of Mandini), as well as Kearsney and Darnall, recorded rainfalls much above normal, the average for the 17 northernmost stations being 22 per cent. above normal.

	1940 rainfall in inches.	1929/40 average in inches.	1940 percentage of average in inches.
Mean of 9 stations south of the Umgeni River	32.54	42.73	76.15
Mean of 9 stations between the Umgeni and Umvoti Rivers..	40.24	42.07	95.65
Mean of 17 stations north of the Umvoti River	53.71	43.90	122.35
General (weighted) averages ..	44.80	43.13	103.88

Eshowe, which has the highest average rainfall, 53.23 ins., of any station in the sugar-growing belt, again heads the list for 1940 with an annual rainfall of 70.67 ins., or nearly 33 per cent. above normal. Other stations with a total of over 60 ins. are Mtunzini, 62.16 ins., Eteza 61.81 ins., and Felixton 61.15 ins. The Eshowe-Mtunzini-Felixton triangle, therefore, was, as usual, the wettest section of the sugar belt, closely followed on this occasion by the Umfolozi valley area, and in fact by the whole of the intervening territory through Empangeni and Mposa. Every station north of the Amatikulu River, with one exception, recorded a rainfall of over 50 ins., making 1940 the most bountiful year for Zululand since 1932.

The rainfall at Eteza was 48 per cent. above normal, and that at Riverview (Umfolozi mill) 50 per cent. The only station south of Amatikulu to have a rainfall of 50 ins. was Kearsney.

On the other hand, at the southern extremity of the sugar belt, Port Shepstone and Umzumbi had rainfalls of only 27.66 and 27.74 ins. respectively, or 62.78 and 67.05 per cent. of normal, a very remarkable deficiency, and by far the lowest rainfalls on record for these stations.

Other stations with a total of less than 32 ins. were Esperanza, Park Rynie, Illovo and Umbogintwini on the South Coast, and Chakas Kraal on the North Coast.

The latter station, together with Illovo, Mount Edgecombe (Experiment Station), Empangeni West and Riverview, are the only ones to have an average rainfall of less than 40 ins. over the past 12 years, while Eshowe, Mtunzini and Felixton are the only stations to have an average rainfall of over 50 ins.

For the past two years we have taken into account rainfall returns only as far north as Riverview, two miles north of the Umfolozi River. Sugarcane is grown nearly as far north as Hluhluwe, about 40 miles north of the Umfolozi, but only on a few scattered estates, so that this cannot now be considered a very representative sugar-growing district.

The 1940 rainfall at Mr. C. A. Wheelwright's estate (H16), a few miles south of Hluhluwe, is 38.97 ins., and the average annual rainfall from 1929 inclusive 30.89 ins., which is not much lower than the average for Riverview. Nevertheless, there are indications that this is about the northern limit for sugarcane growing, except under irrigation or in moist, low-lying soils, since there is a tendency further north for certain years to have a rainfall much too low for unirrigated sugarcane, 15 ins. or less. The potentialities for growing sugarcane under irrigation in the rich alluvial fields of northern Zululand are, however, very great—given, of course, a market for the product.

Temperatures.

1940 is the warmest year on record at this station, regulation Stevenson screen temperatures going back to 1928.

The mean shade temperature for the year was 69.9°F., the annual mean for the past 13 years being 68.4°F., and the previous highest 69.2°F. for 1932.

ANNUAL RAINFALL 1929-1940.

