Water management during drought

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During drought, producers should implement all possible management strategies that maximise water use efficiency and minimise the negative effects of reduced water to the plants. This article provides some strategies that growers can consider implementing to help mitigate the effects of drought.

Water Management Strategies

Pre-season planning & irrigation system checks

A pre-season water management plan might include estimating the water requirements per block, expected irrigation periods, scheduling, frequency, run times and prioritising blocks if water becomes limited. Planning ahead for blocks that will be placed on plant survival irrigation, if necessary, will be easier before the season rather than during the season. System checking involves a test run before the irrigation season to assess system output and identify any problems such as breakages, blockages or off-target water losses.

> **For blueberries grown on slopes, checking your distribution uniformity and focusing on your drain percentage is very important.**

Where sub-mains are not pressure compensated and are on steep slopes, excess water will be distributed unevenly to the lower drip lines until they finish draining.

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 1).

If sub mains are on steep slopes, a check valve at the start of each dripper line can reduce the drainage from mains into the lowest drippers (Figure 2).

Figure 2. Check valves can reduce the drainage from mains to the lowest drippers. Photo credit: Rob Hoogers

According to Irrigation Officer at NSW DPI Rob Hoogers, operating pressure is another common issue that greatly reduces the distribution uniformity.

Check that you have at least 120Kpa, it is better to have 200Kpa at the highest or furthest point in every block. This will ensure the PC dripper can do their job and meter out the same volume to every plant during your irrigation.

