PFR SPTS No. 19716

Marlborough Meteorological Services

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1 Introduction

The funding that the Marlborough Research Centre (MRC) continues to provide for the provision of meteorological services facilitates a large range of activities, as follows:

- Meteorological information for community use.
- Access to the Grovetown Park weather station for education groups.
- Provision of data to the National Institute of Water and Atmospheric Research (NIWA) National Climate Database.
- Maintenance of a database of meteorological data for the Blenheim and Awatere stations.
- Provision of monthly meteorological summaries and press releases to local media.
- Publication of monthly meteorological summaries for the Blenheim and Dashwood Awatere weather stations on the MRC website.
- Provision of 11 monthly Met Report articles for inclusion in Winepress, the official magazine of Wine Marlborough.
- Provision of weather data to support many of the research projects that are conducted by The New Zealand Institute for Plant and Food Research Limited, Lincoln University, University of Auckland and Nelson Marlborough Institute of Technology.
- Provision of data to organisations associated with the wine industry, e.g. Bragato Research Institute, Sustainable Winegrowing New Zealand, Nelson Marlborough Institute of Technology Viticulture & Wine programme, Wine Marlborough and many wine companies.
- Provision of data for use by the wider agricultural and horticultural industries, e.g. Fruitfed Supplies, Farmlands Co-Operative Society Ltd, Fruition Horticulture (SI) Ltd.

Detailed summaries of data from the Blenheim and Awatere weather stations can be accessed on the MRC website www.mrc.org.nz.

2 Weather data for the 2019–20 year

Table 1 summarises the main weather parameters for the 2019–20 year, for the Blenheim weather station located at the Grovetown Park campus of the MRC.

Table 1. Blenheim weather summary for the 12 months from July 2019 to June 2020.

	LTA Mean Max °C	19/20 Mean Max °C	LTA Mean Min °C	19/20 Mean Min °C	LTA Mean °C	19/20 Mean °C	LTA GDD	19/20 GDD	LTA PET mm	19/20 PET mm	LTA Rain mm	19/20 Rain mm	LTA Sun hours	19/20 Sun hours
July	13.2	14.7	2.7	4.8	8.0	9.7	9.5	17.9	36.2	35.7	63.6	119.6	162.2	137.2
August	14.2	14.5	3.9	3.0	9.1	8.8	19.0	11.7	49.2	57.2	61.9	56.6	184.7	221.9
September	16.2	16.2	6.0	5.9	11.1	11.1	55.9	47.8	71.9	75.6	52.5	63.4	193.4	215.4
October	18.3	18.4	7.8	7.0	13.1	12.7	104.4	95.4	102.4	103.5	57.8	28.0	230.8	250.5
November	20.0	22.2	9.5	11.2	14.8	16.7	145.4	201.9	123.0	134.0	49.6	42.6	241.4	272.8
December	21.9	21.5	11.7	11.9	16.8	16.7	216.7	208.2	140.3	140.1	48.1	91.2	250.6	272.6
January	23.6	22.9	12.9	12.2	18.2	17.5	255.8	236.4	143.9	133.9	44.5	0.2	263.5	245.0
February	23.2	24.9	12.5	13.5	17.9	19.2	226.2	267.4	114.1	140.3	47.7	8.6	229.4	270.9
March	21.5	21.4	10.6	9.6	16.1	15.5	199.3	170.6	99.5	104.2	41.5	11.2	230.4	234.0
April	18.8	20.1	8.0	7.6	13.5	13.8	110.4	116.7	63.2	81.9	51.7	24.2	190.4	233.4
May	16.6	16.5	5.8	5.4	11.2	10.9	60.4	47.6	45.7	45.8	57.9	81.6	176.2	187.5
June	13.8	14.3	3.5	5.3	8.7	9.8	18.8	20.3	33.2	32.8	65.0	77.6	151.9	115.1
Total – July to June							1421.9	1441.9	1022.6	1085.0	641.8	604.8	2504.9	2656.3
Mean – July to June	18.5	19.0	7.9	8.1	13.2	13.55								
LTA comparison		+0.5°C		+0.2°C		+0.35°C		101%		106%		94%		106%
Sept to April – Mean Sept to April – Total	20.5	21.0	9.9	9.9	15.18	15.42	1314.1	1344.4	858.3	913.5	393.4	269.4	1829.8	1994.6

LTA – Long-term average Rainfall, Temperature, Sunshine, GDD – growing degree-days (1986–2019), PET – potential evapotranspiration (1996–2019).