Station.	Recorder.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.	Average
Port Shepstone... ...	Lightkeeper, S.A.R. & H.	61.89	42.82	51.06	49.71	40.58	38.55	42.01	49.63	38.25	42.52	44.08	27.66	**44.06**
Umzumbi	Mrs. M. G. Lomas	56.28	34.95	40.31	42.04	36.35	37.50	43.66	51.24	40.63	42.82	42.86	27.74	**41.37**
Esperanza	Hawksworth & Sons, Ltd.	57.47	42.10	36.13	38.36	32.81	46.13	43.70	44.74	36.14	41.41	47.31	30.48	**41.40**
Renishaw	Crookes Bros., Ltd.	58.24	37.22	31.86	41.56	34.43	42.17	42.69	46.10	44.40	36.13	46.90	31.83	**41.13**
Park Rynie	V. J. S. Crookes	58.84	39.25	38.94	44.14	37.71	46.53	47.89	52.85	46.10	43.22	56.25	34.46	**45.52**
Illovo	Illovo Sugar Estates, Ltd.	49.22	38.12	31.54	36.89	26.94	41.00	39.03	51.65	30.79	43.09	42.22	30.10	**38.38**
Umbogintwini	African Explosives & Industries, Ltd. ...	47.88	42.10	32.42	36.67	36.43	45.59	52.87	53.09	34.78	41.94	48.53	31.26	**42.21**
Durban (Berea) ...	M. Cruickshank	46.87	38.93	31.51	44.74	31.61	42.28	58.08	46.71	36.09	41.23	47.26	38.35	**41.97**
Durban (Point) ...	S.A. Railways & Harbours	59.97	38.92	43.68	49.45	34.42	47.45	60.93	56.85	45.84	41.89	62.57	40.99	**48.58**
Mount Edgecombe ...	Natal Estates, Ltd.	47.04	34.52	32.98	43.51	30.94	40.03	57.41	49.60	36.65	43.13	46.06	40.23	**41.84**
Mount Edgecombe ...	S.A.S.A. Experiment Station	43.83	30.03	28.01	41.36	27.14	39.42	53.25	45.36	33.21	37.97	42.87	37.31	**38.31**
La Mercy	Gersigny Bros.	53.37	36.40	29.26	56.65	31.16	37.64	56.27	45.65	35.17	45.36	49.41	42.63	**43.25**
Tongaat...	Tongaat Sugar Co., Ltd.	50.55	34.26	29.88	48.79	26.59	38.44	47.54	50.87	35.61	40.85	44.67	40.87	**40.74**
Sinembe...	H. C. Heenan...	49.78	37.02	30.36	52.71	38.64	49.99	41.48	56.80	35.17	42.07	45.80	43.53	**43.61**
Umhlali...	G. P. Ladlau	50.38	40.07	29.09	49.85	35.13	41.20	53.61	56.57	40.29	56.88	58.14	39.72	**45.91**
Chakas Kraal	Waldene Sugar Estate	42.78	33.06	22.25	43.09	30.14	35.09	43.38	46.74	32.87	38.40	42.27	30.81	**36.74**
Tinley Manor	Sir J. L. Hulett & Sons, Ltd.	51.36	33.22	30.97	47.44	35.44	41.20	50.97	56.83	38.38	46.35	48.93	41.16	**43.52**
Riet Valley	H. E. Essery	50.07	35.65	25.38	54.64	37.98	47.70	44.33	65.99	35.28	41.96	51.39	45.90	**44.69**
Kearsney	Sir J. L. Hulett & Sons, Ltd.	49.20	43.36	26.31	55.49	37.45	53.57	38.42	64.34	39.73	44.30	47.46	50.80	**45.87**
Darnall	Mrs. M. C. Rouillard...	40.75	37.36	23.03	44.14	25.45	49.91	44.04	56.32	40.68	45.56	44.65	48.48	**41.70**
Darnall	Sir J. L. Hulett & Sons, Ltd.	42.38	40.63	24.31	52.27	29.22	48.24	40.23	52.09	39.75	43.74	43.80	47.10	**41.93**
Mandini...	H. Francis	42.05	40.41	24.40	50.98	27.41	55.34	45.88	51.25	35.34	40.86	38.34	41.01	**41.11**
Amatikulu	Sir J. L. Hulett & Sons, Ltd.	42.23	40.80	21.09	47.16	29.86	47.66	43.41	47.86	35.38	37.24	47.53	50.40	**40.89**
Gingindhlovu	P. C. Lilburn	42.42	47.72	24.60	53.85	33.08	50.91	53.16	52.68	39.62	40.10	54.12	53.75	**45.50**
Mtunzini	R. D. Shaw	42.57	48.99	32.92	61.97	40.03	59.28	53.02	55.62	43.57	44.23	65.11	62.16	**50.80**
Eshowe	District Forest Officer	49.97	44.26	30.36	65.05	47.31	71.85	46.18	66.61	47.56	46.40	52.55	70.67	**53.23**
Felixton	Sir L. J. Hulett & Sons, Ltd.	59.39	44.57	38.03	69.08	31.43	58.82	50.16	58.71	51.96	38.62	54.99	61.15	**51.41**
Empangeni West ...	W. H. Simpson	51.61	36.82	20.56	48.32	22.92	41.08	36.40	36.62	39.10	32.93	47.01	41.24	**37.88**
Empangeni	Morris Bros.	46.05	33.56	30.35	49.58	27.72	45.60	37.28	47.54	45.31	35.99	52.02	53.46	**42.04**
Empangeni	Zululand Sugar Millers & Planters, Ltd. ...	48.95	33.80	31.98	55.34	29.55	48.72	38.18	49.48	47.87	33.49	51.79	53.11	**43.52**
Kulu Halt	S. B. Forrest	51.94	37.44	25.96	66.55	30.15	48.26	35.03	48.39	56.80	36.95	52.91	57.61	**45.67**
Mposa	W. Springorum	45.80	37.83	24.29	59.33	25.43	46.45	29.59	46.81	51.80	33.08	47.63	51.62	**41.64**
Kwambonambi... ...	A. E. Larsen	55.97	42.99	28.14	64.34	29.35	64.21	34.27	41.64	49.37	33.42	42.91	53.82	**45.04**
Eteza	Haworth Bros.	41.27	36.86	31.27	59.48	29.85	44.05	25.73	42.21	49.95	35.98	41.26	61.81	**41.64**
Riverview	Umfolozi Co-operative Sugar Planters, Ltd.	34.65	38.45	22.38	51.29	25.05	37.36	21.44	35.98	39.45	36.33	39.93	54.95	**36.44**
	Averages	49.23	38.70	30.16	50.82	32.16	46.55	44.33	50.90	40.83	40.75	48.33	44.80	**43.13**

