Department of Primary Industries

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Irrigation scheduling principles for horticultural crops

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Agriculture NSW Water Unit

Crops that are kept within acceptable stress limits during their growth cycle have the potential to produce optimum yields of high quality. The aim of irrigation scheduling is to keep soil moisture within a desired range, usually between field capacity (full point) and a predetermined refill point for optimal growth.

Scheduling involves deciding when and how much to irrigate by considering:

- your soil's readily available water-holding (RAW) capacity
- the application rate (millimetres per hour) of your irrigation system. This allows you to calculate how many hours are needed to apply the required amount of water (in millimetres).
- the evenness of water application (distribution uniformity, DU%) and efficiency of the system
- the current water content of the soil
- the rate of crop water use.

Why schedule?

By failing to make an informed decision about when to irrigate and how much to apply, you risk either over-irrigating or under-irrigating.

Over-irrigating

- can waterlog plants and damage crop health
- wastes water that you have paid for
- wastes pumping power
- leaches nutrients
- produces excess drainage
- restricts property access.

Under-irrigating

- stresses plants, and reduces production
- causes nutrient deficiencies
- increases salt accumulation in the rootzone
- can result in crop variation due to soil type and DU
- can reduce production in the long term.

Figure 1. Tensiometers are a useful scheduling tool when installed and maintained correctly

Benefits of scheduling

- healthy plants
- efficient use of irrigation water
- reduced drainage
- potential to increase crop yields and quality.

These benefits are more easily achieved when the irrigation system is applying water evenly. The benefits and success of scheduling are reduced if the DU% of the system is below 75%.

How to schedule

To apply the right amount of water at the right time, you need some basic information about available soil moisture, system application rates and crop water use.

Readily available water (RAW)

Readily available water (RAW) is the amount of water (in millimetres) that a plant can easily extract from the soil for unrestricted growth. RAW is usually determined by mapping soil profiles and crop rootzones in a soil survey. With some scheduling systems (such as neutron probes and capacitance probes) you can refine the soil survey estimate of RAW.

How much to apply

Knowing the RAW and the application rate (mm per hr) of your irrigation system allows you to calculate approximately how many hours of irrigation are needed.

Once the soil RAW and system application rate are known, the right amount of water to apply has been determined. The next step is to determine the right time to irrigate. This requires measuring or estimating the rate of crop water use using a scheduling system.

Scheduling systems

Several methods are available for estimating crop water use. These are all indirect measurements and require some assumptions. Each system has strengths and weaknesses and it is often recommended that more than one system is used.

There are three types of scheduling systems:

1. soil-based systems, monitoring soil moisture
2. climate-based systems
3. plant-based systems, monitoring the plant. (Most of these are more suited to research situations than use by irrigators.)

Understanding the basis of each different scheduling system helps you to interpret the results.

More information

Primefact 1362 *Determining readily available water (RAW) to assist with irrigation management*

Primefact 1365 *Using capacitance probes for irrigation scheduling*

Primefact 1366 *Using Neutron Probe for irrigation scheduling*

Primefact 1359 *Tensiometer Tips*

NSW Agriculture, 2002, *Irrigation for Horticulture in the Mallee*, available from NSW Department of Primary Industries Bookshop on 02 6391 3994. © 2004 NSW Department of Primary Industries

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