2.1 Temperature

The mean temperature for the 12 months from July 2019 to June 2020 was 13.55°C; 0.35°C above the long-term average (LTA). The 2019–20 year is the fifteenth warmest July to June year on record in Blenheim, for the 88 years from 1932–33 to 2019–20. However, the 2019–20 year was considerably cooler than the previous two very warm years (2017–18 and 2018–19). The 2018–19 year is the warmest on record with a mean temperature of 14.02°C. The 2017–18 year is the second warmest on record with a mean temperature of 14.00°C. What is also of interest is that when we sort the mean annual temperatures for the 88 years from 1932–33 to 2019–20, many of the warmest years on record have occurred since 2000.

Despite the mean temperature for 2019–20 being well above average, only 5 of the 12 months recorded above average temperatures (Table 1). However, November 2019, February and June 2020 were much warmer than their respective long-term averages and these 3 months helped to push the yearly mean up above the LTA.

2.2 Sunshine

Total sunshine for the 12 months from July 2019 to June 2020 was 2656.3 hours (Table 1). This is the fifth sunniest July to June year on record. The 2018–19 year was the second sunniest on record. Blenheim has recorded some very sunny years in the past decade. Four of the five sunniest July to June years on record for the 90 years from 1930–31 to 2019–20, have occurred since 2014–15. Despite marked variation in annual sunshine hours over the past 90 years, the trend line in Figure 1 demonstrates that annual sunshine hours for Blenheim are now slightly higher than they were in 1930.

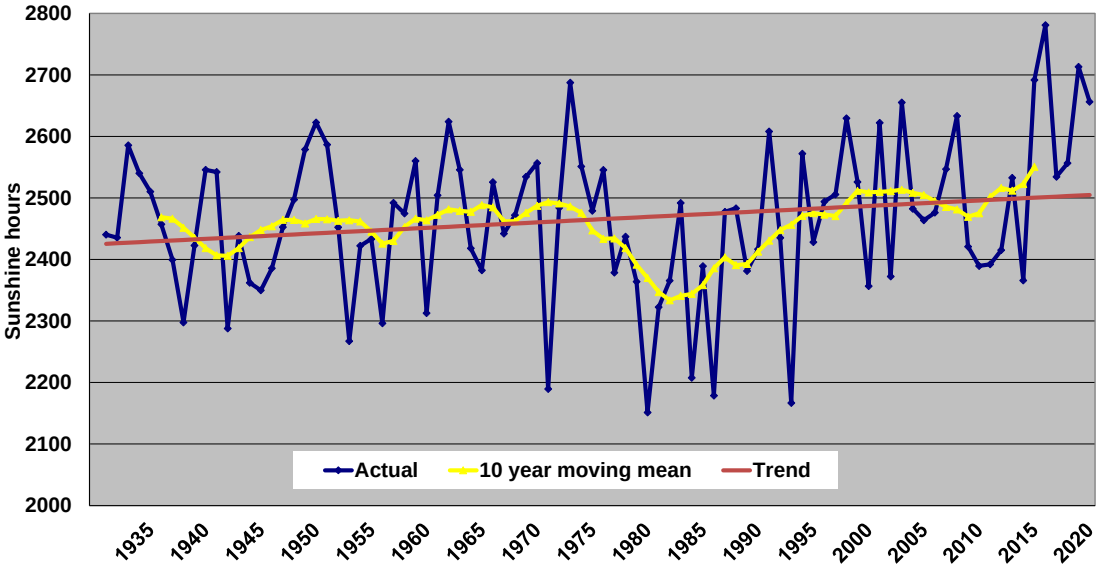

Figure 1. Annual sunshine hours for the 12-month period July to June, for the 90 years from 1930–31 to 2019–20.