Year.	Mean shade temperature in degrees F.	Annual means at date in degrees F.
1928	67.8	67.8
1929	67.5	67.6
1930	67.8	67.7
1931	68.8	68.0
1932	69.2	68.2
1933	68.9	68.3
1934	68.9	68.4
1935	66.8	68.2
1936	67.9	68.2
1937	68.8	68.3
1938	68.3	68.3
1939	68.1	68.3
1940	69.9	68.4
General mean	68.4	

Following are the screen temperatures in degrees Fahrenheit by months:—

Month.	1940. Maximum.	1940. Minimum.	1940. Mean.	1940. Daily range.	1928-1940 inclusive. Maximum.	1928-1940 inclusive. Minimum.	1928-1940 inclusive. Mean.	1928-1940 inclusive. Daily range
January	82.6	67.6	75.1	15.0	80.8	66.6	73.7	14.2
February	84.8	68.3	76.6	16.5	81.6	67.1	74.4	14.5
March	82.3	67.9	75.1	14.4	80.2	65.3	72.8	14.9
April	80.1	62.2	71.2	17.9	78.2	61.6	69.9	16.6
May	77.6	58.9	68.2	18.7	75.7	56.8	66.2	18.9
June	73.7	54.7	64.2	19.0	72.6	53.0	62.8	19.6
July	74.1	51.4	62.8	22.7	71.5	51.7	61.6	19.8
August	71.2	55.9	64.0	16.2	72.4	53.6	63.0	18.8
September	75.8	59.6	67.7	16.2	74.1	56.5	65.3	17.6
October	76.0	59.5	67.8	16.5	76.0	60.3	68.2	15.7
November	77.4	64.2	70.8	13.2	77.5	63.0	70.2	14.5
December	82.3	68.3	75.3	14.0	80.1	65.6	72.8	14.5
Mean, year	78.2	61.5	69.9	16.7	76.7	60.1	68.4	16.6

It may be seen that every month, with the exception of October, had a mean temperature well above normal, the three summer months, January, February and March, having a mean temperature of 75.6°, or 2° above normal. This is the warmest summer ever recorded here, the previous warmest being 1937, with a mean temperature of 75.4° for the first quarter of the year.

As usual, February was the warmest month of the year, with a mean temperature of 76.6°, or 2.2° higher than normal. This is by no means a record for February, however, having been surpassed in 1931, when it was 77.0°, and in 1937, when it was 76.8°.

The mean temperatures for March, 75.1°, May, 68.2°, June, 64.2°, and December, 75.3°, are the highest for those months in any year. The December temperature has only been surpassed on one or two occasions in January and February.

July, also as usual, was the coolest month of the year with a mean temperature of 62.8°, or 1.2° above normal for the month.

The other months show the normal sequence of rise or fall in temperature according to season, though at a higher level than usual.

Although the daily range of temperature for the year was little more than normal, it was abnormally high in certain months, especially those with a limited number of rain days. Sunny days and clear nights promote wide diurnal fluctuations in temperature.

There were some violent fluctuations in temperature in October, associated with rapid changes of direction of wind. Thus on October 15th the minimum temperature was 59.5° and the maximum 93.5°, a range of 34°, the sky was clear, and light easterly to north-easterly winds prevailed. The following day the minimum temperature was 65° and the maximum 69.5°, a range of only 4.5°. On this day there was a moderate south-westerly breeze and the weather was overcast and showery.

Besides the record of the mean monthly temperatures, there are many other indications that 1940 as a whole was unusually warm. There were two days with a shade temperature of 100° and over—100° on December 8th and 101° on April 29th. The latter was the first occasion when the shade temperature exceeded 100° since 30th September, 1936, when it was also 101°.

The absolute maximum shade temperature here is 104°F. on 15th January, 1932.

There were as many as 13 days in 1940 with a maximum shade temperature of 90° and over, one each in January, February, March, April, June, September (97°) and November, and three each in October and December.

The mean maximum shade temperature for the year was 78.2°, which is the highest on record at this station. The mean of the past 13 years is 76.7° and the previous maximum 77.8° in 1932.

In 1939 the mean maximum shade temperature was 75.9° and there was not one day when 90° was reached.

The mean minimum shade temperature for the year, 61.5°, is also a record for this station. The average is 60.1° and the previous highest 60.8° for 1934.

The lowest minimum screen temperature for the year was 43° on July 6th. This is the lowest since July 9th, 1934, when it was 41°, the absolute screen minimum for this station.

Notwithstanding the general warmth of 1940 there was an unusual number of night temperatures below 50°, 16 in all—2 in June, 11 in July, 2 in August, and 1 in September.

However, for the sixth successive year, there were no ground frosts, the lowest reading of the grass thermometer being 38° on July 6th. The average of the grass thermometer readings for the year was 57.5°, which is the highest on record here, the annual normal being 55.2°.

The average reading of the solar radiation maximum thermometer (vacuum bulb) for the year was 128.6°, and the highest 154° on March 6th. These figures are not unusually high for this station.

The average earth temperature readings for the year were 72.6° at 1 foot, 73.5° at 2 feet, and 73.6° at 4 feet. These are 0.8° above normal, and the seasonal changes were about the same as in past years, except that the soil temperatures for February and March ranged from 79.8° to 81.8°, which is extraordinarily high for this station. Irrigation would therefore have been particularly effectual in promoting growth of sugarcane during those months.

