RURAL WATER USE EFFICIENCY INITIATIVE

Improving irrigation management for a profitable and sustainable future

Recycling Benefits — A case study

Benaraby Junction Nursery, located near Gladstone, is a production nursery supplying their own retail facility as well as landscaping projects in the region. Over a period of 21 years Colin Olsen and Judy Turner have implemented a number of water efficiency measures both prior to, and during the Rural Water Use Efficiency Initiative (RWUEI) project which have amounted to cost savings of $92000/ annum. During the previous drought, Benaraby Junction Nursery's reticulated water supply allowance was reduced by half, and then decreased even further with only 15-16kL being their daily allowance, with no alternative options available, and no consideration given to the water efficiency of their business. It was this experience that made Colin and Judy decide that high water supply security was paramount in making their business sustainable, and consequently, their recent focus has been on improving water use efficiency.

The production nursery was initially constructed with a recycling system, where water was collected in a water storage and recycled back to the growing areas. Prior to the RWUEI project, the contribution to water use efficiency of this recycling system was unknown, but due to statistics gathered on water use over the period of the RWUEI project, it's been estimated that there has been an 81% water saving due to recycling in this production system. These figures show that water recycling has provided the greatest water savings compared to any alternative methods that can be implemented to improve nursery water use efficiency.

Recycling systems require site characteristics that allow the collection, retention, treatment and returning of the collected water to the production areas as irrigation. Recycling is technically feasible on all sites, however, economic factors have to be taken into consideration in deciding if a system is

worthwhile installing. A system of maintaining good water quality is paramount to the success of a recycling program, and methods of monitoring water quality, both at a chemical and biological (pathogens) level, need to be implemented to ensure any negative effects from the use of recycled water can be minimised by careful management.

During the RWUEI project, improvements have also been made at Benaraby Junction Nursery to the water storage facility. To increase storage capacity, accumulated sediment was removed from the storage with the fill used to increase the size of a production area. Cleaning of the water storage had some negative effects on water quality, such as a temporary increase in pH, but in the long term, these changes moderated as the storage refilled.

Prior to the implementation of a water quality testing program, visual changes of the water were used as a guide to determine management changes, such as introducing water from other sources. There are, from time to time, large numbers of waterfowl resident on the water storage, and these affect the visual water quality, but, from water testing done onsite, seem to have only minor effects on the chemical characteristics of the water e.g. nitrate content.

Initially, there were concerns about implementing a regular programme of water quality testing, as it was assumed that the water storage would be high in nutrients, and having a record of this would mean a system for reducing nutrients would have to be implemented. An on-site test showed that nitrate and phosphate levels were low and EC and pH levels fell within acceptable Best Management Practice (BMP) parameters. This result gave Colin and Judy the confidence to proceed with a regular on-site testing programme of water coming into the water storage, water being used for irrigation, and water leaving the property. This information has been beneficial in determining the immediate effects of changing practices and, more importantly, can be used to show how the water quality changes as it moves through the production system, and if the cropping process has any detrimental effects on water quality being released into the environment. The regular testing programme showed that, in the main, water quality is very stable and there are minimal effects on water quality as it moves through the nursery. There have been periods of low water quality identified, such as when the water storage was cleaned out, however, water quality quickly returned to normal once the storage had refilled.

Monitoring water use, supported by data collection, has also contributed to improvements in water use efficiency. Calculating the amount of storage on -site, and using this to determine an action plan of when additional water needs to be bought in, and the contribution of run-off from the nursery to the storage, have lead to the better utilisation of available water, and

significantly decreased the need to import water from off-site sources. To aid in managing water quality and increasing the collection of nursery run-off, management of the water storage also involves pumping water from catchment areas directly to the nursery production areas, or back to the main storage using water transfer pumps, .

At the start of the improvement programme, it was difficult to determine the amount of benefit the recycling system had, as the system was already in place, there was limited data available, and there was no way to directly measure runoff . However, as data on water pumped was collected over time, it was calculated that, with the scheduling practices in place at the start of the RWUEI project, the total water use would have been 71ML/annum. At the time of calculating these figures, reticulated water cost $1.30/KL and this would have equated to $92 300/annum in town water costs. In more recent times, there have been significant increases in the price of water, with reticulated water costing $2.16 at the time of writing this case study (August 2012), which makes the annual water cost 66% higher than at the time of original assessment.