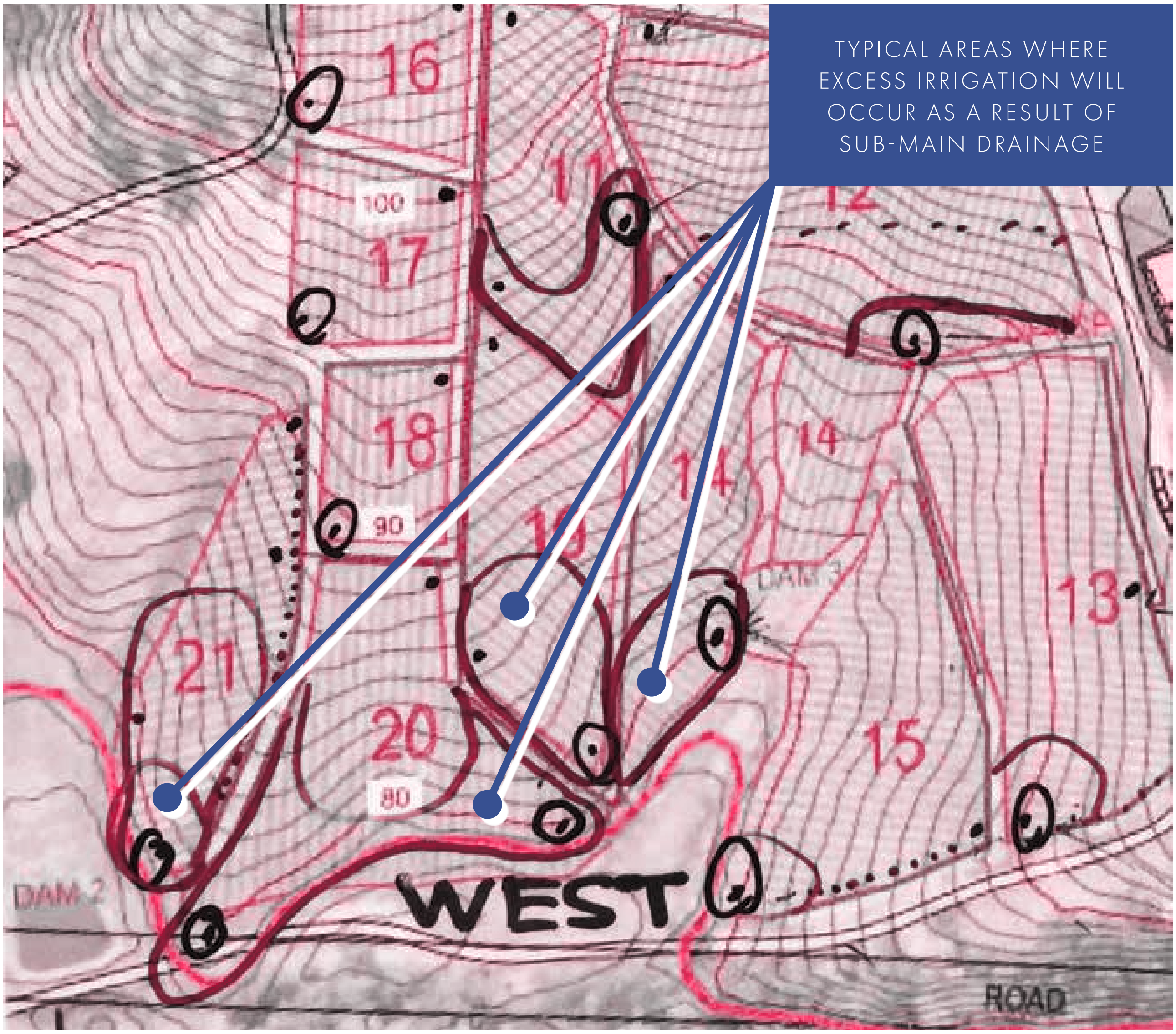

Figure 1. A property example showing areas where sub-main drainage could be a problem.
Photo credit: Melinda Simpson

Prioritising 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 plants 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. Look at historical production and income from each of the blocks, as this will also assist in deciding priorities.

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/varieties that have been under-performing.

Soil/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 the water being applied is sufficient and targeting the root zone.

> **By using monitoring, water use can be reduced by 40% without affecting yield.**

There are two main types of soil moisture probes; 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 total water in the soil and indicate how this changes. Typically, tensiometer probes have a single sensor, meaning that multiple probes will be required to track soil moisture at various depths. Table 1 compares the different types of soil moisture monitoring systems.

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 sample at the root level. This will provide a rough estimate of whether you are over or under watering.

Table 1. Comparison of main soil moisture monitoring systems

System	Advantages	Disadvantages
Tensiometers	Relatively inexpensive Easy to install Can be read by growers	Labour-intensive to collect data Require regular maintenance Inaccurate at high tensions Can be inaccurate in sandy soils
Gypsum block	Relatively inexpensive Easy to install Can be read by growers	Inaccurate at low tensions Have limited life as gypsum dissolves
Capacitance probe	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

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 short in duration and frequent in application (i.e. pulse irrigation) so that the water and nutrients stay within the root zone and therefore are 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 tend to hold less moisture and therefore need to be irrigated more frequently and for a shorter time frame than loams or clays.

Reducing moisture loss

Ensuring good weed control, particularly near the effective root zone, will minimise moisture losses due to competition. Weed control can be physical or chemical. Applying organic mulches where practical will reduce drainage loss by improving field capacity and will also reduce the loss of important nutrients through leaching.

A ground cover will reduce evaporation from the topsoil as well as provide protection for erosion during heavy rain. Mulches prevent crusting and sealing of the soil surface, thus allowing better water infiltration. Mulches will also modify soil surface temperature. Mulches can provide the added benefit of suppressing weeds, provided the depth of the mulch is sufficient to block out light and prevent seed germination and growth (Figure 3).

Figure 3. Mulch will reduce evaporation from the topsoil as well as provide protection for erosion when it does start to rain again
Photo credit: Melinda Simpson

Table 2. Water quality parameters 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

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 periods of 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.**

If using an underground water source (e.g. bore water), obtain a full laboratory test annually and not more than two years apart. 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 re-tested 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.

The images in Figures 4 and 5 demonstrate the effects that high salt and chloride levels in irrigation water will have on blueberries. It has been observed that certain varieties such as Snowchaser and Rabbiteye are highly susceptible to damage from high salt levels.

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Figure 4 and 5. Effects on blueberries due to high salinity irrigation water. Photo credits: Melinda Simpson