Atmospheric Conditions.

The mean true atmospheric pressure for the year at 300 feet elevation was 29.77 ins., which is again the same as normal.

There was a regular rise from the monthly minimum of 29.64 ins. in February to the monthly maximum of 29.96 ins. in July, but a somewhat irregular monthly fall thereafter to 29.67 ins. in December.

The absolute maximum for the year was 30.36 ins. on July 5th and 8th, preceding a long spell of fine calm weather and the minimum, 29.14 ins., on February 9th, followed by heavy rain and a strong south-westerly wind.

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

The mean humidity of the atmosphere was 71.1 per cent. of saturation at 8.30 a.m. and 61.3 per cent. at 1 p.m. These are the lowest recorded for any year at this station. The most humid months were February, March and November, and the driest was July, with an average humidity of 63.4 per cent. of saturation at 8.30 a.m. and 50.5 per cent. at 1 p.m.

The mean daily rate of evaporation from a free water surface was 0.13 ins. or a total of 48.46 ins. for the year.

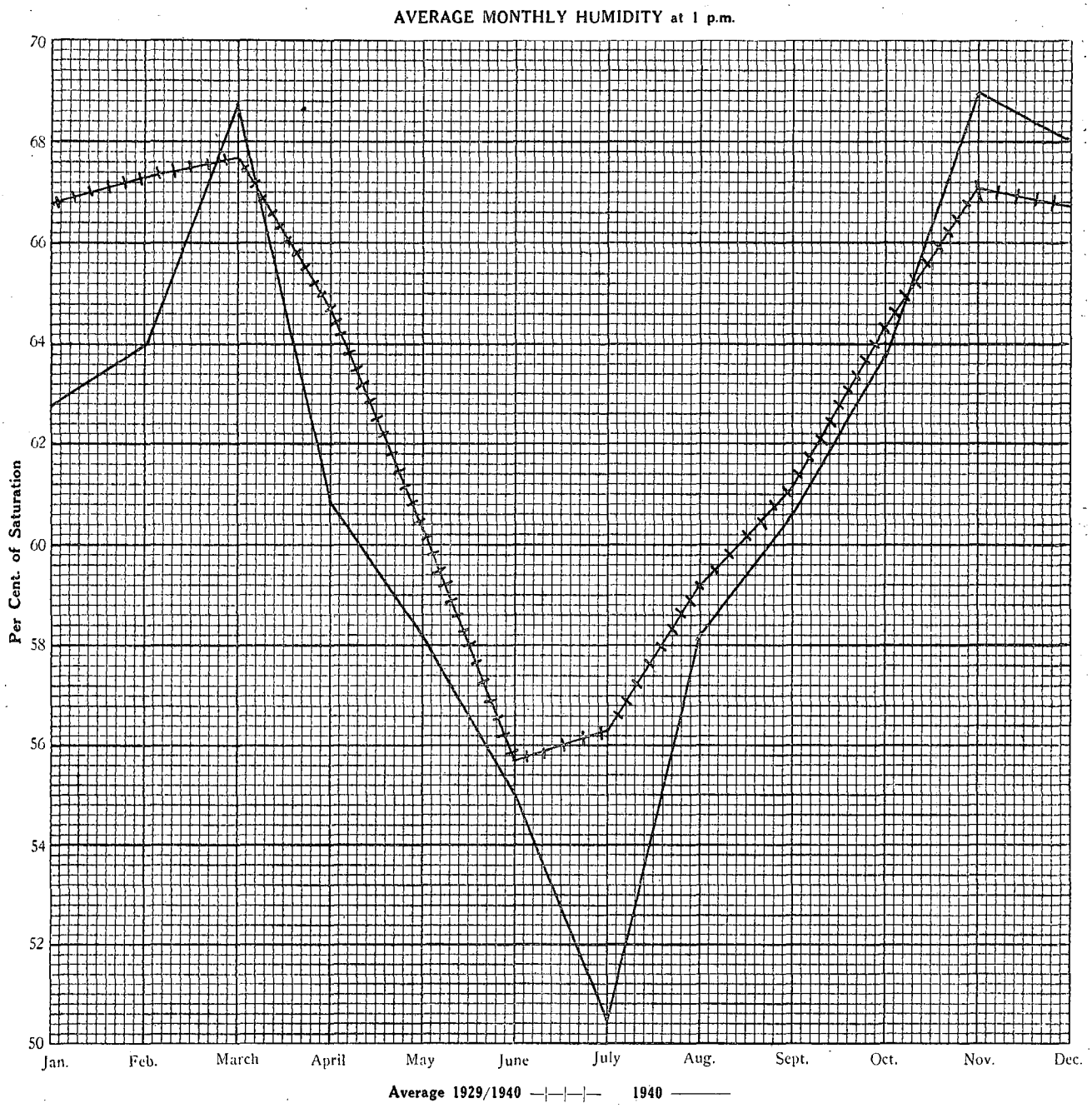
The monthly totals of evaporation range from 5.60 ins. in February to 2.40 ins. in June, so that, as usual, evaporation was mainly governed by temperature and amount of wind, and only slightly affected by relative humidity and hours of sunshine.

