June 2024

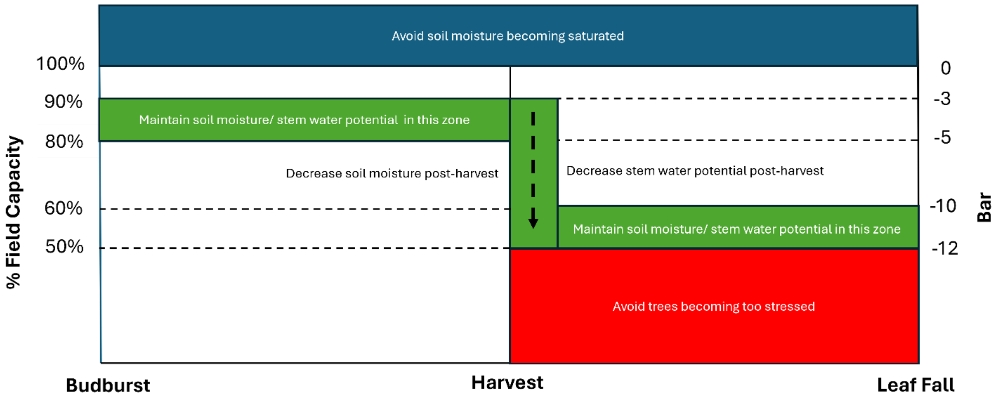
# Irrigation Best Practice Information for Cherry Growers

## Scheduling Irrigation

The following information is taken from the literature review.

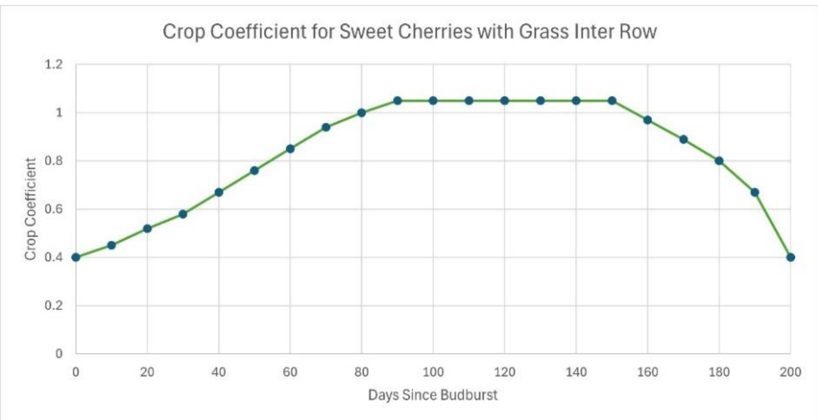
***Pre-harvest -*** Maintain soil moisture between 80 and 90% of field capacity, and stem water potentials between -1 to -7 Bar (ideally between -3 to -5 Bar). Doing this will reduce incidences of cracking and improve fruit quality.

***Post-harvest -*** Gradually reduce soil moisture to the soil's stress point (typically between 50 and 60% of field capacity in a soil with high sand content and between 55 and 65% for a silty soil), and stem water potential between -7 and -15 Bar (ideally between -10 to -12 Bar). Doing this will reduce vegetative growth while having no impact on the following seasons crop.




*Source: Primary Insight visual representation of the literature review best practice irrigation information*

***Cherry daily water use (with a grass inter row) -*** Daily water use (mm/day) can be calculated by multiplying daily potential evapotranspiration (PET) by a crop coefficient (kc). The crop coefficient typically starts at 0.4 (from budburst) and over a period of 90-days increases at a linear rate to 1.05 (full canopy). After 150-days the crop coefficient then decreases back down to 0.4 (at leaf fall). As an example, at 30-days from budburst the kc is 0.6, if the PET was 3.6mm on a given day, the actual daily water use would be 2.2mm.




*Source: Utah State University extension paper*

# Key Considerations for Best Practice Irrigation

## 1. Tree Rooting Depth & Soil Water Holding Capacity

Understanding differences in soil types across the orchard and the characteristics of each different soil type down the profile, allows the potential rooting depth and soil water holding capacity to be calculated for each block.

