NURSERY PAPERS
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IMPROVING WATER AND ENERGY EFFICIENCY IN PRODUCTION NURSERIES

Introduction

When managing a production nursery, water is essential. It makes good business sense to use water wisely and reduce waste.

Production nurseries can make significant profits from efficient water use via:

- much lower water bills
- using water at no cost through recycling and runoff management
- good business practices through implementing water efficiency strategies
- improved crop quality and uniformity
- enhanced plant health
- reduced dispatch costs.

Growers can harness technological advancements and best management practices (BMP) to improve productivity, sustainability and water security through efficient irrigation systems.

Lessons from recent irrigation upgrades and scheduling trials can inform effective nursery irrigation system design, scheduling and management.

And Greenlife Industry Australia (GIA) extension officers are available to provide free, personalised advice.

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System design and water supply optimisation

A core component of efficient irrigation is the water supply and distribution system design.

Variable Frequency Drive (VFD) pumps are more flexible and efficient than traditional fixed-speed pumps. VFDs adjust the pump speed to match the system's demand, while fixed-speed pumps operate at a constant speed, often leading to waste and excessive wear and tear to pipes, valves and emitters.

KEY ADVANTAGES OF VFD PUMPS

Energy efficiency	VFDs minimise energy consumption by only providing the power needed to each irrigation zone, reducing operational costs. Fixed-speed pumps run at full speed regardless of demand, wasting energy.
Operational flexibility	VFDs allow precise control over pump speed, torque, and acceleration, adapting to varying load conditions. Fixed-speed pumps offer limited control.
Reduced wear and tear	VFDs' ability to adjust speed minimises stress on pump components and water distribution infrastructure extending their lifespan and reducing maintenance costs.
Integration with smart systems	VFDs can be integrated with internet of things and other technologies for remote monitoring, control, and predictive maintenance.

It's important to align your irrigation design to your hydraulic and agronomic requirements across the cropping system. Uniform sprinkler spacing, correct alignment and consistent operating pressure help ensure even water distribution.

Trials to achieve best management practice benchmarks

Key metrics in best practice water management

The Coefficient of Uniformity (CU) *measures how evenly water is distributed across a field.*

Scheduling Coefficient (SC) *indicates how much longer an irrigation system needs to run to adequately irrigate the driest areas*

Mean Application Rate (MAR) *is the volume of water applied per hour through an emitter.*

In container production nursery trials, transitioning to a uniform spacing of 4.26 metres between laterals and 4 metres between sprinklers operating at 250 kPa significantly improved Coefficient of Uniformity (CU) and Scheduling Coefficient (SC). While optimal spacing may vary by site, this example demonstrates the potential benefits of system redesign based on testing and site-specific requirements.

Irrigation scheduling and controller technology

Modern irrigation controllers equipped with remote access and advanced scheduling features offer production nurseries increased flexibility and control. Systems such as Netafim NMC Pro or web-based Galcon units allow for real-time adjustments based on observed or forecasted weather conditions. Linking flow meters and pressure sensors to the controller enhances system diagnostics, enabling early fault detection and timely maintenance.

Pulse irrigation – applying water in multiple short cycles instead of a single long application – can improve container moisture uniformity and reduce plant stress during peak temperature periods. Pulsing the irrigation allows the mean application rate of the emitter to align to the growing media absorption rate, improving water retention in the media. This is particularly effective when using advanced controllers that support customisable programming and multiple start functions.

Monitoring and adjustment

Irrigation management must be dynamic and data driven. Production nurseries can fine tune irrigation scheduling by regularly collecting water usage data and monitoring weather. Monthly water usage records and daily zone checks help identify excess use and optimise application based on evapotranspiration and crop needs. This is particularly important in production nurseries with diverse product lines and irrigation types.

Catch can testing before and after system upgrades is a practical tool to quantify uniformity and application efficiency. Improvements can be tracked using the following metrics:

- Mean Application Rate (MAR) – optimal rates should be below 25mm/hr
- Coefficient of Uniformity (CU) – should exceed 85%
- Scheduling Coefficient (SC) – should be less than 1.5.

Upgrading poorly performing zones and redesigning layouts based on test results can lead to substantial increases in irrigation efficiency and productivity, even with minimal capital investment.

CASE STUDY: ASPLEY NURSERY – IMPROVING IRRIGATION EFFICIENCY

Aspley Nursery, a family-owned landscape supply business north of Brisbane, has seen a dramatic improvement in energy efficiency and cost savings through a series of irrigation upgrades.

In 2015, Aspley Nursery conducted an energy audit, which revealed that the irrigation system was a major contributor to the site's energy consumption, representing 33% of total electricity use.

In response, the production nursery replaced its outdated 7.5kW centrifugal pump with a more energy-efficient 5.5kW Grundfos CRIE 15 vertical multi-stage variable frequency drive (VFD) pump. The switch to VFD technology led to a 28% reduction in energy use, saving approximately $3,068 annually.

Along with the pump upgrade, Aspley Nursery replaced 44 fluorescent light fittings with LED tubes, reducing electricity use by 2.75 MWh annually and saving $715 per year.

In addition, the production nursery installed a solar hot water system, reducing energy costs associated with propagation bench heating by preheating water to a more efficient 45-55°C, resulting in further savings on electricity.

The improvements have resulted in a total annual energy savings of 11.8 MWh, or $3,068.

Water disinfestation and recycling

Production nurseries often rely on a combination of roof-harvested rainwater, ground and creek/river water, recycled irrigation water and mains supply. To ensure water quality, recycled water should undergo treatment before reuse. An effective system may include:

- disc filtration – pre-filtration to remove larger contaminants
- media filtration – to remove fine particulates
- chlorination – to kill pathogens.

Integrating these system components safeguards plant health and supports BMP compliance while improving sustainability outcomes.

Outcomes and efficiency gains

Even modest changes in irrigation scheduling and system layout can yield significant improvements in water use efficiency and overall productivity. Across several production nursery trials and upgrades, measured outcomes included:

- a reduction in water use of nearly 2 ML/year following the redesign of irrigation layouts and scheduling strategies
- improved productivity per megalitre of water by up to $4,487 through better targeting of irrigation across zones
- water use per hectare reduced by up to 37%, even as growing areas expanded
- increased system reliability and operational flexibility with the adoption of variable frequency drive (VFD) pumps and remote scheduling technologies.

These results highlight the value of site-specific planning, regular monitoring, and adoption of smart technologies in nursery irrigation systems.

Conclusion

Effective irrigation in production nurseries hinges on well-designed systems, precision scheduling and continuous monitoring. With increasing pressure on water resources and the need for sustainable production systems, investing in irrigation efficiency is both a practical and profitable step. Through adopting best management practices and leveraging smart technologies, nurseries can enhance water use efficiency, reduce environmental impact and secure long-term production viability.

MORE INFORMATION

Past editions of Nursery Papers are available online on the Greenlife Industry Australia website: ***www.greenlifeindustry.com.au/communications-centre?category=nursery-papers***

Additional resources are available on the Australian Plant Production Standard (APPS) website to support growers:

- Irrigation management: ***www.nurseryproductionfms.com.au/irrigation-water/***
- Energy efficiency: ***www.nurseryproductionfms.com.au/energy/***

Catch can testing is covered in more detail in the irrigation section (see page 3, second paragraph under 'Monitoring and adjustment').

- Watch a video demonstration here: ***www.nurseryproductionfms.com.au/videos/***

Contact details for GIA Extension Officers are available at: ***www.nurseryproductionfms.com.au/technical-providers/***

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