

# GENERAL REPORT ON WEATHER CONDITIONS

## FOR THE YEAR 1939

### Rainfall.

The year 1939 continued the recent cycle of years of rainfall above the average, every year since 1933, with the exception of 1937, having at this station a rainfall above normal.

The total for 1939 was 42.87 ins., the average for the past 53 years at Mount Edgecombe being 37.17 ins.

The rainfall was well distributed over the year and drought effects were noticeable only during the early part of January and very slightly in August. There were unseasonable heavy late rains in May which may have been at least partly responsible for the somewhat low sucrose contents of sugar cane during the harvesting season.

On the whole, however, the rainfall and general weather conditions were very favourable both for the growing season of the first four months of the year, and the harvesting season up to the end of August, and excellent for the planting and growing season of the last four months of the year.

The total number of rain days were 134, which is 15 more than the average and five more than have ever been recorded before.

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

Year.	Rain-fall.	Annual normal at date.	% Excess over normal.	% Deficit under normal.	No. of rain days.	Average rainfall per rain day.
1926	25.42	40.22	—	—36.8	116	0.219
1927	42.46	39.85	+ 6.6	—	128	0.332
1928	27.56	39.66	—	—31.5	114	0.242
1929	43.83	39.71	+10.4	—	129	0.340
1930	30.03	37.57	—	—20.1	123	0.244
1931	28.01	37.36	—	—25.0	112	0.250
1932	41.36	37.46	+10.4	—	126	0.328
1933	27.14	36.64	—	—27.6	109	0.249
1934	39.42	36.69	+ 7.4	—	127	0.310
1935	53.25	37.03	+45.1	—	111	0.480
1936	45.36	37.33	+22.5	—	110	0.412
1937	33.21	37.19	—	—11.0	101	0.329
1938	37.97	37.07	+ 2.1	—	117	0.325
1939	42.87	37.17	+15.3	—	134	0.320
Means	<u>36.99</u>	<u>37.85</u>	<u>—</u>	<u>—2.3%</u>	<u>119</u>	<u>0.311</u>

The heaviest fall for any single day was 3.42 ins. on May 20th. The only other day with a rainfall of over 2 ins. was March 14th with 2.08 ins.

There were ten other days with a rainfall of over 1 in.: four in February, two in November, and one each in January, July, September and December.

The highest rainfall for any month, as for 1938, was in February, with 8.00 ins. on fourteen days, and the lowest June, with 0.43 in. on two days. A month with a rather unusual number of rain days was December, when 4.11 ins. fell over eighteen days.

A month with an abnormal deficiency of rain was April, with only 1.34 ins. compared with an average of 2.64 ins. However, it was distributed over six days of the month and preceded and followed by months of plentiful rainfall, so that no drought conditions supervened.

The longest period of the year without any measurable rain was the twenty-seven days between June 1st and 29th.

The rainfall for the year by months compared with the average is as follows :—

Month.	1939.		Mean 1887-1939 (inclusive).		Average rainfall per day
	Total for month in inches.	Total from January 1st.	Total for month.	Total from January 1st.	
January ...	3.39	3.39	4.19	4.19	0.135
February ...	8.00	11.39	4.53	8.72	0.160
March ...	5.14	16.53	4.93	13.65	0.159
April ...	1.34	17.87	2.64	16.29	0.088
May ...	4.24	22.11	1.85	18.14	0.060
June ...	0.43	22.54	1.34	19.48	0.045
July ...	2.53	25.07	1.15	20.63	0.037
August ...	0.93	26.00	1.19	21.82	0.038
September .	4.25	30.25	2.76	24.58	0.092
October ...	3.06	33.31	4.01	28.59	0.130
November .	5.45	38.76	4.05	32.64	0.135
December...	4.11	42.87	4.53	37.17	0.146
Totals	<u>42.87</u>		<u>37.17</u>		<u>Mean 0.102</u>

From the year 1926 inclusive the rainfall has been recorded at the Experiment Station. For the thirty nine years preceding this period the records of Natal Estates, Ltd., at Mount Edgecombe have been used, applying a factor, 0.926, that is indicated by the thirteen years 1926 to 1938 inclusive as the ratio of the rainfall at the Experiment Station to that of Natal Estates Ltd.

There were one or two slight hailstorms during the year. The only one of any severity was on October 24th, which did considerable damage to trees and gardens but not to buildings.

