Department of Primary Industries

primefact

Water use efficiency in blueberries

April 2020, Primefact 1783, First edition

Melinda Simpson, Development Officer – Blueberries, Wollongbar

Efficient water use in horticulture crops is a key management strategy for growers. It can help reduce production costs and minimise the negative effects of reduced water availability to plants, including during drought. The following are some strategies blueberry growers should consider implementing to help mitigate the effects of limited water availability and make their orchards more resilient during drought conditions.

Pre-season planning and irrigation system checks

A pre-season water management plan might include:

- estimating the water requirements per block
- expected irrigation periods e.g. September–February
- irrigation scheduling and frequency during these periods
- run times per irrigation
- prioritising blocks if water becomes limited (this will be easier if it is done before the season rather than during the season).

System checking involves a test run before the irrigation season to assess the system output and identify any problems such as breakages, blockages or off-target water losses.

For blueberries grown on slopes, checking the distribution uniformity and drain percentage are very important.

Where sub-mains are not pressure-compensated and are on steep slopes, excess water will be distributed to the lower drip lines until they finish draining (Figure 1). There have been instances where plants at the lower end of the blocks were receiving four times more water than the intended amount because of drainage issues (Figure 2).

Operating pressure is another common issue that greatly reduces distribution uniformity. Check that you have:

- at least 120 kPa
- 200 kPa at the highest or furthest point in every block.

This will ensure the pressure compensating (PC) drippers can effectively meter out the same volume to every plant being irrigated.

Figure 1. Check valves can reduce the drainage from mains to the lowest dripper. Photo: Robert Hoogers.

Prioritise blocks

Newer blocks are often the most valuable because they contain high-value varieties and represent the future of the plantation. Water stress on young developing trees can result in stunted growth and poor block establishment.

When developing your irrigation plan, prioritise young blocks above older blocks and those which do not perform well. In extreme circumstances, you may need to walk away from some blocks and focus on those with the highest known value and returns. Drought can also be a strong motivator to remove those old blocks or varieties that have been under-performing.

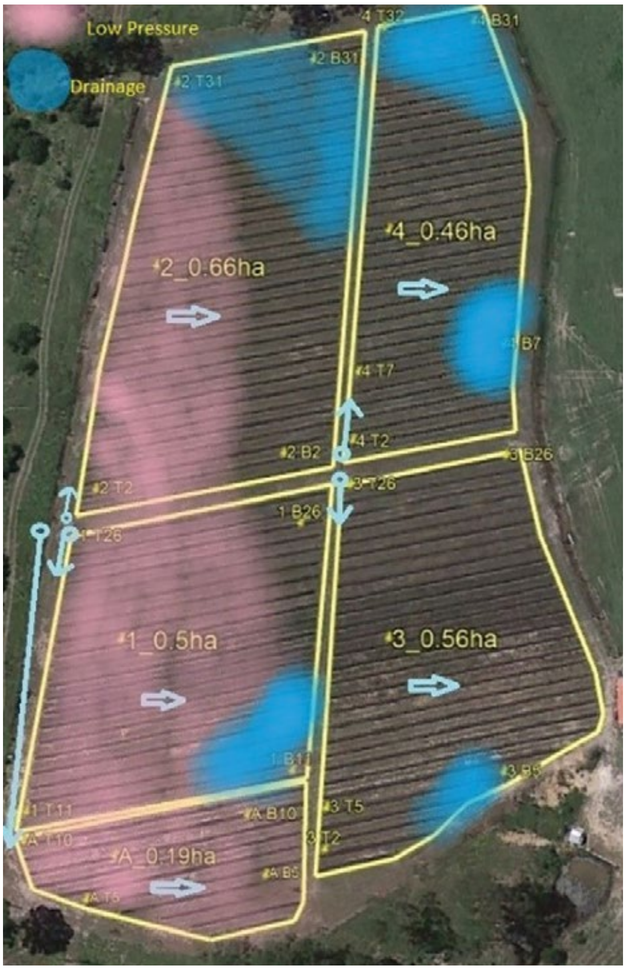

Figure 2. An example property showing areas where sub-main drainage could be a problem (blue shaded areas). Photo: Robert Hoogers.

Soil and substrate moisture monitoring

Using irrigation water efficiently during water shortages is paramount. Monitoring the fate of water applied to the soil is the only way to properly understand if it is meeting crop needs and not resulting in waste and nutrient loss through leaching.

An effective monitoring regime can reduce water use by up to 40% without affecting yield.

There are two main types of soil moisture probes (Table 1); those measuring soil water tension (i.e. tensiometers or gypsum blocks) and those measuring volumetric soil moisture (i.e. capacitance probes).

Tensiometers measure how hard a plant must work to extract the available moisture at a given time, whilst capacitance probes measure the total water in the soil and indicate how it changes. Typically, tensiometer probes have a single sensor, meaning multiple probes will be required to track soil moisture at various depths.

If you do not want to use a monitoring system, an alternative is to use a soil auger (or equivalent device) that you can push down and take a soil sample from the root zone. The presence/absence of saturated/moist/dry soil will provide a rough estimate of whether you are over or under watering.