The total hours of sunshine during the year were 2,388.5 or 55.5 per cent. of total hours of daylight, the highest for some years. This also is connected, of course, with the relative paucity of rain days.

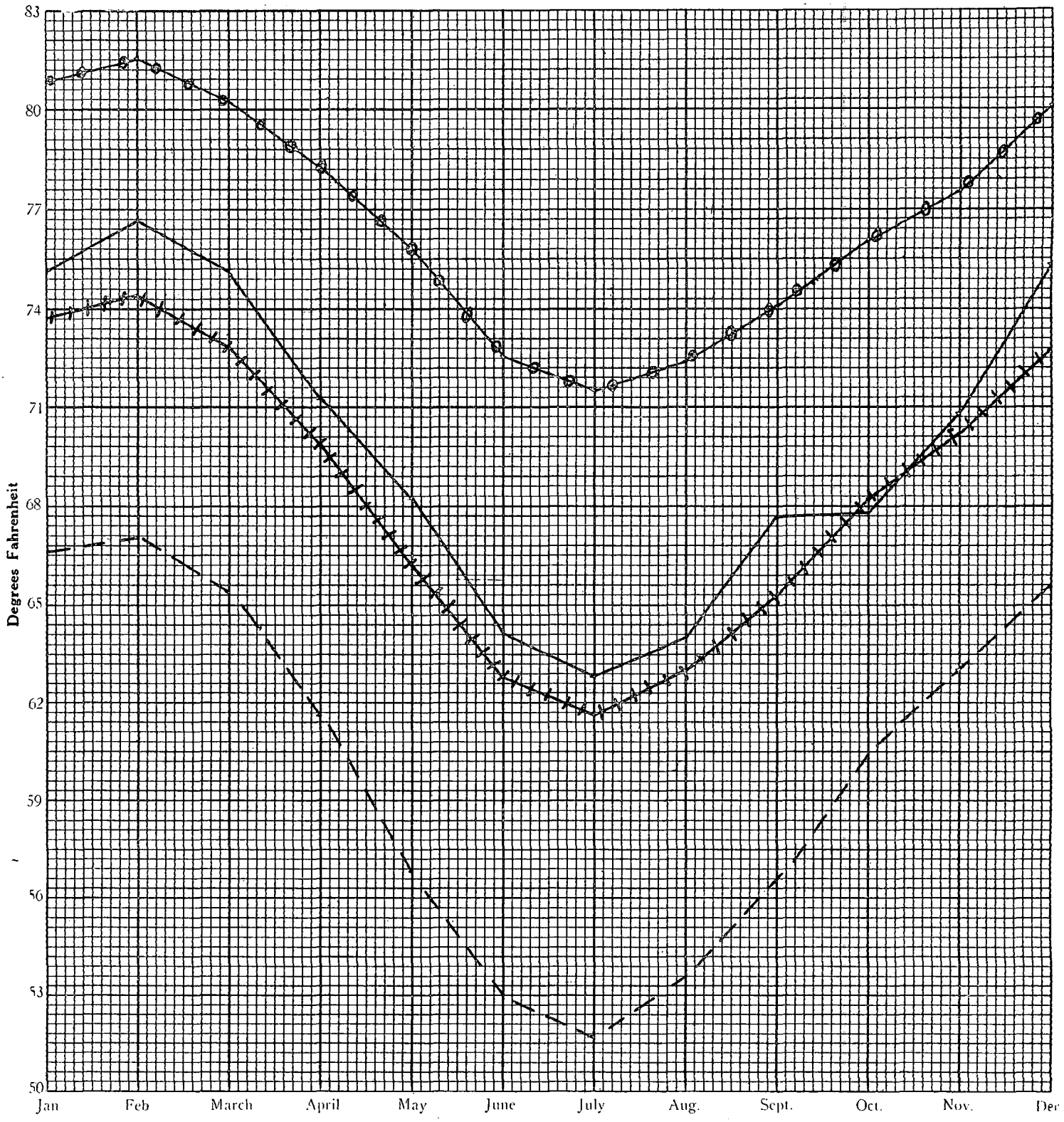
The sunniest months were May and July, with 73.0 and 72.1 sunshine per cent. of hours of daylight, and the cloudiest was November, with only 34.8 per cent.

Conclusion.

In general, it may be said that 1940 was a very unfavourable year for the growth and ripening of sugarcane, due to abnormal and unseasonable distribution of rainfall, but with a good though somewhat late planting season. A prominent feature was the relatively high temperatures sustained throughout the year.


