

NURSERY PAPERS

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Water use is a major issue for the nursery industry. Environmental concerns, climate variability, water shortages and increased water costs continue to put pressure on growers to address water use efficiency.

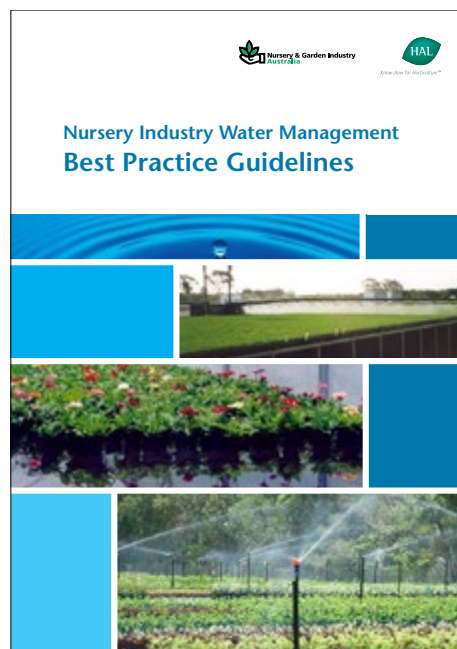
For many nursery managers the question is how to optimise production while reducing water use, in a cost effective way.

This Nursery Paper recaps some of the available research on water use efficiency to help growers make the best production decisions for their businesses.

Summary

- Nutrients and water are inter-related. Plant growth depends on the management of nutrients, which in turn depends on the management of water
- Efficient and effective water use will provide positive outcomes such as improved plant quality, increased uniformity, reduced water requirements, and associated cost savings
- Community expectations are growing for all industries to be accountable for their water use, and nurseries are not exempt. Being able to show improvements in efficiency helps the industry maintain its social licence, and can provide marketing opportunities for individual businesses.

NURSERY INDUSTRY WATER MANAGEMENT BEST PRACTICE GUIDELINES



Water use and irrigation is a critical aspect to the success of any business growing and maintaining plants. Ineffective irrigation can lead to poor product quality and quality variations in plants produced in the nursery.

The Nursery Industry Water Management Best Practice Guidelines were developed in 1997 and updated in 2010 to promote best practice water management in production nurseries. They also form the basis for the Water Chapter that is included in the Nursery Industry Accreditation Scheme, Australia (NIASA) Manual.

The Guidelines provide practical steps for both nursery operators and the relevant authorities in achieving outcomes that are economically and environmentally sustainable, with a focus on six areas:

1. Efficient water use to minimise the business' demand on the water resource.
2. Irrigation management tools to ensure more productive and efficient use of water.
3. Increased reuse of waste water to minimise the demand of the business on the -water resource.
4. Effective management of sediment and litter.
5. Maximising the retention of nutrients to improve efficiency of production and maintain water quality.
6. Environmentally responsible use of plant protection products to produce quality products.

The guidelines are available to download from NGIA's website (www.ngia.com.au/Section?Action=View&Sectionid=556) and are included as an appendix to the NIASA manual.



WATER MANAGEMENT OPTIONS

There has been a significant amount of work around the recapture, reuse and treatment of water in the production sector and extended supply chain. In particular, this work assisted industry during widespread water restrictions that were implemented during the millennial droughts.

The Nursery and Garden Industry Australia website (www.ngia.com.au) is a great resource to access final reports from research conducted over the years. It also contains a full library of Nursery Papers, many of which summarise aspects of these projects.

Below are summaries of some of the key projects highlighting aspects of water management to be considered by production nurseries to improve productivity and profitability, as well as to support a more sustainable future for the industry.

THE PROS AND CONS OF HAND WATERING

Hand watering is still used as a method of irrigation in some production nurseries. The perceived benefits include enabling the operator to supplement fixed irrigation systems, and preventing over watering in low water use areas.

However, research¹ conducted by the Department of Primary Industries and Fisheries, Queensland, suggests the cost of hand watering is greater than that of any other irrigation system, as the capital cost of equipment and installation is one-off and labour costs are on-going. It is also an inefficient use of water, and should only be relied upon as a 'fall back' option.

Where hand irrigation is used to maintain flexibility in the nursery layout, it is important that best management practices are adhered to. For example, nozzles which reduce flow rate and incorporate a trigger mechanism should be chosen to reduce the volume of water applied to pots and minimise water wastage between pots.

AUTOMATING IRRIGATION SCHEDULING IN NURSERY PRODUCTION

Irrigation scheduling is the science of establishing a balance between the application rate of an irrigation system and the time period that is required to replace the amount of water previously lost from a container or to re-fill the container to the capacity of the growing media.

Most production nurseries schedule irrigation based on season (more in summer, less in winter), or by 'testing' container moisture by feel and visual assessment.

Research² carried out by Nursery and Garden Industry Queensland (NGIQ) has looked at ways to remove the 'human factor' and provide accurate, automated tools for growers.

The project involved the use of a weight-based irrigation controller (WBIC). This used electronic load cells to determine the average weight of sample containers which, in conjunction with an understanding of container capacity, allowed a very accurate water content measurement at any given time.



As part of a research project, two reed beds were constructed to clean runoff water at Bau Farm Wholesale Nursery on the New South Wales north coast. Each was 150 cubic metres, sealed with heavy-duty plastic and filled with five millimetres of blue gravel.



The experimental reed beds at the Alstonville Centre for Tropical Horticulture in New South Wales.

Irrigation events were initiated within seconds of container weights reaching the lower trigger weight and continued until the upper stop weight was reached.

