POINTS TO CONSIDER WHEN SETTING UP A PROPAGULE SCHEME

Firstly the goals of the scheme must be identified, e.g., disease freedom (or known status), selection of best-performing clonal lines, trueness-to-type, production and distribution of propagules, or all of the above.

There must be enough usage of the scheme over a long period to make it financially viable. Low usage will result in high cost per propagule to recover costs, which will further reduce usage. There must also be a significant advantage to the general industry in using the scheme, otherwise it will be underutilized and may fail.

If health status is an important feature of the scheme, sound scientific support is required to identify the respective diseases, to determine suitable testing regimes, and to carry out the testing. This needs regular review and assessment, preferably by independent peers in the scientific community.

There may be a large capital requirement to set up the scheme — industry funding or grants may be required. People will also need to be recruited to run the scheme — finding the right person, who has the industry's well-being at heart, can be difficult. Strategies need to be put in place to allow for key staff to be replaced without jeopardizing the schemes operations.

Accreditation of nurseries can be a significant aid in increasing usage of the scheme, however this can be a complex and controversial system to implement.

The scheme must have the support of the major industry bodies, and preferably advisory services such as Department of Primary Industries, etc.

Some Problems in Water Recycling©

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Strict water regulation by the Council of Australia Governments is imminent. Tight controls in water use will make us all more frugal with Australia's limited water resources — having to make do with a lot less. We will be forced to conserve water and use it without degrading the environment. The government plans to return rivers to their original flows.

At Alstonville we are blessed with an average annual rainfall of 1600 mm, mainly falling in the first half of the year. The creek flowing through the property is unreliable and the underground water supply also proved unreliable. Water recycling was the answer. It seemed to be very expensive at the time but should give us dividends in the future. Our system has minimal effect on the environment and gives us a secure water supply.

Ten years of water recycling has revealed a range of challenging problems. We chose a 12.5-ha site for our nursery. The production area is located on a gentle slope all running down to a catchment dam. We received considerable assistance from N.S.W. Agriculture in the design of our system (Fig. 1).

All production areas were leveled and graded to a 1–80 fall. Drains were formed with 200-µm plastic with agricultural pipe laid in drains, 7-mm blue metal was laid around the pipe. A 75-mm depth of 20-mm blue metal was then laid on plastic covered by weedmat. All areas were piped away commencing with 150-mm PVC underground in low volume areas, with the size increasing as volume increased to 225 mm into catchment dam. All drainage is in straight lines, with storm water pits

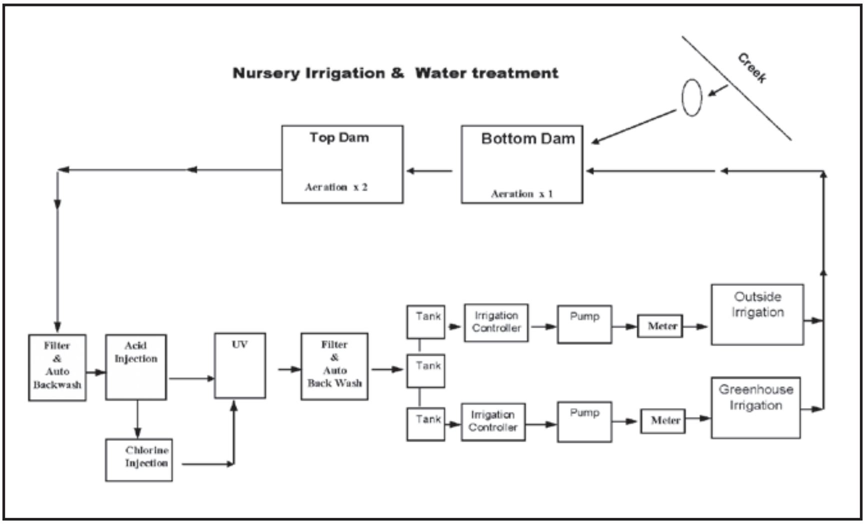

Figure 1. Schematic design of water recycling system at Alstonville Palms.

installed for change of direction and future expansion and maintenance.

Both dams are lined. One dam has 500-µm plastic and the other has polyweave. The lining is essential as the red basalt soil of Alstonville is extremely porous. This lining gives us the added benefit of no soil in the water and therefore a clean water supply to the nursery.

Apart from high rainfall adding to the system, water is reused many times. A total two-dam capacity of 17 megalitres (ML) allowed better water treatment options.

Last year (2004) our nursery used a total of 9 ML. Evaporation from dam capacity accounted for 30%–40%. Four to five megalitres of water was pumped from the creek.

Efficiency of use was paramount and we were fortunate in 1995 that our nursery was selected for a Horticulture Australia Limited research project (NY95025) looking at minimizing water use and nutrient runoff (Huett, 1999).

Considerable improvement in irrigation techniques and the addition of windbreaks have helped. The greatest single factor in achieving water saving was the use of an International Class "A Pan." An evaporation reading is taken on a daily basis to establish water requirements to which crop factors were added, i.e., a calculation of irrigation water to be applied based on the requirements of individual plants and prevailing environmental conditions.