AVERAGE MONTHLY HUMIDITY at 1 p.m.
Per Cent. of Saturation
70
68
66
64
62
60
58
56
54
52
50
Jan.
Feb.
March
April
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.
Average 1929/1940
1940

TEMPERATURES BY MONTHS

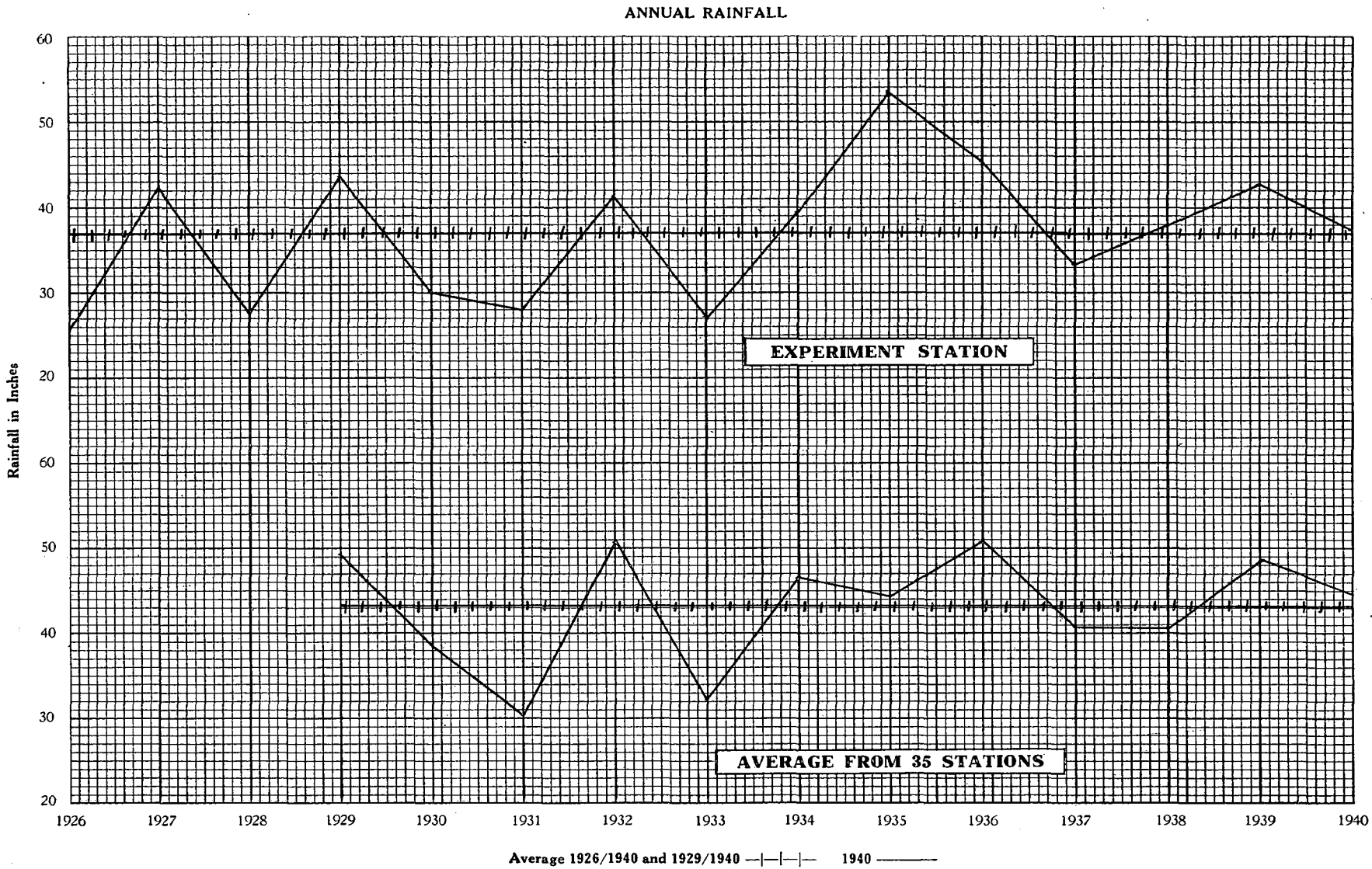