Most soils in Central Otago have a high sand content, a high stone content or pan below 40 to 60cm, and therefore a low to moderate water holding capacity, typically 60 to 90 mm down to 60 cm.

Knowing this information allows the application depth (run-time) and timing (frequency of irrigation in relation to tree water use) to be correctly set for each block. The objective is to avoid applying irrigation beyond where tree roots can abstract it.

Undertaking a soil survey (radiometric or soil conductivity) and ground truthing this (soil pits down to at least 60cm based on the differences found in the survey) is recommended. Alternatively, a transect of soil pits across the orchard, that also accounts for known changes in landform or soil type can be used.

## 2. Irrigation Application Depth

For sprinkler irrigation systems calculating the irrigation depth applied is a product of the flow rate and sprinkler spacings (how many per hectare). Orchard sprinkler irrigation systems typically apply 3 - 4 mm per hour.

When managing irrigation close to field capacity or near to the soils stress point (replacing daily tree water use) run times should be around 1-hour in the early season and then extended to 2-hours (typically from late November). During dry periods at the peak of the season occasional 3-hour irrigations may be necessary. Late in the season run times then reduce back to 1-hour (typically from mid-March).

For drip systems, calculating the irrigation depth applied is a product of the flow rate and dripper spacings (how many per hectare). Most orchards with double drip line systems apply around 2 mm per hour. However, when the reduced wetted zone is considered (typically 40%) this increases to a 5mm per hour equivalent in the wetted zone.

This is an important consideration for soils of low water holding during the peak of the season. Applying 3 or 4-hours of irrigation (6 to 8 mm) results in an application depth of 15 to 20mm in the wetted zone. If applied in one application this may result in irrigation being lost below the rooting zone. Split irrigations (two applications over the day) are therefore recommended. The split irrigation approach (pulsing) has also been shown to increase the lateral movement (horizontal spread) of water in the soil under dripline systems.

## 3. Soil Moisture Sensor Location

Soil moisture sensors only measure a very small volume of soil. It is essential their location is representative of the blocks soil water holding characteristics. Best practice recommends siting them in the lowest water holding capacity soil type present that makes up at least a quarter of the block, and in an area where the average depth of irrigation is being applied. Factors that influence the location of sensors include the landscape (avoid hollows or tops of ridges), and their location in relation to drippers or sprinklers. Avoid siting sensors directly underneath of beside drippers or sprinklers, and ensure they are not located in areas where tree trunks or branches can obstruct irrigation resulting in an irrigation rain shadow.

## 4. Regularly Check Irrigation Around Sensors

Managing irrigation system performance is critical. At the very least there should be a regular focus on the blocks and immediate areas around sensors used for irrigation decision-making. Faulty solenoid valves and split laterals can greatly impact (reduce and increase) the irrigation depth applied, as can blocked drippers, or broken, blocked or knocked over sprinklers. All result in monitoring data that is very difficult to make irrigation decisions from.

To prevent these issues valves, laterals and dripper or sprinkler checks should be undertaken at least weekly in blocks with sensors in them, and preferably across the entire orchard. This becomes more important as the irrigation system ages (typically +5-years old). When replacing split drip tube or broken or blocked sprinklers, it is critical they are of the same flow rate and spacing or coverage (throw). The irrigation system should also be fully checked at the start of each irrigation season, including cleaning filters that do not have automatic flushing. Information around how to assess irrigation drip-micro irrigation systems can be found on the IrrigationNZ website.

## 5. Invest in Irrigation System Control

When managing to a specific level of soil moisture or tree stress, investing in a modern automated irrigation controller will make life easy, particularly over harvest. The ability to have preset irrigation schedules and quickly change between these should not be underestimated.

## 6. Identify & Manage Surface Soil Compaction

Soil textures of high sand content are susceptible to surface soil compaction through 'hard setting'. This develops when the soil is dry for long periods creating a dense layer at the soils surface that water struggles to permeate through. Run-off under drip irrigation systems can occur on slopes or if long irrigation run times are used. When run-off happens around soil moisture sensors it can result in data that is very difficult to interpret.Regularly checking around the soil moisture probe for signs of surface soil compaction is recommended.