The 1939 rainfall shows a general increase over the past eleven year average reflected at almost every one of the thirty five stations recorded. The general average rainfall for the year was 48.33 ins., compared with 42.98 ins. normal, an excess over normal of 12.4 per cent. This excess was more

Station.	Recorder.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	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	45.55
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	42.60
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	42.39
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	41.97
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	46.52
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	39.14
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	43.21
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	42.30
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	49.27
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	41.99
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	38.40
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	43.30
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	40.73
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	43.62
Umhlahi... ..	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	46.47
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	37.28
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	43.74
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	44.58
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	45.42
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	41.08
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	41.51
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	41.11
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	40.02
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	44.75
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	49.76
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	51.65
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	50.52
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	37.58
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	41.00
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	42.65
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	44.58
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	40.73
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	44.24
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	39.81
Riverview ...	Umfoloji 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	34.76
	Averages ... ..	49.23	38.70	30.16	50.82	32.16	46.55	44.33	50.90	40.83	40.75	48.33	42.98

marked progressively towards the north, as the following table shows:—

Mean of—	1939 rainfall.	1929-39 average.	1939 excess over normal.
9 South Coast stations...	47.55 ins.	43.65 ins.	8.9%
12 North Coast stations...	47.12 ins.	42.34 ins.	11.3%
14 Zululand stations ...	49.15 ins.	43.08 ins.	14.1%

The highest total and the greatest excess over normal was recorded at Mtunzini, 65.11 ins., an excess of 15.35 ins., or 30.8 per cent. above the eleven-year average for that station.

As usual the Mtunzini-Eshowe-Felixton area shows the highest rainfall, but on this occasion (though not normally) this area may be considered to include also Gingindhlovu, Empangeni and Kulu, and will then take in most of the stations receiving more than 50 ins. of rain in 1939.

	1939 rainfall.	1929-39 mean.	1939 excess over normal.	1939 % excess.
Gingindhlovu ...	54.12	44.75	9.37 ins.	20.9
Mtunzini ...	65.11	49.76	15.35 ins.	30.8
Eshowe ...	52.55	51.65	0.90 ins.	1.7
Felixton ...	54.99	50.52	4.47 ins.	8.8
Empangeni—				
(Morris Bros.) .	52.02	41.00	11.02 ins.	26.9
(Z.S.M. & P.)...	51.79	42.65	9.14 ins.	21.4
Kulu ...	52.91	44.58	8.33 ins.	18.7

Although Eshowe again does not attain the highest rainfall it still maintains the highest average, 51.65 ins., built up by the heavy falls of 1934 and 1936. The only other station with an eleven-year average rainfall of over 50 ins. is Felixton, 50.52 ins.

Other unconnected stations having a rainfall of over 50 ins. are:—

	1939 rainfall.	1929-39 mean.	1939 excess over normal.	1939 % excess.
Durban (Point)...	62.57	49.27	13.30 ins.	27.0
Umdlali ...	58.14	46.47	11.67 ins.	25.1
Park Rynie ...	56.25	46.52	9.73 ins.	20.9
Riet Valley ...	51.39	44.58	6.81 ins.	15.3

The lowest rainfall was recorded at Riverview (Umfoloji), 39.93 ins. Other records below 43 ins. are Eteza 41.26 ins., Illovo 42.22 ins., Chakas Kraal 42.27 ins., Umzumbi 42.86 ins., Mount Edgecombe (Experiment Station) 42.87 ins., and Kwambonambi 42.91 ins.

Only three widely separated stations show for 1939 a deficiency of rainfall below normal.

	1939 rainfall.	1929-39 mean.	1939 deficiency below normal.	1939 % de- ficiency.
Port Shepstone...	44.08	45.55	1.47 ins.	3.2
Mandini ...	38.34	41.11	2.77 ins.	6.7
Kwambonambi...	42.91	44.24	1.35 ins.	3.0

There are now four stations with an eleven-year average rainfall of less than 39 ins.: Riverview (Umfoloji) 34.76 ins., Chakas Kraal 37.28 ins., Empangeni West 37.58 ins., and Mount Edgecombe (Experiment Station) 38.40 ins.

Certain changes have been made in our selection of rainfall stations for these records, with the intention of making it more thoroughly representative of the sugar-growing area.

Thus Dukuduku and Hluhluwe have been omitted, relatively little sugar cane being produced in those areas, and the returns from Riverview (Umfoloji factory) substituted. This is in the centre of a large cane-growing area, while being within the lower rainfall zone which forms the northern limit of the sugar industry.