2.3 Rainfall

Examination of the LTA monthly rainfall totals for Blenheim would seem that Blenheim has little variation in rainfall from month to month. However, what the LTA monthly totals hide is the marked variation in rainfall that can occur from month to month and for any given month from year to year, e.g. the lowest January rainfall total is 0.0 mm and the highest is 167.0 mm. When examining a year's rainfall, it is very rare not to see at least 1 or 2 months in a 12-month period that have either very low or very high rainfall totals. This was again the situation for the 2019–20 year (Figure 2). The first 6 months of the year from July to December 2019 recorded 401.4 mm rain; 120% of the LTA. However, total rainfall over the 133 days from 21 December 2019 through until 1 May 2020 was only 44.2 mm, or 21.6% of the LTA total of 201.1 mm. This is the lowest ever 133-day rainfall total, over any time period, for the 80 years from 1941 to 2020 (the period for which daily records are available).

January 2020 recorded only 0.2 mm rain. However, despite 0.2 mm being the lowest volume of rain that the automatic rain gauge can record, this only qualifies as the second lowest January total on record. January 1978 has the distinction of having recorded zero rainfall, the only month on record to have ever done so. February 2020 (8.6 mm), March 2020 (11.2 mm) and April 2020 (24.2 mm) all recorded well below their respective LTAs. The 2-month rainfall total for January and February (8.8 mm) and the 3-month total for January, February and March (20.0 mm) were both the third lowest on record. The fact there are two other years that have recorded even lower totals from January to March highlights how low rainfall totals in Marlborough can be in very dry seasons. January to March 1939 recorded 9.7 mm and January to March 2001 recorded 19.6 mm. While the dry period of 133 days from 21 December 2019 through until 1 May 2020 was the driest for this length of time, it was not the longest dry period that Marlborough has experienced. The drought that occurred over the 2000–01 season lasted for 6 months. The 180 days from 6 November 2000 through until 4 May 2001 only recorded 75.8 mm rain, 30% of the LTA.

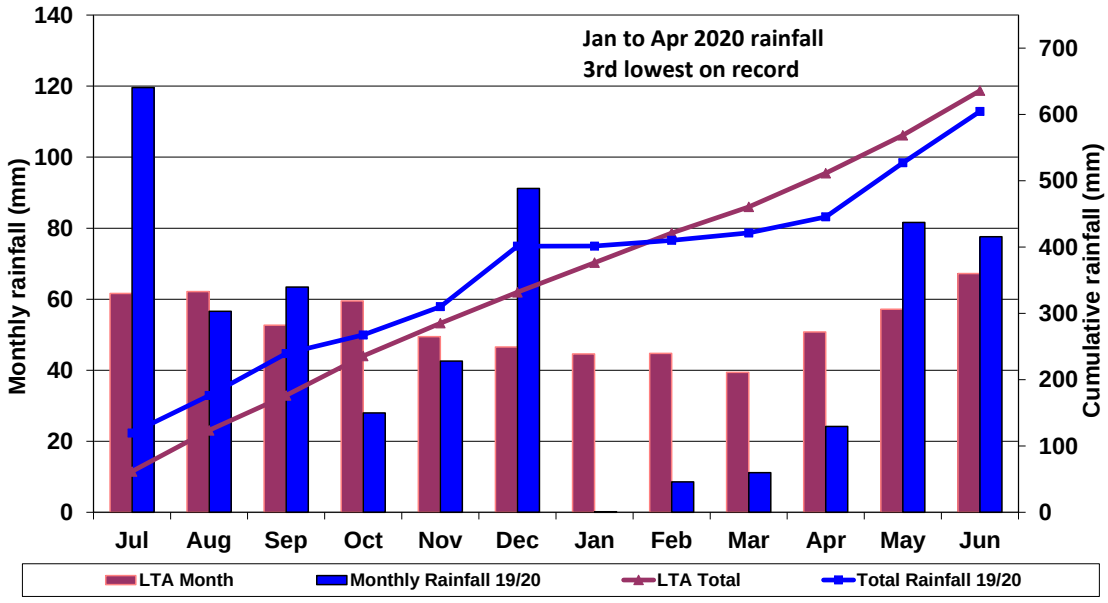

Figure 2. Monthly and cumulative rainfall in Blenheim for the 12 months from July 2019 to June 2020 compared with the long-term average (LTA).