It should be noted here, if the recycling system hadn't been installed from the outset, some of the irrigation practices that contribute to this high water use would not have been put in place. The recycling system allowed water use in excess of plant requirements to be applied, with the thinking being, if more irrigation was applied than the plants required the excess was not lost, with the only disadvantage being an increase in pumping costs. It was considered that the increase in pumping costs would have been easily offset by the potential crop loss due to under watering. That is, without recycling, scheduling practices would have been much more precise.

The next largest water saving achieved at Benaraby Junction Nursery was in irrigation scheduling. Irrigation scheduling changes are the easiest and most cost effective method of saving water. To implement this, gathering and analyzing information is required to match irrigation with water use of the crop. At Benaraby Junction Nursery a record has always been maintained of how long, and how frequently, the irrigation in each area is run for. As not all areas are irrigated every day, this information is used both to inform other staff of the current irrigation scheduling status, and to compare past and present scheduling practices. An analysis of this information showed that a large proportion of water was being used in non-growing areas, such as windbreaks. Analysing this data found that the non-crop areas were using 50kL out of a total of 234kL pumped daily – 21% of water being pumped onto non-cropping areas. Much of the water being applied to the non-cropping areas was not able to be recycled, and it was estimated that 70% of the water applied to these areas was being lost to the recycling system, either through use by the plants or as runoff.

From this exercise, it was determined, if the watering in the non-crop areas was managed more effectively, the importing of water from off-site could be significantly reduced or eliminated, which ultimately has been the case. By closely observing the crops, and only applying irrigation when the crops need water, and also reducing run times during each irrigation event, town water purchases have been reduced by 6.7ML/annum and water from an alternative surface source also by 6.7ML/annum. This equates to a total cost saving of $11 000/annum in water costs. Pumping costs have also been reduced due to the reduction in average daily pumping from 265 000L/day to 179 000L/day – a 33% reduction in energy use.

There are a number of specific site factors Colin and Judy consider have contributed to the success of the irrigation and recycling system at Benaraby Junction Nursery.

- The existing soil type has an impervious layer at depth, which was ideal for the construction of water storage facilities, without having to import any additional materials or use dam liners.
- Adjacent roads increase the water catchment area. However, this could potentially be at the expense of water quality caused by contaminants from passing traffic.
- An impervious soil type allows water to be collected and stored without significant loss.
- An almost level site with gradients suitable for water collection.
- Vegetation established in and around the nursery, creating a suitable micro-climate for plant growth and minimising evaporation.
- Protection from prevailing winds reducing evaporation losses.
- Relatively low frost risk, so a system for frost control is not required.
- Staff training is mostly done on site, and staff are trained in the site specific requirements of the irrigation system and irrigation scheduling.
- The nursery production system is an integrated system which means changing one thing in the system will affect all other parts of the system. e.g. If the sprinkler jet size were decreased, the Mean Application Rate, Scheduling Coefficient and Coefficient of Uniformity would also change, leading to changes in the run times of the system.
- Pesticide spraying of crops is minimised. Colin and Judy's philosophy is, if a plant needs constant pesticide applications, the final consumer will struggle with growing this plant, and it will ultimately have be replaced with something else, leaving an unsatisfied customer. This philosophy also translates to water use, as plants that have high water use in a landscape situation are generally not grown, which means that the water requirement within the nursery is also reduced.

At all stages in the process of water efficiency improvement, Colin and Judy have given careful consideration to the possible effects of proposed changes to the irrigation system before any alterations were made, and have gathered data from a number of different sources to enable an informed decision to be made on the changes being considered.

Colin and Judy have commented that the RWUEI project has been invaluable in guiding them through the changes that have enabled them to achieve their aim of becoming self sufficient in water, and recommend that other growers take advantage of the information provided by the RWUEI project.

For further information contact NGIQ on 07 3277 7900

Nursery & Garden Industry Queensland

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