

# NURSERY PAPERS

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## BACK TO BASICS: WATER MANAGEMENT

The recent drought gripping large parts of the country has been a timely reminder for all Australians to be more water efficient. With warmer and drier conditions on the horizon, this nursery paper revisits industry best practice for water and irrigation in production nurseries.

In this nursery paper, we explore efficient water use including irrigation techniques to minimise wastage through the NIASA best practice program. We also profile nurseries committed to effective water management, which is boosting plant quality and positioning the industry as responsible water users.

### Summary

Effective irrigation plays a major role in determining plant quality and consistency. NIASA has a suite of best practice guidelines for nurseries to follow, these include:

- Irrigation water should be applied evenly to meet the water requirements of the plant to minimise demand on water.
- There are a variety of methods for applying water in production nurseries which can be grouped into top irrigation and bottom irrigation.
- Excess water from irrigation (wastewater) and stormwater run-off should be collected and reused for gardens or recycled back onto production areas.
- Nurseries should install and maintain an effective drainage system to minimise the movement of sediment and litter.
- Nutrient loads in wastewater should be minimised by ensuring that fertilisers are applied correctly and match the requirements of the specific crop.
- Plant protection chemicals should be applied safely through appropriately maintained equipment to minimise contamination of wastewater.



Sprinkler watering system, Jayfields Nursery, Wagga Wagga, NSW.



## BACKGROUND

Over the past several years, there's been an increased focus from nurseries about how they can produce more, using less resources. There has been a drive of continuous improvement to ensure water use is efficient and impacts on the environment are reduced.

Outside nurseries, regulatory changes continue to impact on the cost and availability of water at certain times of the year. The recent drought has placed additional pressure on some nurseries across the country, and will continue to do so as hotter seasons approach.

More broadly, there is a growing assumption from the community that all businesses are reducing their environmental footprint, as well as minimising impacts on the surrounding natural habitat and biodiversity.

The nursery best practice guidelines, such as those outlined in best practice programs NIASA and EcoHort, assist with this process and promote best practice water management. They are reviewed on a regular basis to ensure they meet new or emerging industry and environmental issues.

## TYPES OF EFFICIENT IRRIGATION **Top irrigation**

There are a variety of methods for applying water in production nurseries: from overhead sprinkler systems through to trough and capillary mat systems. Importantly, irrigation water must be applied evenly to minimise the demand of the business on the water resource.

### Top irrigation

#### Fixed overhead sprinkler systems

Fixed overhead sprinkler systems are usually set up on a grid pattern, which can be upright or inverted on rigid piping. They are spaced appropriately and achieve a coefficient of uniformity of at least 85% and a water absorption rate of 25mm an hour.

#### Mobile boom system

The system consists of one or more pipes fitted with nozzles that apply water as the system moves over plants. It can be suspended from an overhead rail system or from a trailer that moves down the aisle. Water is supplied by a hose and the boom is powered by electrically driven cables or batteries.

#### Drip irrigation systems

Usually installed with a multi-outlet manifold connected to the top of each container with a stake (known as arrows), the system works best when non-draining drippers are used to ensure even irrigation for each container.

Dripper flow rates and numbers of arrows are matched to the growing media, so that maximum lateral spread

## HOW MUCH TO WATER?

According to NIASA, any irrigation system should be designed to perform at or better than the minimum efficiency with a coefficient of uniformity (Cu) greater than 85%; mean application rate (MAR) less than 25mm/hour and a scheduling coefficient (Sc) less than 1.5.

Remember that; the Cu is a measure of how evenly the water application is distributed; the MAR is the average rate that water is applied and; the Sc is a measure of the extra water required to provide sufficient water to the driest part of the bed/block – 1 is the best and a good Sc is 1.2.

## IRRIGATION BEST PRACTICE

Nursery manager, Kieran Studders, had two simple goals when he first installed the irrigation system at Big Leaf Wholesale Nurseries in Queensland – to save time and water.

Installing irrigation systems to meet industry best practice, utilising a variable speed drive pumping system, implementing larger irrigation zones, consolidating plants with similar water use and purchasing an irrigation controller, as well as the use of a rain sensor have all contributed to substantial water and energy savings in the business.

Big Leaf's commitment to BMP and improving the uniformity of irrigation application has resulted in a number of other benefits:

- 20% improvement in general crop health with quicker, healthier plant growth
- 25% improvement in crop uniformity
- 15% improvement in crop turn or production
- 7% reduction in throw outs or plant losses.



Kieran Studders, Big Leaf Nurseries, QLD.





of water occurs before reaching the container bottom. **TIP:** *the lower the dripper discharge flow, the more time the water has to spread laterally in the growing media.*

## Bottom Irrigation

### Ebb and flow systems

Consisting of graded level benches flooded with water to a depth of 20mm, the water is held for a short time to saturate the bottom of containers, which then leaves through channels into the drains. The cycle should only take 6-8 minutes to minimise leaching and stop root damage.

### Flood Floor systems

Concrete floor modules are fitted with underground piping that allows water to flood and drain rapidly. Most modules are split longitudinally into four with two rows of pipe located a quarter of the distance from each side, with the slope of the floor peaked at each edge.

### Trough systems

The troughs are sized to suit containers laid on a grade of about 1:600 and spaced to suit the plant

material. Troughs can be made of aluminium, PV or steel painted with marine paint, and water is supplied at one or both ends at a low rate (using an 8L/hour dripper or 1.5 2m microtube).