2.4 Water deficit and soil moisture

The seasonal water balance (Figure 3) is the difference between the 3-monthly running totals of rainfall and evapotranspiration. It is a way of identifying whether the current season is tracking wetter or drier than the LTA. In mid-November 2019, the water balance was close to average. But by mid-December the water balance had fallen well below average. However, 58.2 mm of rain from 15 to 20 December 2019 reduced the deficit back closer to average and the water balance line tracked the average line through until mid-January 2020. The water balance line began to drop below the average line from mid-January and then fell sharply during February 2020. This was because of the lack of summer rainfall in January and February. However, at the beginning of March 2020, although the seasonal water balance was well below average, it was still higher than at the same point in March 2017 and 2019. The graph highlights how far below average the water balance lines were in February and March 2017, 2019 and 2020. From mid-March 2020 onwards the 2019–20 water balance line was

well below the 2017 and 2019 lines. It was at this point in mid-March 2020 when the 3-month rainfall total was only 10 mm. The low rainfall in the early months of 2020 was quite widespread across New Zealand.

On 19 March 2020, the 3-month water balance was –392.8 mm, which was 162.4 mm lower than average. As there was no significant rainfall until early May 2020 the water balance line for 2019–20 stayed much lower than average and lower than in the previous 3 years, right through until June 2020. The water balance was back close to average at the end of June 2020 because of the above average rainfall in May and June. However, note that this graph only shows the water balance over a rolling 3-month period. At the end of June 2020, there was still a significant water deficit over the 6-month period from January to June 2020.

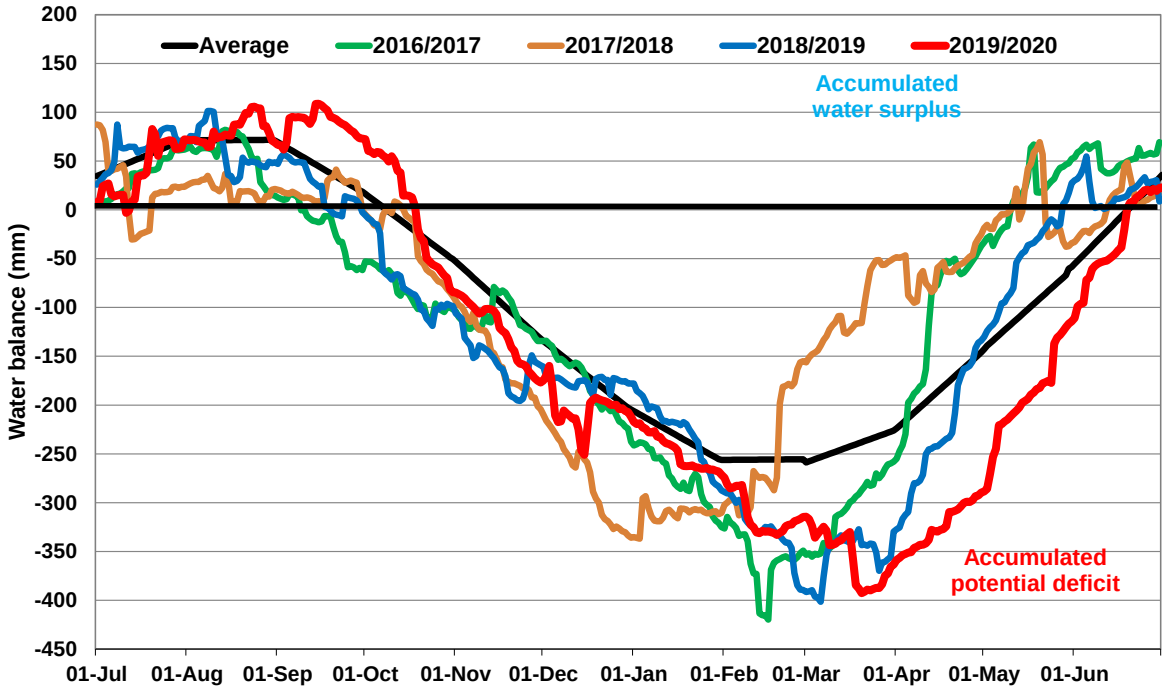

Figure 3. Seasonal water balance for Blenheim: difference between 3-month totals of rainfall and potential evapotranspiration