Mandini has been substituted for Sitebe to represent better the district immediately north of the Tugela River, although the returns for 1929, 1930 and 1931 from Sitebe are retained for lack of returns from Mandini earlier than 1932.

Also Umzumbi has been included to represent the considerable area of cane-growing country between Port Shepstone and Esperanza. The returns from 1929 to 1935 are from Kloofend, and since 1936 from Melville, both near Umzumbi and mutually comparable.

#### Temperatures.

The mean temperature for the year recorded in the Stevenson screen was 68.1°F., which is slightly below the average of the years 1928-39 inclusive, 68.3°F.

The record by months is as follows:—

Month.	1939			1928-1939 inclusive		
	Maxi- mum.	Mini- mum.	Daily Mean range	Maxi- mum.	Mini- mum.	Daily Mean range
January ...	80.7	65.8	73.3 14.9	80.6	66.5	73.6 14.1
February ...	82.5	69.7	76.1 12.8	81.3	67.0	74.2 14.3
March...	78.1	65.2	71.7 12.9	80.0	65.1	72.6 14.9
April ...	77.8	60.9	69.4 16.9	78.0	61.5	69.8 16.5
May ...	75.1	57.4	66.3 17.7	75.5	56.6	66.1 18.9
June ...	72.5	53.4	63.0 19.1	72.5	52.8	62.7 19.7
July ...	69.7	51.6	60.7 18.1	71.3	51.7	61.5 19.6
August ...	72.9	54.3	63.6 18.6	72.4	53.4	62.9 19.0
September...	70.8	54.7	62.8 16.1	74.0	56.2	65.1 17.8
October ...	76.0	62.2	69.1 13.8	76.0	60.4	68.2 15.6
November...	76.6	63.4	70.0 13.2	77.5	62.9	70.2 14.6
December ...	78.3	64.8	71.6 13.5	79.9	65.4	72.7 14.5
Mean for year	75.9	60.3	68.1 15.6	76.6	60.0	68.3 16.6

The mean daily range of temperature is less than normal, probably because of the longer extent of rainy conditions in 1939.

As usual, February was the warmest month with a mean temperature of 76.1° compared with 74.2° normal for that month, and July the coolest with 60.7° compared with 61.5° normal for July.

The other months show the usual seasonal rise or fall of temperature compared with neighbouring months, except that September, with a mean temperature of 62.8°, was 0.8° cooler than August, instead of being 2.2° warmer than August with a mean

temperature of 65.1° as normal. This was no doubt due to the unusually plentiful rains of September.

No other month deviated as much as 1° from normal, January, March, April, July, September, November and December being slightly below normal and the remaining months above normal.

Although February, with a mean temperature of 76.1°, was one of the warmest months ever recorded at this station, the summer of 1937-38 as a whole was only slightly above normal.

#### Mean Summer Temperatures.

December, 1938 ...	73.4°	December, 1928/39 ...	72.7°
January, 1939 ...	73.3°	January, 1928/39 ...	73.6°
February, 1939 ...	76.1°	February, 1928/39 ...	74.2°
March, 1939 ...	71.7°	March, 1928/39 ...	72.6°
Means ...	<u>73.6°</u>		<u>73.3°</u>

The year's temperatures were even more equable than usual. Thus there was no shade temperature as high as 90°, the highest being 89.5° on February 13th. Normally there are several days during the year with a maximum shade temperature of 90° or over (six in 1938 and fourteen in 1937), and on several occasions in previous years the 100° mark has been passed, the absolute screen maximum being 104° on January 15th, 1932.

The unusually low screen maximum temperature for this station, 58.5°, was recorded on September 6th and November 3rd. The lowest screen maximum temperature recorded here is 58.0° on June 12th and August 3rd, 1935.

On the other hand, there was no screen temperature during the year lower than 46.5°, which was recorded on as many as four days during 1939—July 29th, August 12 and 31st, and September 19th.

This is the highest absolute minimum for any year recorded at this station. The absolute screen minimum is 41° on July 9th, 1934.

Screen temperatures below 44° have been recorded at this station on only six occasions, and none since 1934.

For the fifth successive year, no damage from frost was recorded.

The average solar radiation thermometer (vacuum bulb) reading for the year was 127.1°, ranging from 115.3° for July to 139.5° in January. The absolute maximum was 160° on January 15th, which was equalled only once before at this station, February 27th, 1936.

The mean grass minimum thermometer reading for the year was 56.4°, ranging from 46.1° for July

to 67.9° in February. The absolute minimum was 40.0° on August 12th.