Our biggest problem was algal blooms. A chelated copper product was sprayed on the surface of the dam, which killed the algae and solved the problem in the short term. Algae create high pH levels. This can produce difficulties in some forms of disinfestations, e.g., chlorine injection (which is the most popular form of disinfestation). In soilless potting media we should aim for pH values in the range of 5.5–6.3 (depending on individual plant requirements). If continually irrigating with water at a high pH level, the pH in media will also drift upwards. High pH water is also likely to clog the irrigation system by depositing calcium on irrigation equipment.

Our next major problem was a build up of broken down organic matter in the catchment dam. After 3 years we had 1.2 m of organic residue on the bottom. Organic particles of potting mix breakdown in the layer of blue metal under plants to a very fine size. Silt traps were considered expensive and too labour intensive to maintain. Therefore this technology was not implemented. We were worried that the dam would become full in the years to come.

Around March and September each year the dam was inverted bringing up lots of sediment. This added to the algal bloom problem making filtration very difficult. Investigations of this silt showed an anaerobic condition — evident by foul-smelling sulfur. Anaerobic conditions were very bad when dam water levels were low and could prove unsatisfactory for plant growth with low levels of oxygen.

The Answer. Aeration equipment was then installed and concentrates of microbes were added to the water. These concentrates contain billions of microbes. The aeration equipment brought all organic residues to the surface. The microbes consumed the entire residue in 8 weeks. This treatment was also of assistance in minimizing algal blooms and assisting these friendly microorganisms to stay healthy and breed. I have since established that with sufficient aeration, each of our units produces 3.3 kg of oxygen per hour so in our case two aerators were required; algae is now almost completely eliminated. Now pH levels close to neutral are easily achieved and only a small correction is required. We still correct pH to 6–6.5. We can save money because very little hydrochloric acid is needed. Aeration eliminates layering, stirring up the strata and maintaining a more consistent quality. Aeration need not be a 24-h per day exercise and should take place preferably at night.

We have since dispensed with chlorination and changed to ultra violet (UV) treatment for disinfestation, with great cost savings. Cost to install and maintain UV treatment would be comparable with slow sand filtration.

Some recent research in the U.S.A. indicates that anaerobic conditions of some recycled water can be detrimental to plant growth due to low levels of dissolved oxygen. The method of irrigation application and air filled porosity of potting mixes all play a part in plant health and growth. My latest indications are that with the assistance of aeration and microbes we can emulate nature to achieve the equivalent of rainwater.

ADDITIONAL BENEFITS OF RECYCLING

Environmental. A very important environmental point — our system utilizes only 12% of rainfall as our production areas cover 12% of land and our nursery now has a known water source that is excluded from all water charges within the Water Act 2000.

Improved Profitability. Our recycling system necessitated efficiency of water use, which in turn led to improved plant health and savings in production costs, i.e., fertilizer, pesticides, labour, etc.

Self-sufficient. Information gathered indicates that a containerized production nursery with 1400 mm of rainfall per year or even lower could be self sufficient for water providing all aspects of recycling are carried out, and dams are covered with an evaporation barrier.

SUMMARY

Although recycling involves establishment costs, monitoring of oxygen and pH, careful disinfestation, etc., which is more work, the benefits gained from the effort far out-weigh any costs or inconvenience incurred in the setup process.

Once the system has been established the additional upkeep is non-existent or negligible.

The Council of Australia Governments has stated for many years that water from the environment will be given to the most profitable use. Top nurseries are reporting $60,000 gross sales per megalitres of water. However, when a nursery recycles water and procures only 2 ML of water from outside, the payback on the water can easily be as high as $250,000 per megalitres.

LITERATURE CITED

Huett, D.O. 1999. Improved irrigation and fertiliser management strategies for containerised nursery plants through commercial demonstrations and further research. Final Report NY95025. Horticulture Australia Limited.

Water Saving, More Than Just Recycling©

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ACKNOWLEDGEMENT

I will begin by acknowledging Lance Gladigau of Irritech. He infected in me enough of his passion for water conservation to encourage me after his death to continue his work. The result of which has been several Awards in Environmental Excellence for our wholesale nursery.

INTRODUCTION

Heyne's Nurseries Pty Ltd is the oldest registered nursery in Australia. It was first established in Norwood, an Eastern Suburb of Adelaide, South Australia (SA), in 1869 and has played a prominent role in the development of the SA's nursery industry. High quality stock and good customer service have been our company's main aims since its beginning. The challenge of the 1990s was to produce this high quality stock economically, with minimal impact on the environment. In doing so the company aimed to increase water usage efficiency and to investigate the feasibility of recycling its runoff water. In 1995 our company received an $11,800 grant from the Cleaner Industries Demonstration Scheme to supplement its research.

This paper will provide information on the system of recycling water from the wetlands that Heyne's Wholesale Nursery has set up in conjunction with Salisbury Council. But more importantly, it will supply information on some of the in-house procedures taken to improve water-use efficiency and decrease pollutants.

HISTORY

In 1845 Ernest Bernhard Heyne migrated from Germany. He was a learned man with degrees, including a Diploma in Botany from Leipzig University. These, his experience gained as an employee of Dresden Botanical Gardens along with his ability to write five languages and speak seven, soon landed him the job as head draughtsman at the Royal Botanic Gardens Melbourne and Personal Secretary to Von Mueller, the director. In 1869 after trying several other ventures E.B. Heyne moved to Adelaide where he established a nursery in Bond Street, Norwood, and a