This rainfall deficit that had built up over summer and the first 2 months of autumn meant that soils in Marlborough were very dry in early May 2020. Figure 4 presents the shallow soil moisture at the site of the Blenheim weather station. As the soil moisture is only measured in the topsoil from 5 to 35 cm depth it changes fairly rapidly in response to either lack of rainfall or significant rainfall events. The line for 2019/20 clearly demonstrates the large rise in soil moisture from 18 to 35.7% between 1 and 19 December 2019 in response to the 91.2 mm rain received over that period. However, with virtually no rain received during January 2020 the shallow soil moisture plummeted and was sitting at 14.6% on 9 February, close to the minimum value possible. The shallow soil moisture stayed much lower than average through until early May 2020. Well above average rainfall in May and June 2020 restored the moisture in the topsoil back up close to average by mid-June. However, following a significant period of low rainfall it can take many months to restore soil moisture throughout the soil profile. Unfortunately we do not have soil moisture measurements below 35 cm depth at the site of the

Blenheim weather station. However, previous studies in vineyards have demonstrated that well above average rainfall is required in order to allow water to percolate through the soil profile and restore the soil moisture back up to field capacity. The normal time for soil moisture to be recharged is from April to August when evapotranspiration is low.

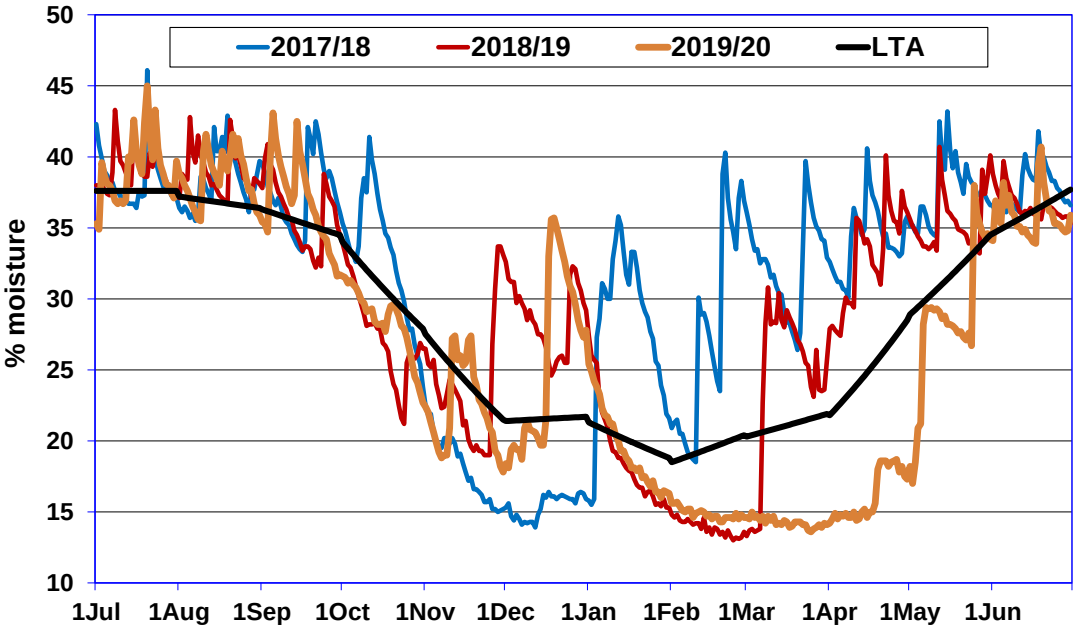

Figure 4. Shallow soil moisture (5–35 cm depth) at the Blenheim weather station. LTA = long-term average.

The rainfall deficit from 21 December 2019 to 30 April 2020 was 156.9 mm. Average monthly rainfall in Blenheim from May to August is 62 mm. In order for the rainfall deficit to be recovered over the 4 months from May to August 2020 would require Blenheim to receive 101 mm rain for each of those months. At the time of writing in early July, Blenheim had recorded above average rainfall in May (81.6 mm) and June 2020 (77.6 mm); however, both months were well short of 101 mm. This indicates that Marlborough is likely to go into the new season in September 2020 with a continuing rainfall and soil moisture deficit.