The earth thermometer temperatures ranged about as usual with maxima in February and minima in July and August.

#### Earth Thermometer Readings.

	Maximum averages.	Minimum averages.	Average for year
1 foot ... ..	79.6° (Feb.)	66.7° (Aug.)	73.0°
2 feet ... ..	80.8° (Feb.)	65.2° (July)	72.9°
4 feet ... ..	80.6° (Feb.)	62.8° (July)	71.9°

From June to September inclusive the soil temperatures were below 70° and consequently during that period, as during each year since records were first taken in 1935, temperatures were too low to make the irrigation of sugar cane profitable during those months, except to avert drought effects. During the remaining months of each year (excepting October, 1936, when it was unusually cool) irrigation to at least a moderate extent would have encouraged growth, given, of course, adequate drainage. During the months of December to April, when the soil temperatures are usually above 73°, the cane will respond to very heavy watering.

#### Atmospheric Conditions.

The mean true barometric reading at 300 feet elevation was 29.77 ins. for 1939, which is identical with the twelve-year average.

There was a regular sequence of rise and fall from the monthly minimum of 29.60 ins. in February to 29.97 ins. in June and a steady fall thereafter to 29.68 ins. in December.

The absolute maximum for the year was 30.34 ins. on July 9th and 10th, and the absolute minimum 29.29 ins. on November 11th. The latter was followed by a strong north-east gale.

The mean humidity of the atmosphere was 76.2 per cent. of saturation at 8-30 a.m. and 65.7 per cent. at 1 p.m. These are the highest readings for any year since observations were begun in 1929.

The most humid month was February, with the very high humidities of 82 per cent. of saturation at 8.30 a.m. and 73 per cent. at 1 p.m.; this is the most humid month on record here.

The driest month was August, with a relative humidity of 74.0 per cent. at 8-30 a.m. and 58.8 at 1 p.m.

The mean daily rate of evaporation from a free water surface was the same as in 1938, 0.12 ins. per day or 43.8 ins. for the year. The highest rate of evaporation was during February, when it was 0.17 ins. per day, and the lowest in July, 0.06 ins.

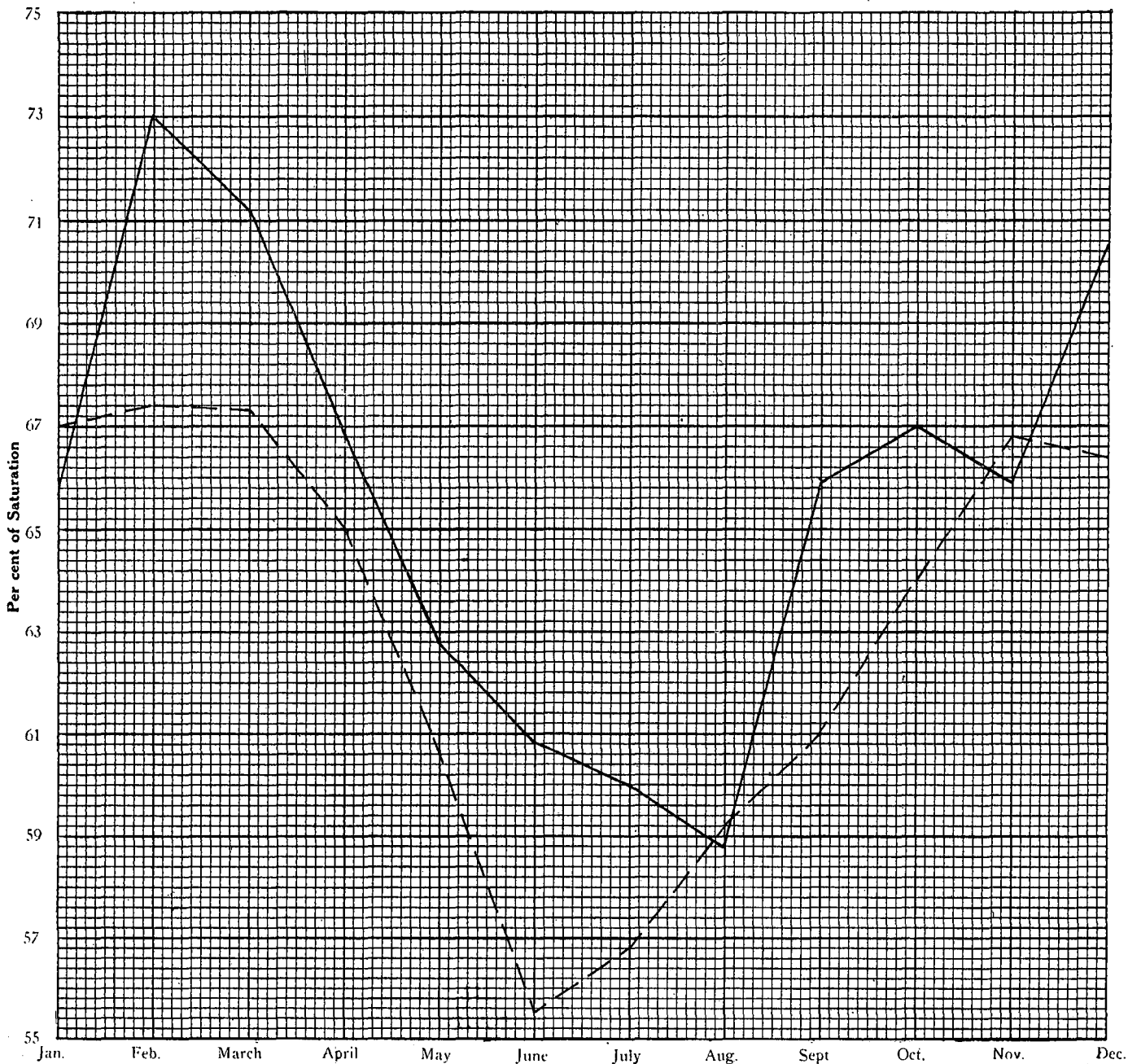
The total hours of sunshine were 2,256, corresponding to 51.5 per cent. of total hours of daylight. This is the lowest for any year since records were first begun here in 1928.