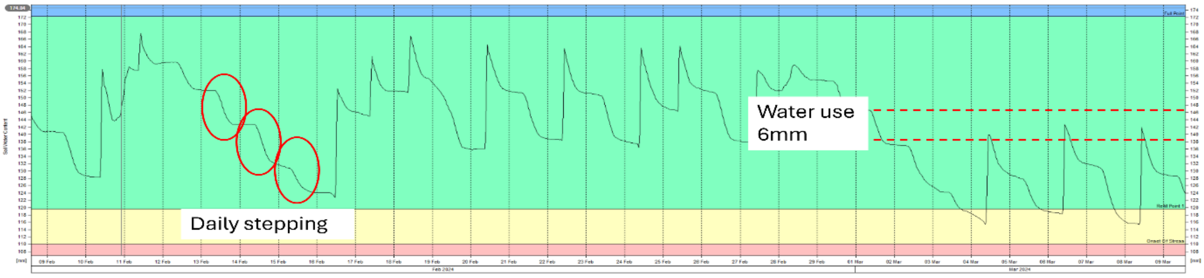
To prevent this, irrigation should be run in short pulses of around 1-hour or less as this helps to prevent the soil surface 'drying-out'. Narrowing the weed-spray strip and the use of interrow cover crops with a mixture of plant species can also help alleviate soil surface compaction.

## 7. Interpreting Sensor Monitoring Data

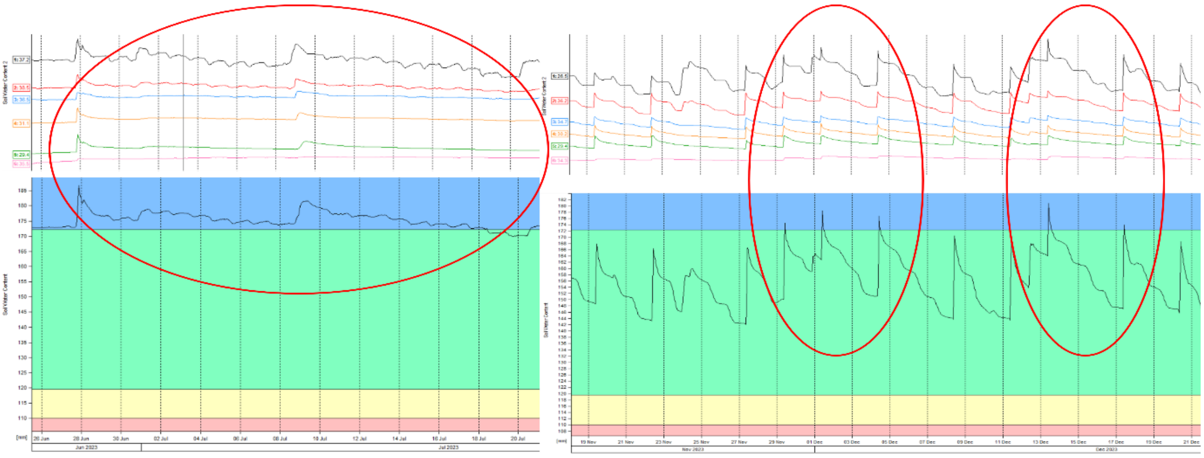
Using sensor data for irrigation decision-making requires an understanding of how to interpret the data. Information is provided below on how to read a soil moisture or stem water potential trace.

Sensor monitoring data also needs to be checked against field observations of the trees around them. This allows the sensor readings to be related to tree and fruit growth and quality characteristics and will help to better inform irrigation decision-making.

### *Soil Moisture*




Each step on a soil moisture trace is a day (trees use water during the day but not at night).
The amount each step decreases is a measure of daily tree water use, the greater the step the higher the water use.



Soil full point is set by looking for very wet periods during the winter, or during the season look for spikes in the trace caused by rainfall or irrigation events when all sensors down the profile rapidly respond.
Soil stress points is typically set as a % of the full point (50-60% in soils of high sand content) but laboratory analysis can also be used to inform this.

### *Stem Water Potential*