

## Efficient Water and Fertiliser Use

**Ian Gordon**

University of Queensland Gatton College, Lawes, Queensland 4343

### INTRODUCTION

Water is the most important input in the production of plants in the nursery industry and, if we are honest, probably the most badly used. We have grown up in a time when water has been cheap and in most cases readily available when we need it. Water has not been the limiting factor in the development of most nurseries; it has been the capital needed to provide automatic irrigation systems which has been our major limitation.

We have taken for granted the readily available supply of cheap and good quality water but this cannot continue indefinitely. There is an ever increasing demand for water and this will gradually force up the cost of water for irrigation use. It is likely we will also have to face increasing pressures to avoid using high quality water supplies for nursery irrigation and to have greater reliance on the use of waste water such as sewage effluent.

The nursery industry in Australia has traditionally been an urban-based industry with most nursery producers having access to reticulated town water supplies at relatively low cost. During the last 20 years there have been pressures on the industry to move out of suburbia into more rural locations where often reticulated town water supplies do not exist. This has created the situation where nurseries have to become responsible for managing their water supplies more carefully to ensure that they do not run out of water, and to maintain the quality of that water at an acceptable level for the maintenance of plant quality.

### IRRIGATION DISTRIBUTION SYSTEMS

Most nursery irrigation in Australia is via overhead sprinkler systems, usually controlled by microprocessor time controllers. The reason for the dependence on overhead sprinkler systems is largely a financial one: these are the simplest and cheapest systems to install.

However, overhead sprinkler systems have a number of limitations and many of the serious water management problems faced by the nursery industry would not be as severe if the industry did not rely so heavily on this type of distribution system. The drawbacks to the use of overhead sprinklers include:

**Poor Water Efficiency.** Overhead sprinkler irrigation of plants in containers has probably the lowest water efficiency of any system of irrigation. If the total amount of water used to irrigate a batch of plants is expressed as 100%, the actual amount of water reaching the target (i.e., landing in the pot and taken up by the potting media) is unlikely to be greater than 50% and may actually be as low as 20%.

The first step in reducing water waste must be to improve the efficiency of the irrigation system. Areas where considerable savings in water can be made include:

**1) Application of water to growing beds which contain no plants.** The irrigation system should be designed to ensure that individual sprinklers can be turned off when batches of plants are removed.

**2) *Group plants together according to pot size.*** On any one irrigation control station it is important to ensure that all plants being irrigated are in the same pot size. This prevents over-application of water to some small pots and under-application to larger plants.

**3) *Time the duration of an irrigation cycle to prevent waste.*** At the end of a cycle of irrigation all of the plants should be at container capacity.

**4) *Understand how water movement occurs in your potting mix during irrigation.*** With some highly porous mixes, especially those which are difficult to re-wet, the water being applied from overhead does not always move down through the mix in a uniform way. A large proportion of the water applied may actually run off the surface of the mix and move down the interface between pot and mix without wetting much of the potting mix volume. This problem can be greatest when the water is being applied from overhead very rapidly.

Nursery producers should seriously consider experimenting with pulse watering as a first step to the improvement of irrigation efficiency and the reduction in waste of water.

**5) *Ensure that the potting mixes being used have a satisfactory water-holding capacity.*** The emphasis on potting mix formulation is often placed on getting a high air-filled porosity to achieve rapid growth. A high air-filled porosity is achieved at the expense of water-holding capacity and it is important to aim for a balance in the air and water available in the pot. Fifteen to twenty percent air-filled porosity and 35% to 40% readily available water will provide an acceptable balance for satisfactory growth.

**6) *Adopt proper system maintenance.*** All fittings must be installed in a way that prevents leaks. Dripping taps, etc. should be repaired. Considerable wastage of water can occur through unrepaired leaks.

**7) *Keep accurate records of water use.*** Water meters should be installed in the supply line so that proper records can be kept of water use. Without accurate records it is not possible to monitor and reduce water use.

**8) *Evaluate alternative systems of water application.*** The efficiency of water use can be greatly improved by moving from overhead sprinkler application to other distribution systems such as drip irrigation and capillary irrigation. These systems of irrigation have a higher initial capital cost compared to overhead sprinkler systems and this acts as a deterrent to their use. However, very great savings in water can be achieved with their installation.

**9) *Investigate opportunities for recycling of water.*** Many nurseries have the potential to create storage dams to collect and store run-off water from irrigation and stormwater. Although costly in construction, recycling schemes will eventually provide the nursery producer with a degree of independence in the supply of water for irrigation.

**Nutrient Loss Through Leaching.** There is a very wide range of fertilisation strategies used in the nursery industry. Many fertilisers are highly soluble and they have the tendency to leach when heavy rainfall occurs or when irrigation is used to excess.



What is happening at present in agriculture and horticulture in general around Australia is an increased awareness of nutrient run-off and its impact on the environment. We as an industry need to address the questions:

- What nutrients are being leached from our nurseries?
- Where are they going?
- What environmental hazards do they pose?

A number of factors associated with nutrient leaching must be considered:

**1) *Selection of fertilisers to minimise leaching.*** The practice of fertigation (application of soluble fertilisers to containers via the irrigation system) is the most contentious fertiliser practice from the point of view of nutrient loss. The move towards greater use of controlled-release fertilisers in nursery production will reduce the nutrient loss through leaching.

**2) *Loss of fertiliser through leaching means reduced growth.*** Plant growth and quality must be adversely affected as a result of loss of fertiliser through leaching. Plants will not grow as quickly, the quality of the growth may be impaired, and extra fertiliser may be required to keep the plants growing.

**3) *Design potting mixes with a high cation-exchange capacity (CEC).*** Where soluble liquid fertilisers are used it is important to have potting mixes with a high CEC. In the past most potting mixes contained a high proportion of peat, the naturally high CEC of peat resulted in good retention of most nutrients. With the trend away from the use of peat in recent years in favour of the use of low-cost organic substitutes, the CEC of many modern potting mixes is quite low and a greater amount of fertiliser is being lost.

**4) *Monitoring of nutrient leaching in nursery run-off water.*** At present there is little activity in the routine monitoring of nursery waste water to determine its nutrient content. I believe that the time is not far off when we will all be required, as a matter of course, to carry out regular testing of run-off water.

The challenge which we all have to face is to ensure that the final quality of our run-off water at the back of the nursery is as close as possible to the quality that we started with. It will require substantial changes to present day irrigation and fertiliser practices but it can be achieved.

The nursery industry likes to project itself as an environmentally “green” industry which is helping to solve the nations’ environmental problems. If we do not get our act together and implement improvements to our water and fertiliser-use practices, we may be seen as a part of the pollution problem, rather than the answer to it.