The sunniest month was June with 71.4 hours of sunshine per cent. of total hours of daylight, and the cloudiest December with 36.4 per cent.

#### Conclusion.

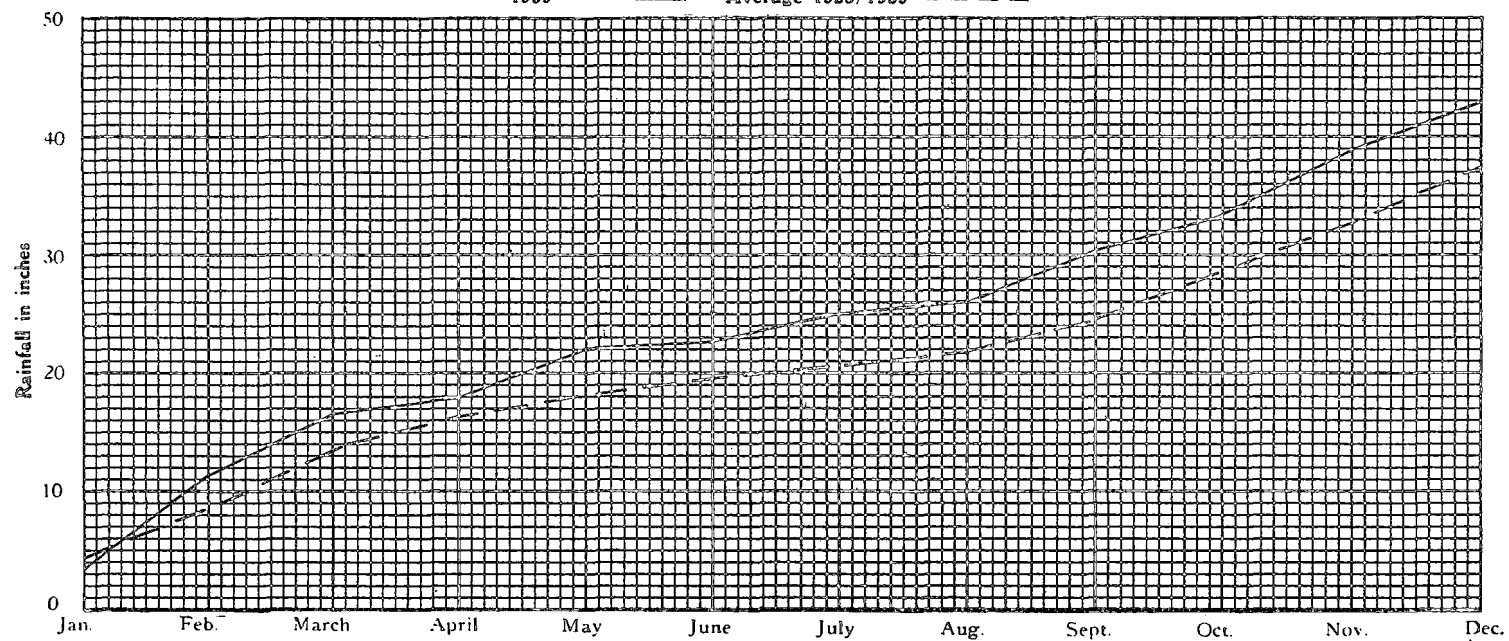
As for 1938, it may be said that weather conditions in 1939 were very favourable for the growth of the sugar cane crop.

