RURAL WATER USE EFFICIENCY IRRIGATION FUTURES

Improving irrigation management for a profitable and sustainable future

Queensland Government

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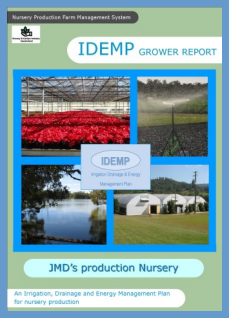
Irrigation, Drainage & Energy Management Plans (IDEMP) describe the infrastructure and management practices in operation at a production nursery and outline plans, designs, suggestions and opportunities for on-farm system and equipment improvements and upgrades.

IDEMPs support growers in nursery production to address both economic and environmental issues relating to water access, recycling, storage and use to ensure the business remains profitable and sustainable into the future.



IDEMP
Irrigation Drainage & Energy Management Plan

Nursery & Garden Industry Queensland

The Pipeline

An electronic update on Nursery Production RWUE-IF project activities

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Nursery Production Rural Water Use Efficiency—Irrigation Futures (NGIQ RWUE-IF)

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16 November

FEATURE VIDEO
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http://youtu.be/eQ_DgZZZD9U

Improving irrigation scheduling

Since the last edition of the Pipeline, project officer Lex McMullin has visited growers across the state discussing implementation of the action plans contained in their Irrigation Drainage and Energy Management Plans (IDEMPs). Due to the prevailing dry conditions in all regions at the time, the topic of water security was high on everyone's agenda, with much discussion on how existing water supplies could be extended. The need for regular monitoring of water use, system performance and water storages was highlighted during these visits, with the focus on planning strategies to maximise available water.

Discussions during the site visits centred on improving irrigation scheduling. A question that frequently arises during these discussions is, "How do I know if my irrigation scheduling is right?"

Aligning or comparing irrigation scheduling practices to daily weather data, such as evapotranspiration (ET), is one method that can be used to adjust and fine-tune irrigation scheduling. This has proven to be a useful first step in answering the question of irrigation scheduling accuracy, and provides a broad indication of how the amount of water being applied to the crop matches the amount of water being used by the crop.

In its simplest form, the Mean Application Rate (MAR) of the system, either calculated from catch can tests or sprinkler flow rates, and the length of time the system is run for can be used to calculate the amount of water applied by the system. This can then be compared to evapotranspiration data gathered onsite, or from the Bureau of Meteorology, to gain an idea of how closely the amount of water applied is to the amount of water used by the crop. In this assessment an allowance should also be made for how uniformly the water is applied using the scheduling coefficient (SC). Incorporating the SC in the calculations will give a more accurate measure of how appropriate the irrigation schedule is for the driest container.

Leachate testing is another method that can provide a guide to the suitability of irrigation scheduling practices. Leachate testing measures the amount of water that flows out of a container during and after an irrigation event. This demonstrates whether there has been sufficient irrigation to wet the growing media, and how much of the applied water drains from the container. This in turn provides an indication of the effectiveness of the irrigation, and if run times are too long or too short.

While evapotranspiration and leachate testing can be used to guide irrigation scheduling, physical observation of the crop is a vital component of irrigation management. It is the skill of the irrigation manager in using their experience and

IDEMP Video and Technical Information

For technical information visit the NGIQ Technical Information Library at https://www.ngiq.asn.au/resources/technical-information/

these tools that maximises production while minimising water use.

Monitoring Leaching Fractions

One of the common questions asked about newly installed irrigation layouts is, 'How long do I need to run the system for?'. Sometimes it's assumed the length of time is the same as the old system, but this is rarely the case, as the new system will generally be more efficient, have a different Mean Application Rate (MAR) and improved uniformity, which changes the length of time the system needs to run. So how do you work out the appropriate time to run the irrigation for?

One method that can be used is by measuring the proportion of applied water which drains from the container after irrigation. This is known as the Leaching Fraction (LF). The LF can be used as a guide to how appropriate the irrigation scheduling is. A high LF indicates an irrigation schedule that is either too often, too long or both.

The factors that contribute to the LF are

- Irrigation duration (run time)
- Growing media wettability or absorption rate
- If pulse watering is used
- The Mean Application Rate (MAR)
- The Scheduling Coefficient (SC)
- The Coefficient of Uniformity (CU)

In systems with high MAR's which exceed the absorption rate of the growing media, a higher LF may be required to ensure the media has been thoroughly wetted. However, more water will be applied to achieve adequate wetting, and consequently, more water will be wasted when compared with an irrigation system with an MAR matched to the absorption rate of the growing media. It should also be noted that higher LF's also increase the amount of nutrients leached from the media, and managing LF's more effectively can also reduce fertiliser requirements.

To measure the LF, tape a plastic bag around the container, but do not cover the top of the media. To prevent the leachate from being absorbed back into the media, the container needs to be raised so it doesn't sit in the water that has drained through the container. A second empty container is set up the same way to measure the potential amount of water captured by the container (See Figure 1).

Operate the irrigation system as normal, and allow the container to finish draining after the irrigation cycle has completed. Measure the leachate from each of the two containers. Measure and average the leachate of several containers throughout the growing area to account for any variation in the application uniformity and give a more accurate result.

The LF is calculated by dividing the volume of water collected in the bag of the container with the plant (Leachate P), by the volume of water in the bag of the empty container (Volume of Water Applied), and multiplying by 100 to give a percent LF

For example,
Leachate P ÷ Volume of Water Applied x 100 = %LF.

Industry Best Management Practice for LF is 12%, e.g. if 100mL of irrigation water is applied to the media, 12mL will be collected as leachate. This can be a useful indicator as to how long to run the irrigation. An LF of 0% isn't desirable, as some leaching is required to ensure the container is fully wet, and to minimise an increase in salinity due to the build-up of fertiliser salts.

In practice, there are a number of factors that have to be taken into account when interpreting the results of leachate testing. The biggest factor is how the plants capture water applied as irrigation, and guide it into or away from the container. In sprinkler irrigation systems, some plants e.g. palms, capture water from a larger area than the surface area of the container and guide it into the media. In this instance it may be possible for the leachate measured to be greater than the volume of water applied to the empty container. Conversely, if a plant sheds water away from the surface of the media, it may be impossible to achieve 12% leachate, as more water has to be applied to achieve the same degree of leaching. For crops such as these, drip or bottom up irrigation is a more efficient method of applying water.

Given the above limitations, measuring Leaching Fractions is still a useful guide in determining the appropriateness of irrigation scheduling in both new and existing irrigation systems.

Figure 1: Leachate testing apparatus

In the Pipeline for November/December 2017

- Project officer visits to North Queensland, Central Queensland, Wide Bay, Lockyer Valley and South-East Queensland
- Farm Management Systems Field Day – Lizard Mountain Nursery. 16th November