

How to Better Model Your Irrigation System®

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INTRODUCTION

As water reforms impact catchment areas, water users are now required to detail how efficiently they are using this limited resource. For many, water use efficiency is an area often neglected as the initial design and implementation of a system is all they have to demonstrate the theoretical performance rather than documented irrigation performance post system installation.

To meet water reform requirements, it is important for nurseries to carry out regular water audits so the information required is at hand and any shortcomings can be rectified. An audit not only considers the physical elements but how water is managed within a nursery.

This paper looks at how an irrigation system could be audited to determine its water usage. The information has been extrapolated from the Nursery and Garden Industry Australia (NGIA) Waterwork training workshops, which are available to the nursery and garden industry across the Nursery and Garden Industry State and Territory Associations.

WATER AUDIT

To commence with an audit you need to consider the following key areas:

- Water sources
- Water quality
- Operational requirements
- Irrigation system
- System hydraulics
- Drainage, recycling and management

Water Sources. A nursery may rely upon several sources of water to meet its irrigation needs:

- Catchment (surface storages from property or buildings)
- Extraction (rivers, groundwater)
- Potable (water authority)
- Recycling (occurring onsite or via treated tertiary water)

In all of these cases it is important to consider the limiting factors which may include:

- The certainty of rainfall to generate sufficient storage capacity.
- Size of the storage to capture the frequency of rainfall events.
- Certainty of extracting water (recharge, licence).
- Cost of reuse or recycling versus improved water self security.

Water Quality. Without water fit for purpose to meet the range of plants grown in a nursery there is likely to be compromises made in the capacity to produce plants.

The quality of water required for irrigation will vary in response to the application and plant requirements. As a guide the highest quality water should be reserved for propagation and any salt-sensitive plants.

Quality should not just be defined as the chemical components (pH, electrical conductivity, specific ions), but the physical (increased filtration needs), and level of contamination of plant pathogens (disinfestation needs). In addition, in closed irrigation or recycled systems there may be a need to monitor the applications of pesticides which may accumulate to levels beyond plant tolerances — particularly where fresh water input dilution is reduced.

In areas subject to seasonal variation and where nurseries recycle their water the quality of water/water sources will need to be monitored to ensure the water is still fit for the purpose. With evaporation of surface storages there can be an increase in salt levels and perhaps increase in algae activity too.

Operational Requirements. The successful operation of a nursery relies upon numerous factors. It is not just about the irrigation system applying water to plants but how the activity may disrupt the flow of the business.

When applying water consider the following:

- Plant needs
 - Establishment versus saleable and total crop needs
 - Grouping plants under same water requirements
 - Propagation, hardening, maximum growth, and development
- Influence of climate
 - Evaporation, wind, overcast, rainfall
- Growing media properties
 - How much water it holds and adsorption rate
- Ability to continue working whilst irrigation system is operating.

Irrigation System. To undertake a complete review of the irrigation system and management practices, you are encouraged to seek the assistance of an irrigation specialist. The technical elements of the system (below) are generally best addressed by specialists, however the findings and recommendations for improvements need to be assessed by those working in the nursery to ensure it meets the needs of the plants and nursery.

When evaluating an irrigation system consider the following:

- Pumps
 - Detail each pump (type) and note pressure at each irrigation block
 - Record shut-off pressures, measure suction losses, and assess pump curves to check the suitability for each duty
 - Outline the maintenance schedule for pumps
- Filtration
 - Note the type and size of filter and whether they are suitable
 - Outline maintenance (backflush), replacement
- Sprinklers/drippers
 - Measure the performance of the irrigation block via conducting catch-can tests and the NGIA waterwork calculator to determine the mean application rate (MAR <25 mm·h⁻¹), coefficient of uniformity (CU >85%), and scheduling coefficient (SC <1.5)

- List the irrigation schedule for each irrigation block and timings used according to different times of the year
- Outline how performance is assessed and the maintenance schedule used

System Hydraulics.

- This is where a specialist is critical to assess adequacy of the piping, pumps, filtration, and valves and to recommend improvements
- Is the system maintained, i.e., flushed to avoid build-up of slimes and clogging

Drainage Recycling and Management. How water is collected and then utilised after irrigation or rainfall is as important as applying irrigation water within a nursery.

The ability to deal with drainage is influenced by the irrigation system (how well water can be applied), the management (how well water is applied), and the climate (type of rainfall event and run-off volume generated). A well designed system is critical to limiting the time lost in not being able to access an area, preventing water-borne pathogens, and creating an environment which plants need.

Consider the drainage/recycling system:

- Detail types of drains used
- Detail how drains are connected and where drainage is diverted and stored
- Does run off leave the site and if so how is it treated
- Does the system cope with peak rainfall events

The aim of the audit is to highlight limitations and opportunities for optimising water use efficiency. A key area is to allow you to determine your current irrigation delivery and usage and whether you have a sustainable supply. If found lacking, the information gathered above can be used to identify the avenues required to address this issue.

In many cases the overriding factor to improving water use efficiency is not via adopting improved irrigation and drainage systems but via improving the education and management of the system. Without appropriate and timely management to suit plant and climatic needs you could just be wasting the potential benefits by investing in the most well designed but unfortunately most poorly managed system.

ADDITIONAL READING

Nursery and Garden Industry Australia/Policies. <http://www.ngia.com.au/Category?Action=View&Category_id=139>.