Water wisely

Blueberry plants have a relatively shallow root system, with most roots in the top 20–30 cm of the soil. This means that irrigation should be applied in short, frequent bursts (i.e. pulse irrigation) so the water and nutrients stay within the root zone and are therefore available to the plant. Knowing your soil and understanding root zone depth will help you determine how much water can be held in the root zone. In general, sandy soils are free-draining and will hold less moisture and therefore need to be irrigated more frequently and for a shorter duration than loams or clays.

Reducing moisture loss

Ensuring good weed control, particularly near the effective root zone, will minimise moisture losses due to competition.

Applying organic mulches (where practical) will reduce drainage loss by improving field capacity and will also reduce the loss of important nutrients through leaching.

Additionally, mulch (Figure 3) will:

- reduce evaporation from the topsoil
- provide protection from erosion during heavy rain
- prevent crusting and sealing of the soil surface, thus allowing better water infiltration
- modify soil surface temperature
- suppress weeds, provided the mulch is deep enough to block out light and prevent seed germination and growth.

Table 1. A comparison of the main soil and substrate moisture monitoring systems.

System	Measures	Advantages	Disadvantages
Tensiometer	Soil water tension	• relatively inexpensive • easy to install • easy to use	• labour-intensive to collect data • require regular maintenance • inaccurate at high tensions • can be inaccurate in sandy soils
Gypsum block	Soil water tension	• relatively inexpensive • easy to install • easy to use	• inaccurate at low tensions • have limited life as gypsum dissolves
Capacitance probe	Volumetric soil moisture	• continuously logged • very sensitive and responsive to soil moisture	• costly • can require skill and training in interpretation • removal and re-installation can be considered difficult if re-developing mounds every few years
Moisture sensors and weigh scale (substrate monitoring)	The moisture level of the substrate using a weighing scale, the data collected is used by a moisture balance module to control water and fertiliser dosing and timing	Determines the optimal irrigation start strategy based on three important influences: • the quantity of water evaporated • the desired amount of drain water • the water content of the substrate.	• costly • can require skill and training in interpretation

Figure 3. Mulch will reduce evaporation from the topsoil as well as provide protection from erosion.

Test water quality

Water quality is highly variable and is dependent on the water source (e.g. rainwater, farm dams, river, bore, town reservoir). Water quality can also vary throughout the year and after high rainfall or drought.

Water quality should be tested, particularly when water sources are getting low. There can be significant differences in water quality between a full dam and an almost empty dam. This is important because iron and iron-loving bacteria can cause blockages in drippers and blueberries are sensitive to high salinity (Figure 4 and Figure 5) and chloride levels. Certain varieties, such as Snowchaser and Rabbiteye, are highly susceptible to damage from high salt levels.

If using an underground water source (e.g. bore water), obtain a full laboratory test annually. If extending the interval between tests to two years, use test strips to check water quality in between. If a significant change in pH or hardness is noticed on the test strips, the water should be retested by a laboratory.

Table 2 provides a summary of the ranges for specific water quality parameters and the levels of salt, chloride, iron and pH that are applicable when irrigating blueberries.

Figure 4. Blueberries do not tolerate high salinity irrigation water.

Figure 5. A blueberry plant showing early signs of suffering from salinity.

Summary

Efficient water use is especially important during drought. By implementing a few water-saving strategies on your blueberry farm, you can mitigate some of the effects. Consider doing pre-season irrigation system checks to ensure you are getting the desired output and there are no blockages or breakages. Ensure that your irrigation is uniformly distributed, especially to blueberries grown on slopes. If necessary, consider prioritising water to the higher-value blocks and perhaps remove non-performing blocks or varieties.

Knowing how much water is going onto your crop and where exactly that water is going is essential, so consider installing some sensors to measure soil moisture. Apply mulch as it has many benefits for blueberry crops and make sure the water you are using is suitable for blueberries; they are highly sensitive to high levels of salt and chloride.

Useful resource

Anon. 2016. Irrigation management of blueberries in Northern NSW, Primefact 1509, NSW DPI. https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/693341/irrigation-management-of-blueberries-in-nthn-nsw.pdf

Acknowledgements

Robert Hoogers, Research Development Officer – Soil and Water R&D Unit, Yanco

Table 2. Water quality parameters to consider when irrigating blueberries.

Test	Fine	Be careful	Problem
Electrical conductivity (salinity)	0.8 dS/m	0.9–2.3 dS/m	>2.3 dS/m
pH	5.5–6.5	6.6–8.5	>8.5
Chloride	<350 mg/L	350–450 mg/L	>450 mg/L
Iron	–	0.1–1.0 mg/L	1.0 mg/L

Support for drought affected farmers

Department of Agriculture: http://www.agriculture.gov.au/ag-farm-food/drought

DroughtHub: https://www.dpi.nsw.gov.au/climate-and-emergencies/droughthub

Reference number: PUB20/226.

Hort Innovation Strategic levy investment | BLUEBERRY FUND
Hort Innovation Strategic levy investment | RASPBERRY AND BLACKBERRY FUND
Hort Innovation Strategic levy investment | STRAWBERRY FUND

This project has been funded by Hort Innovation using research and development levies from the Blueberry Fund, Raspberry and Blackberry Fund and Strawberry Fund and funds from the Australian Government. For more information on the funds and strategic levy investment visit horticulture.com.au