### Capillary mat systems

The system is usually made of synthetic fibrous material like carpet underlay or geotextile fabric. This matting covers black polythen film laid on a flat bench with a plastic sheet or weed mat. The mat is kept wet by applying water, usually through a low volume discharge system like drip tape.

### Controlling and scheduling irrigation

Irrigation controllers allow users to power an irrigation operation with the added flexibility to precisely determine how much water is to be used and at what time of the day, amongst a host of other benefits.

Excessive irrigation can waste water, energy and labour. Many nurseries utilise irrigation scheduling as a tool to replenish the precise amount of water lost from a container, and then apply that volume at a specified time.

## System Design and Operation

An efficient irrigation operation will take a number of steps according to NIASA, these include:

1. Divide the nursery into areas with similar needs e.g. propagation, shade areas
2. Choose a suitable irrigation method for each area
3. Consider the water requirements – quality, disinfestation, automation, number of pump, maximum capture of rainfall etc.
4. Consult an irrigation designer
5. Consult an equipment supplier and installer
6. Prepare a maintenance plan

If you're installing misting systems, ensure that placement, height, diameter, spacing, pressure, number of spray lines per bed and sensors are thought out carefully to get the best results for your business.

For pumps and other irrigation equipment, nurseries are encouraged to refer to the NIASA manual which includes a full run down on considerations when selecting the right option for your business, as well as best practice when it comes to fertigation.

## WASTEWATER REUSE

Excess water from irrigation and stormwater run-off should be collected and reused for gardens or alternatively recycled back to the nursery. It is essential to monitor and treat nursery wastewater as quality can vary greatly.

Run off from roofs and grassed areas is higher quality compared to that from roads and paths, as well as water collected from production areas with nutrients, floating growing media and other chemicals.

Ensuring good practice when it comes to managing irrigation and fertiliser use is absolutely critical. Nutrient levels vary significantly for every business and for different times of the year, so regular monitoring is critical to ensure quality of recycled water.

## CAPILLARY MATS

When specialist perennial wholesale business, Cameron's Nursery, ran out of water for a second time during the 1990s due to prolonged drought and limited access to potable water, owners Sonja and Andy Cameron researched new ways to capture and recycle water.

They chose capillary watering to allow plants to take up only the water they require, which reduced the total amount of water applied. They also selected water efficient sprinklers with good coverage.

Over time, the business has reduced its water use from 25 megalitres a year to now only 5 to 8 megalitres a year, paying homage to best practice methods and knowledge they've acquired over the years.



Example of capillary watering, Cameron's Nursery, NSW.



Drip watering system, Heyne's Wholesale Nursery, SA.

## SEDIMENTS AND LITTER

Nurseries are encouraged to develop an erosion, sediment and litter control plan. Tailored to each site, the plan will consider topographic limitations climate patterns, soil types, drainage systems and the general workings of the business. A well designed, installed and maintained drainage system will minimise erosion and control sediment and litter movement throughout the nursery.

## NUTRIENTS IN WASTEWATER

Nutrient loads in wastewater should be minimised by ensuring fertilisers are applied correctly and match the requirements of the crop. When fertiliser sprays miss targets or when growing media spills, this wastewater should be collected and diverted through filter strips, wetlands, reed beds or other systems to ensure nutrients are stripped before reuse or recycle.

## REVIEW YOUR IRRIGATION SYSTEM

Irrigation system performance does deteriorate over time. For example, sprinkler heads wear out or become blocked and irrigation pressures can vary. So, it is best practice to assess that your system is operating to its desired specification. Performing a catch can test is an easy way that you can do this.

Also, don't forget to assess your pumps, in many circumstances these are not considered until they break down but new pumps can be more efficient not only with water use, but also with power use – both of which can save you money.

## CONTAMINATION OF WASTEWATER WITH PLANT PROTECTION PRODUCTS

Plant protection chemicals need to be stored, handled and applied safely through appropriately maintained equipment, supported by adequate staff training and supervision. Management practices can be adopted to reduce contamination levels and minimise levels in recycled and discharged waste by:

- Reducing plant protection product use by limiting quantity of applications or reducing the amount of active ingredients used for each application.
- Choosing the best chemical application strategies for your needs.

## NEXT STEPS: ECOHORT

EcoHort is the next step after NIASA certification and provides businesses with key principles to work towards to improve their sustainability for the betterment of the business. It dives deeper into wastewater management, recycling, safe chemical use and increased water efficiency.

NIASA accredited businesses can become EcoHort certified through Nursery & Garden Industry Australia and are encouraged to visit the website [www.nurseryproductionfms.com.au](http://www.nurseryproductionfms.com.au) for more information and to download the manuals.

## LINKS TO RESOURCES

NIASA Accreditation: <http://nurseryproductionfms.com.au/niasa-accreditation/>

EcoHort Certification: <http://nurseryproductionfms.com.au/ecohort-certification/>

Nursery production FMS: <http://nurseryproductionfms.com.au/>

How to perform a catch can test: [https://www.youtube.com/watch?v=b\\_ZLl4mSfv8](https://www.youtube.com/watch?v=b_ZLl4mSfv8)

Case Study on Energy saving – replacing your pump – Aspley Nursery: [https://www.youtube.com/watch?v=8lgb18GmgdA&feature=youtu.be&list=PLTjhYhkq\\_-xbFxADspkEyWkIqtFvrd2Dt](https://www.youtube.com/watch?v=8lgb18GmgdA&feature=youtu.be&list=PLTjhYhkq_-xbFxADspkEyWkIqtFvrd2Dt)

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[http://www.ngia.com.au/Section?Action=View&Section\\_id=46](http://www.ngia.com.au/Section?Action=View&Section_id=46)