The use of load cells to schedule irrigation demonstrated significant savings in water use (up to 70% compared to timed irrigation) and energy consumption as well as improving the overall operation of the irrigation system.

UPGRADING AN IRRIGATION SYSTEM TO REDUCE OVERALL OPERATING EXPENSES

Irrigation is a critical aspect to nursery production, and the question for many growers is how to optimise production while reducing water use. Retro-fitting an irrigation system can provide efficiency gains, but will there be an overall return on investment to the business?

Research³ conducted by the Queensland Government Department of Agriculture and Fisheries reviewed two production nurseries working toward NIASA accreditation. Both required upgrades

of overhead irrigation systems and had the potential to collect and reuse their runoff.

An irrigation specialist was engaged to design and install irrigation upgrades based upon benchmark criteria used in water use efficiency under Best Management Practice (BMP) Guidelines. This includes: Mean Application Rates (MAR) <25mm/hr, Coefficient of Uniformity (CU) >85% and Scheduling Coefficient (SC) of <1.5.

The benefits identified by this research included not just reduced water use, but improved crop performance, enhanced water security and reduced run off. However, the pay-off for each nursery will be different, demonstrating the need for businesses to undertake an economic cost/benefit assessment to plan the most appropriate investment for their needs.

REED BEDS

Government legislation in many parts of Australia now restricts the discharge of nutrient-laden run-off water from any premises, including nurseries. Reed beds are one way to efficiently remove nutrients and organic matter, and can

also help to minimise the amount of treatment needed before re-using stored water.

Research⁴ at the Alstonville Centre for Tropical Horticulture has shown that established reed beds are very effective in removing 90% of the nitrogen and 96% of the phosphorus from nursery run-off. Furthermore, reed beds eliminated the root disease *Phytophthora*, even though the inlet water was 'seeded' with the disease spores.

Designing a reed bed for a commercial nursery is a complex procedure, but it can be simplified if done in a systematic way, and resources⁵ are available to explain some of the factors to be considered.

A land survey should be conducted by a qualified surveyor, and an engineer may be required to prepare site plans and design specifications for a Council Development Application.

- 1 Nursery Paper: Assessment of hand watering in production and retail nurseries http://www.ngia.com.au/Story?Action=View&Story_id=1158
- 2 Nursery Paper: Automating irrigation scheduling in nursery production http://www.ngia.com.au/Story?Action=View&Story_id=2192
- 3 Nursery Paper: Upgrading an irrigation system to reduce overall operating expenses http://www.ngia.com.au/Story?Action=View&Story_id=1160
- 4 Nursery Paper: Reed beds clean up nursery run-off water http://www.ngia.com.au/Story?Action=View&Story_id=1223
- 5 Nursery Paper: Designing a nursery reed bed http://www.ngia.com.au/Story?Action=View&Story_id=1221



IMPLICATIONS FOR THE NURSERY INDUSTRY

Ineffective irrigation is the one operation that most often accounts for poor product quality and quality variations in plants produced in the nursery. Under or over watering and uneven water application can lead to under, over or uneven nutrient uptake, which affects quality and consistency.

With increasing climate variability as well as increasing water and energy costs, it is more important than ever before for the industry to achieve reductions in water use and demonstrate a commitment to responsible water management.

Production nursery businesses will benefit from the practical application of the Nursery Industry Water Management Best Practice Guidelines through improved plant quality, increased uniformity, reduced water requirements, and associated cost savings.

The irrigation system you select will depend a great deal on the range of plants you intend to produce, the flexibility you wish to build into your operation, the quality of the water, and how much of it there is available and when it is available. An efficient system that applies water evenly and can be easily controlled to meet the variations of plant water requirements will provide a surprisingly attractive cost/benefit ratio.

Once you have selected the types of irrigation systems that suit your operation, you then need to give thought to the irrigation design so that it not only applies water efficiently but also fits into the constraints of your business.



ENVIRONMENTAL CREDENTIALS

As part of an irrigation industry, both production and retail nurseries are under the spotlight when it comes to being accountable for water use.

Several schemes have been developed by the industry to help demonstrate its commitment to continual improvement in water use efficiency and help to protect its social licence to operate.

The Nursery Production Farm Management System (FMS) is the industry developed on-farm system for production nurseries that encompasses Best Management Practice, Biosecurity, Environmental and Natural Resource Management.

The three programs that form the Nursery Production FMS are: the Nursery Industry Accreditation Scheme, Australia (NIASA) Best Management Practice; the environmental and natural resource management system EcoHort; and the on-farm biosecurity program BioSecure HACCP.

Each program offers guidance in water management.

EcoHort offers businesses with a risk assessment pathway to continually improve and demonstrate sound environmental stewardship and natural resource management to government, industry and the general community.

It's been proven that eco-labels can improve sales by providing consumers with tools for supporting decision making with environmentally significant products at point of purchase. Accreditation under industry-supported schemes may therefore provide a point of difference for individual businesses when marketing their products.

The Nursery Industry Water Management Best Management Practice Guidelines are designed to be used in conjunction with the detailed references listed in each chapter. National, State and Territory Nursery & Garden Industry bodies can assist in accessing the most up to date information and research, and identifying suitable experts from both government and private enterprise who can provide additional advice.

LINKS TO RESOURCES

Nursery Industry Water Management Best Practice Guidelines http://www.ngia.com.au/Section?Action=View&Section_id=556

Online Water Management Toolbox <http://watertoolbox.ngi.org.au/>

Nursery Production Farm Management System website <http://nurseryproductionfms.com.au/>