Mean Maximum Temp. 1928/1940 Average —o—o—o—

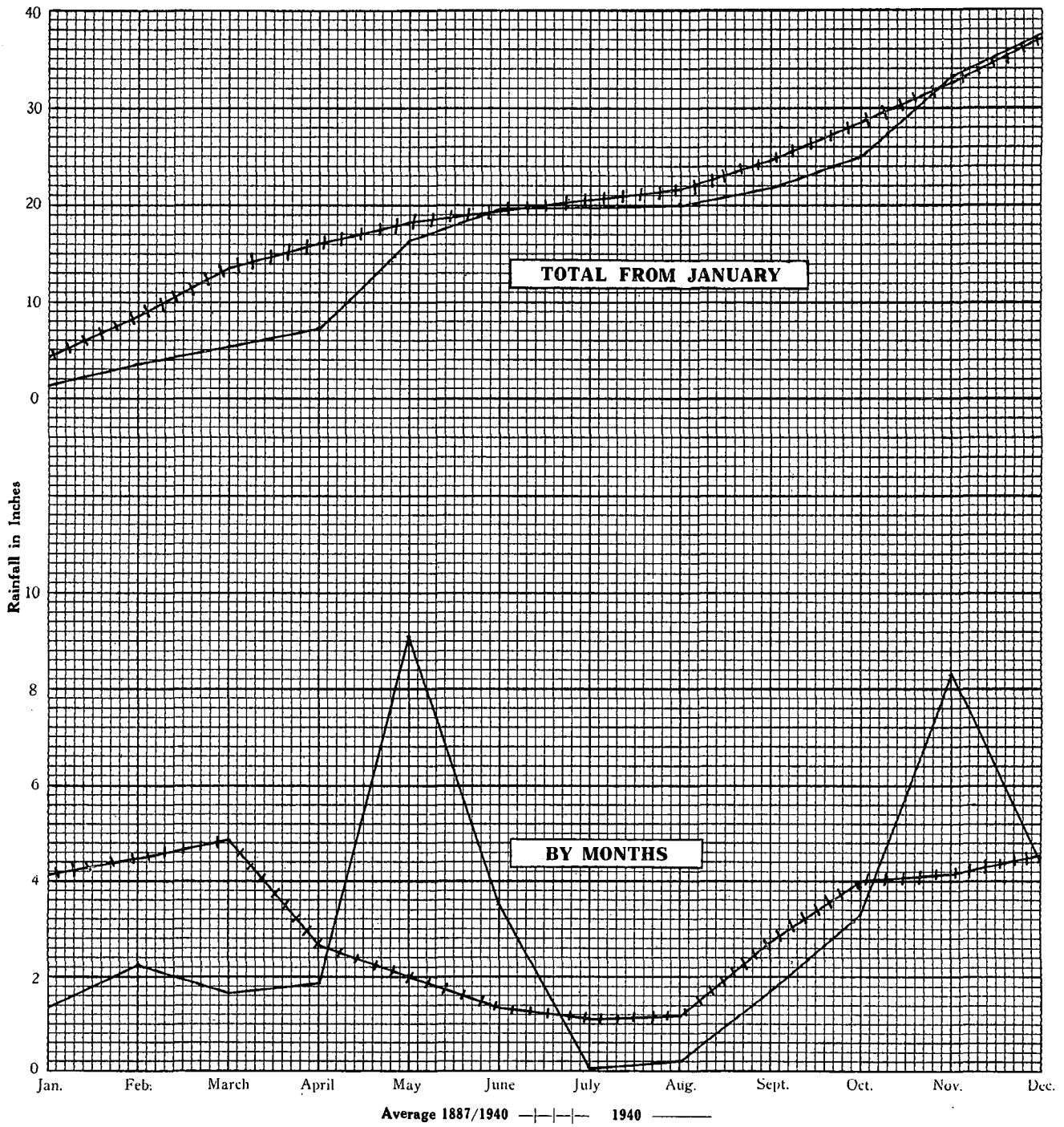
Mean Monthly Temperature, 1940 ————————

Mean Temperature 1928/1940 Average —|—|—|—|—|—

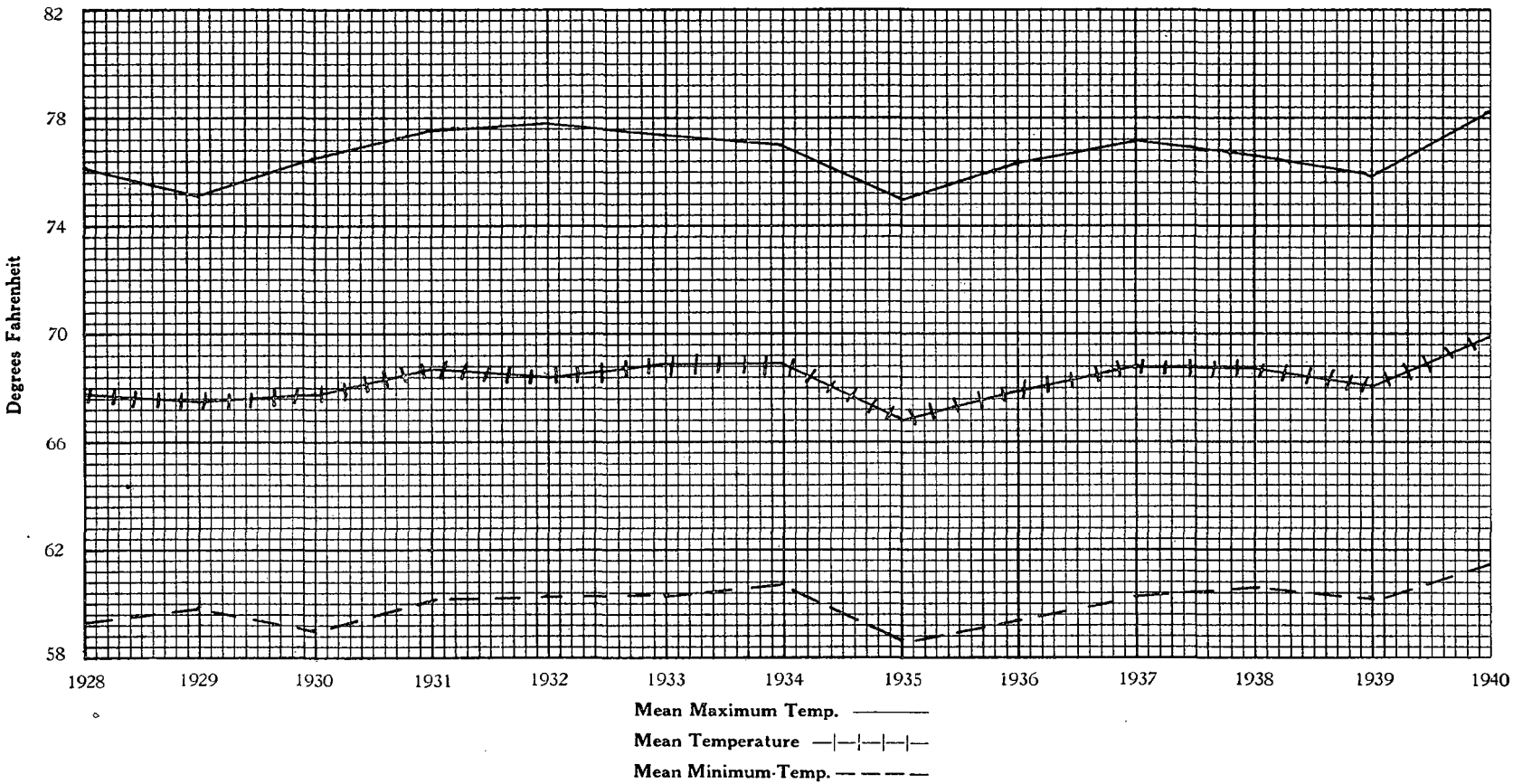
Mean Minimum Temp. 1928/1940 Average — — — —