2.5 Wairau river water consents in 2019 and 2020

The Marlborough District Council monitor the flow in a number of Marlborough's rivers. When the flow rate drops to certain specified limits, Class C, B and A water consents are sequentially shut off and water is no longer available to be drawn from the rivers. Total rainfall was very low in both January and February 2019 (11.8 mm) and 2020 (8.8 mm). However, there was a marked contrast between the 2019 and 2020 seasons with regard to the Wairau River Class A water consents, which are shut off when flow in the Wairau drops below 8 m^3/s. Data supplied by Val Wadsworth at the Marlborough District Council (Figure 5) details that in 2019 Wairau River Class A consents were shut off on 1 February and continued to be off until 8 March 2019, with the exception of 1 day, a total of 35 days. A couple of good rain events in March 2019 then meant there were no further substantial restrictions. In 2020, the dry period started later, after the above average rainfall in the first 3 weeks of December

put some base flow into the upper Wairau River catchment. Consequently, restrictions in 2020 were nearly a month later and then some very small rainfall events in the headwaters just kept flows above the threshold, resulting in three short shutoffs in 2020 totalling 7 days: 28–29 February, 15–17 March, and 20–21 March. Figure 5 displays the Wairau River flow at Barnett's Bank for the period January to March 2019 (black line) and 2020 (red line).

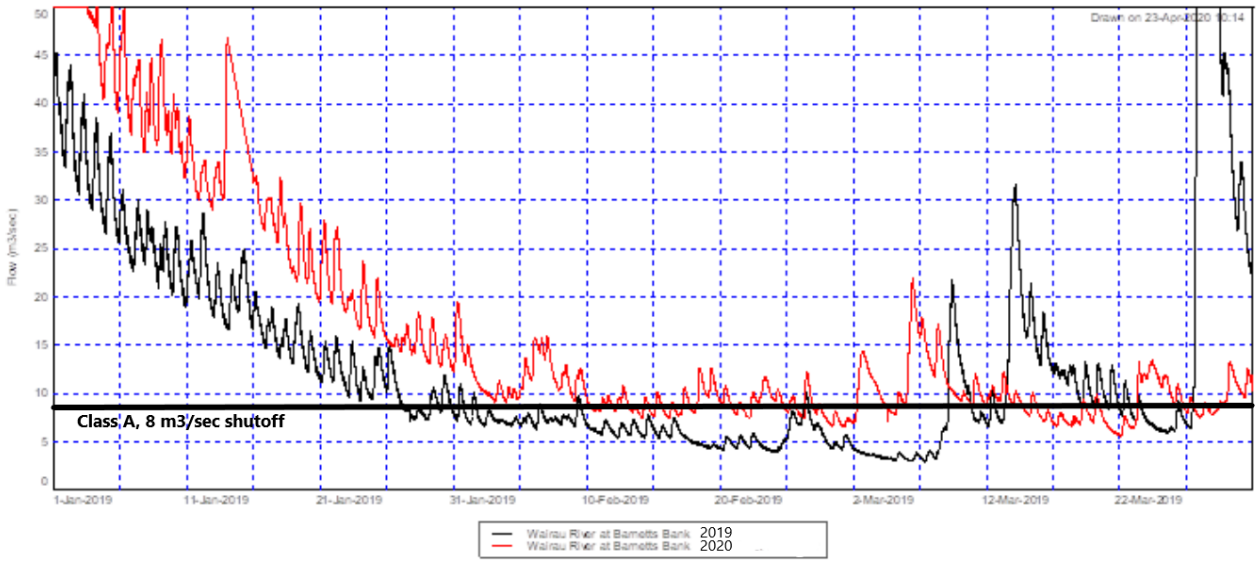

Figure 5. Wairau River flow at Barnett's Bank: January to March 2019 (black line) and 2020 (red line).

3 Key funding sources

- Marlborough Research Centre Trust
- The New Zealand Institute for Plant and Food Research Limited
- Wine Marlborough/Tasman Crop Protection
- National Institute of Water & Atmospheric Research (NIWA) (annual calibration and maintenance of the Blenheim weather station).

Confidential report for:

Marlborough Research Centre Trust
Project #1

PUBLICATION DATA

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