**AVERAGE DAILY HUMIDITY**  
 Average 1929/1939 — — — — 1939 —————

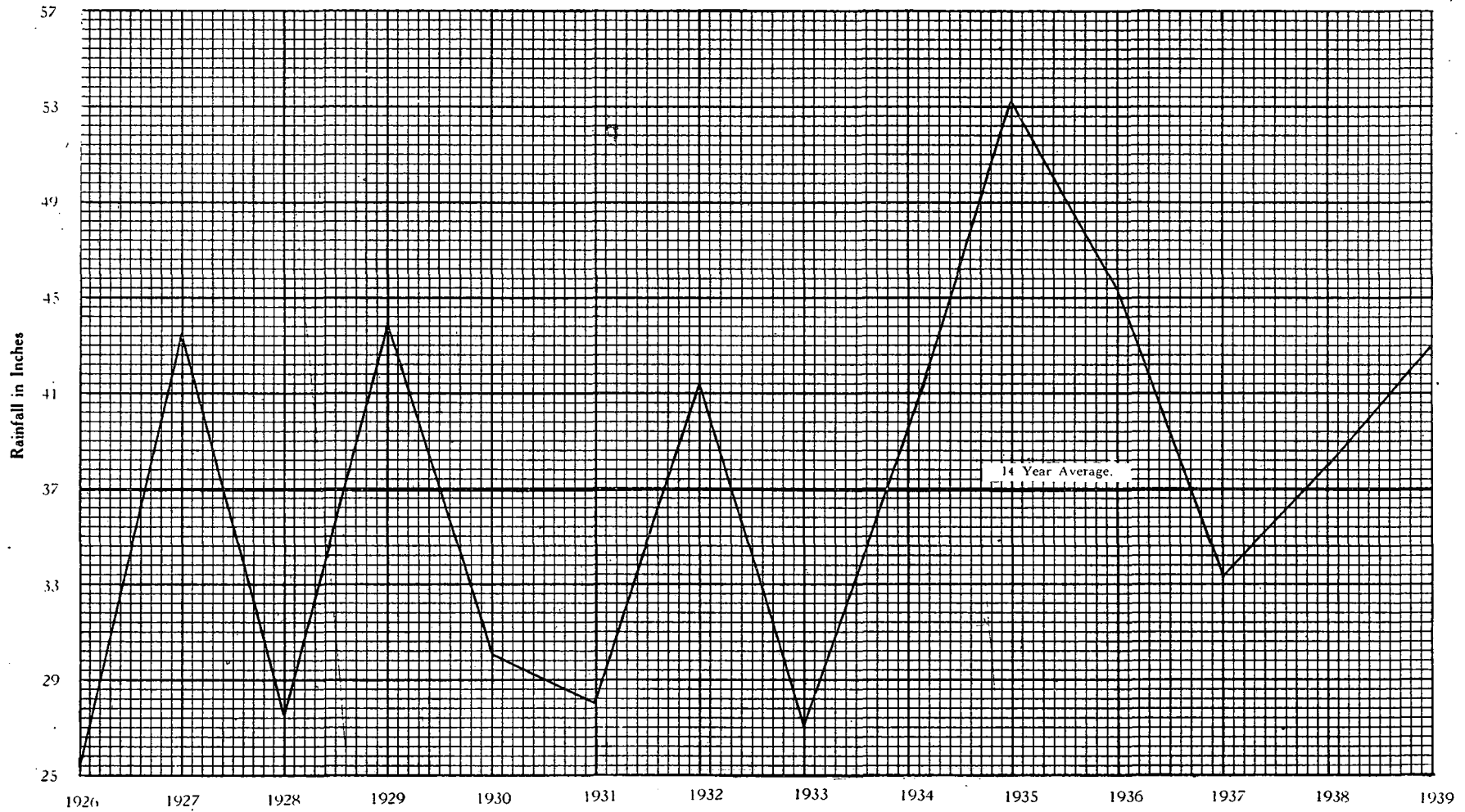


TOTAL RAINFALL FROM JANUARY

1939 ——— Average 1928/1939 - - - - -

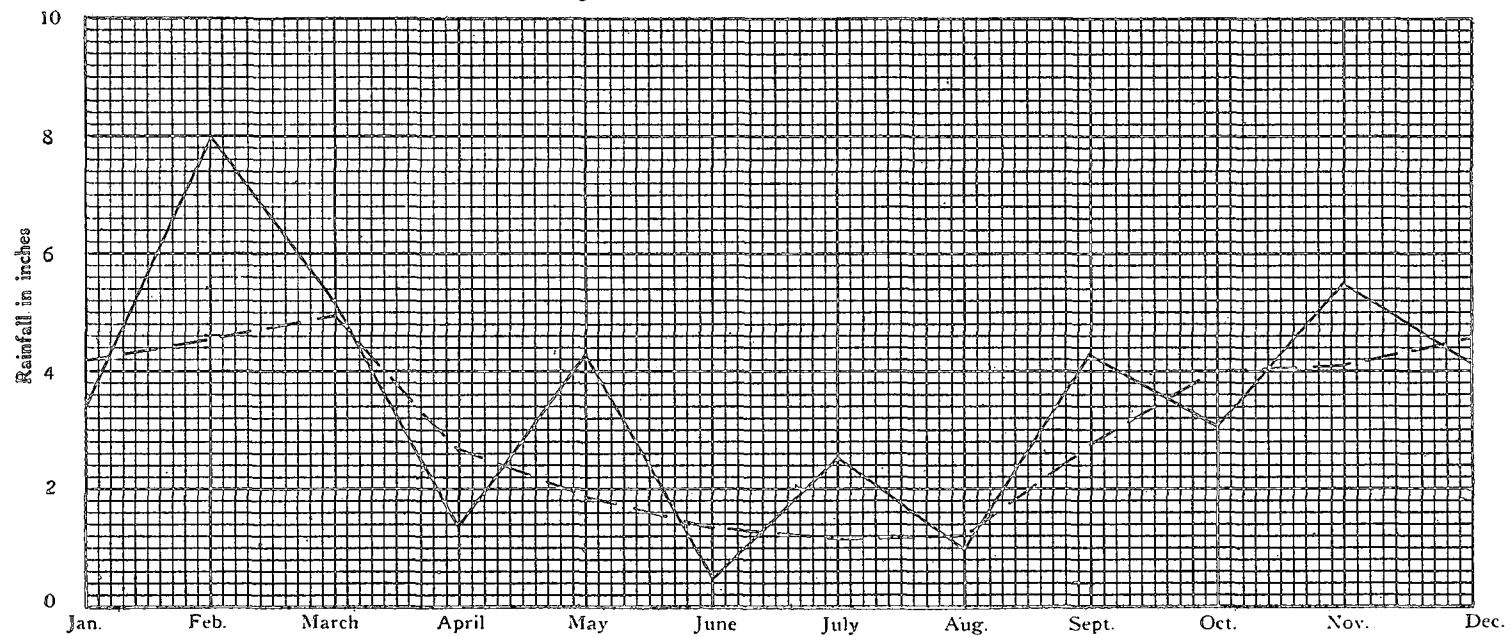


ANNUAL RAINFALL FOR EXPERIMENTAL STATION 1926/1939

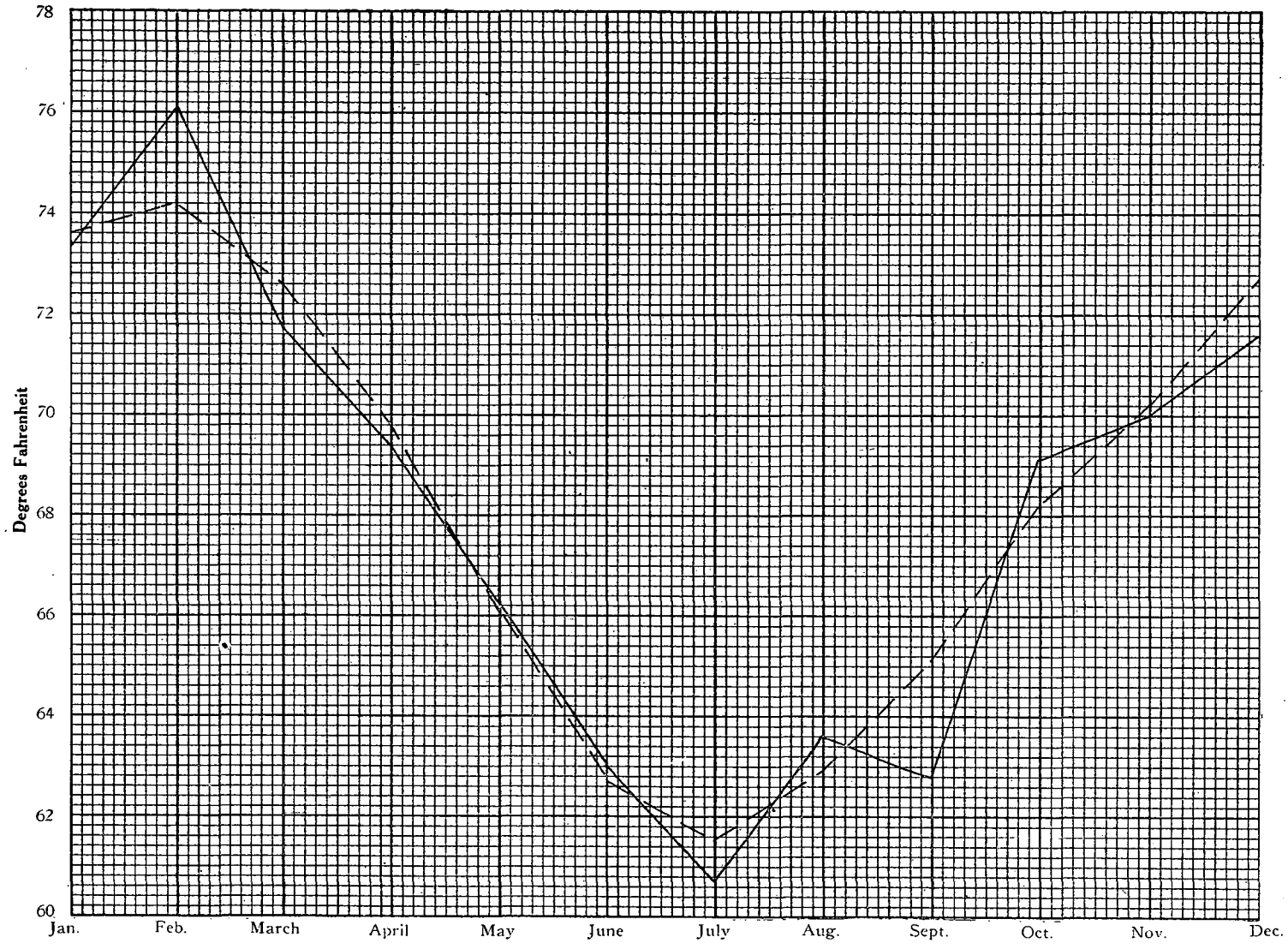




**RAINFALL BY MONTHS**  
Average 1887/1939 — — — — — 1939 —————



MEAN MONTHLY TEMPERATURE  
Average 1928/1939 — — — — 1939 —————



The PRESIDENT remarked on the annual improvement in the figures and opened the paper for discussion.

Mr. DODDS drew attention to the increase in recovery from 74 to 75 from 1929 to 1932 to just under 82 for the past year.

Mr. HAYES suggested that we ought to disregard molasses purity as a criterion of efficiencies in working. This figure is subject to too many differences in analysis to bear a true relation to efficiency in practice. The vital figure is molasses per cent. sucrose in cane, that would indicate whether there is room for improvement or not.

Mr. BIJOUX said purity of molasses did not go with recovery. He agreed with Mr. Hayes that the final figure to be sought was sucrose in molasses per cent sucrose in cane. Loss in filter-press cake has come down too, from six per cent. to two per cent.

Mr. DODDS remarked that some factories did report sucrose in molasses per cent. sucrose in cane, but the figures we had compared favourably with overseas figures.

Mr. BIRCHARD spoke on molasses purity determination. Errors in determination lay largely with the method of brix determination. He regretted that the industry had not adopted the refractometer basis some years ago.

Mr. DODDS stated that the various points raised would receive the attention of the Committee on the Standardisation of Chemical Control.

The PRESIDENT thanked Mr. Dodds for his informative paper and added that he thought the figures in this country compared very favourably with those of other progressive countries.

*(Applause).*