ANNUAL RAINFALL
60
50
40
30
20
Rainfall in Inches
EXPERIMENT STATION
60
50
40
30
20
AVERAGE FROM 35 STATIONS
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
Average 1926/1940 and 1929/1940 —|—|—|— 1940 ———

RAINFALL BY MONTHS



AVERAGE ANNUAL SCREEN TEMPERATURES, 1928/1940



Mr. BOOTH congratulated the authors and the Experiment Station on producing once more such a valuable paper. The Annual Summary, he said, was of permanent value and it was only afterwards when it was studied at leisure in the mill laboratories that the full benefit was derived from it. He also expressed his appreciation of the monthly mill returns which were circulated by the Experiment Station. These, too, were eagerly anticipated by the mills.

Mr. Booth, however, maintaining that the reduced extraction and recovery figures were not accepted by the majority of technologists in this country, and he thought that they should not be included in the Annual Summary.

Mr. RAULT agreed with the previous speaker, but asked that if possible more information should be given. This would show how the results were obtained and would stop misinterpretation of the figures given. It would be very useful if leading men in the mills could give a short resume of their year's experiences at the Annual Congress. This would provide further information and lead to a lot of discussion.

A few years ago Mr. Dodds had stated that the sucrose per cent. was often proportional to the hours of sunshine, and it was also the experience of others that the high sucrose figures often coincided with years of drought. Last season the chemists had expected a high sucrose but the year was certainly exceptional. Mr. Dodds explained these figures by the fact that we had unseasonable rains, but Mr. Rault thought there were other causes as well.

Mr. MURRAY too objected to the interpretation that some people put on these figures. He said that the reduced extraction and recovery figures were the chief causes of trouble in this respect.

The report, however, was exceedingly interesting. An interesting fact was that the biggest mill and the smallest mill had the two best extractions.

Mr. DODDS thanked those who participated in the discussion for their kind remarks. He was sorry to find some technologists objected to the publication of the reduced figures. He considered these as useful information and was the more surprised that objections were made this year. It was only through the application of this ratio that the progressive improvements in extraction and recovery were apparent this season.

In April a series of tests done at the Experiment Station showed a remarkably high sucrose content of cane, but the heavy rains of May caused a permanent setback.

Mr. Dodds said that he would very much like to see further data become available. These would enable more accurate comparisons to be drawn, the fibre crushed per unit surface of mill roller would, for example, be valuable additional information. He thought Mr. Rault's suggestion to have individual reports from the technical staffs of the different mills was a most excellent one. Mr. Rault himself prepared a most interesting technical report to his company every year. If that or part of it could be available for publication it would be of great benefit to the industry as a whole.

Mr. RAULT said that although the reduced formulæ had shown that good work had been done in the past year, they often, as a result of purely theoretical analyses, did not give credit where credit was due.

Mr. Rault welcomed Mr. de Vasconcellos from the Portuguese West African sugar industry to our Conference.

Mr. DYMOND, who was unfortunately not able to attend the Annual Conference, sent the following written comments on this paper :—

"I cannot agree with the authors that the fall in sugar production was primarily due to the "unfavourable distribution of rainfall." In my opinion the primary cause was the age of the cane crushed, which in many cases was three, four and even five years old.

"The effect of rainfall is, I believe, a more complex problem than would appear from a cursory inspection of individual monthly records. I consider that this effect can only be studied by continuous yearly charts embodying the monthly rainfall and the weekly sucrose figures. In this way the "residual" effects of droughts and heavy rainfalls can be studied and forecasts of the probable sucrose can be made with reasonable accuracy."

The PRESIDENT concluded by asking for a hearty vote of thanks to be extended to the authors for their paper.