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IRRIGATION AUSTRALIA

JOURNAL
FOR IRRIGATION PROFESSIONALS

THE BIG ISSUE
Floodplain harvesting and managed aquifer recharge

Council collaboration saves money and water

RURAL
Novel container propagation system for fruit trees

IRRIGATION AUSTRALIA CONFERENCE
A spotlight on the workshops

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IN THIS ISSUE:

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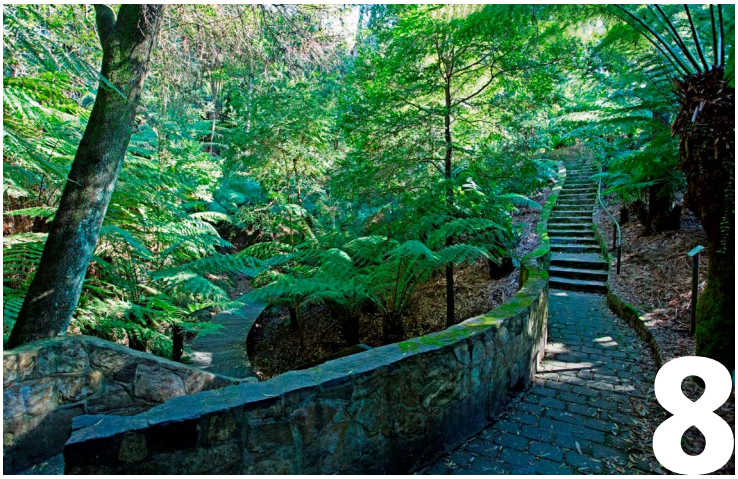
CONTENTS

FEATURES

REGULAR ITEMS



ON THE FRONT COVER: Three Adelaide councils have formed a cross-council irrigation construction partnership. Left to right: Jarryd Kelly, Steve Smith, Andrew Brumfitt and Tyron Bennetts. Article on page 16.

WELCOME

CHAIR'S MESSAGE

On behalf of the Irrigation Australia Board, I thank all members for your strong ongoing support. Your engagement provides confidence for the board when planning for the future of our industry organisation.

Personnel movements

As many of you would know, our Chief Executive Officer Bryan Ward has announced his retirement after nearly seven years with Irrigation Australia. When Bryan started, the organisation was facing an uncertain future, and his contribution has been outstanding. The changes he has made, in line with the strategic direction set by the board, have enabled Irrigation Australia not only to endure the challenges of the past few years but also to grow its engagement with and work on behalf of its members. While Bryan still has several months' work ahead of him, I'm sure all members will join me in thanking him for his time with Irrigation Australia and wishing him well in his retirement.

The board has recently undertaken an extensive search for a new CEO, resulting in the appointment of Dave Cameron. We are confident that Dave is the right person to lead Irrigation Australia during the next stage of its development and ask that you join us in welcoming Dave when he commences in mid-September.

Event

Our last Irrigation Australia national conference (way back in 2018) had the premonitive theme 'Addressing the big issues'. I'm sure none of us imagined the issues that would arise soon after – the floods, fires, and pandemic that have affected almost all of us in some way.

'Irrigation for the future – challenges, innovations and opportunities' is the theme for our national conference and expo in Adelaide this October. This is a fantastic opportunity to bring our industry together; to re-establish old friendships and establish new ones; and to discuss the challenges of recent years. Australians are renowned for their response to adversity, and we look forward to learning of the opportunities and innovative responses within our industry.

Irrigation Australia also welcomes our international family to Adelaide for the 24th International Congress on Irrigation and Drainage (ICID) and the 73rd International Executive Council meeting. Held in conjunction with our national conference and exhibition, this international forum will be guided by the theme 'Innovation and research in agricultural water management to achieve sustainable development goals'.

These triennial congresses focus on world issues in irrigation, drainage and flood management, including reviewing contentious issues concerning the future of irrigation water in the context of increased demands for competitive uses. With Australia's new federal Department of Climate Change, Energy, the Environment and Water, and the renewed focus on environmental and water issues at all government levels, the ICID discussions are well-timed to view Australian irrigation water issues in the context of similar issues globally.

Participation

Our annual general meeting will be held on 27 October 2022. If you can participate, I encourage you to do so.

With the call for nominations due soon, I encourage all members to consider standing for a position on the board, to have a role in monitoring current and evolving industry trends, making key decisions on planning and policy, and determining the strategic priorities for Irrigation Australia.

To those directors who have served their term on the board (Peter Durand, John Pivac, Colin Bendall, Carl Walters, Greig Graham and Rob Nadebaum) and will either retire or make themselves available for renomination, my sincere thanks for your commitment. All directors have made significant contributions to Irrigation Australia over the past year, and as Chair I am most grateful for this support.

Andrew Ogden
Chair

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WELCOME

FROM THE CEO

Welcome to the spring edition of the *Irrigation Australia Journal*.

Conference and exhibition

The biennial Irrigation Australia Conference is the highlight of our events calendar, and this is a particularly significant one since it's combined with the ICID 24th International Congress. Back in 2016, Irrigation Australia was delighted to be awarded the right to host the Congress (originally planned to be held in Sydney in 2020). This prestigious event has been held every three years since 1951, but this is the first time for it to be held in the southern hemisphere. Of course, we did not anticipate or plan for the arrival of COVID-19, which resulted in the Congress being postponed twice, and the location changed to Adelaide.

To say this has been an arduous journey would be an understatement! A full six years of planning, adjustment, and readjustment has gone into organising these events. The last time the irrigation industry came together was in Sydney in 2018, and much has changed since then. This is an ideal opportunity for our members and stakeholders to enjoy an informative and interesting get-together. Your registration gives you access to both the Irrigation Australia Conference and Exhibition and the presentations within the ICID Congress. And if you only want to attend the exhibition, entry is free. This really is great value considering some major exhibitions charge exorbitant amounts for entry.

I encourage everyone in the irrigation industry to come along to Adelaide from 5 to 7 October to see the latest technology and products and to hear from leading industry experts who are prepared to share their knowledge with you. It truly will be the greatest irrigation show ever! Visit the event website for more information and to register.

New CEO for Irrigation Australia

The Irrigation Australia Board has announced the appointment of David Cameron as your next CEO, and he will start in mid-September. Dave brings to Irrigation Australia knowledge and passion for the water sector as well as his strong commercial acumen, which is a fantastic combination to lead the organisation into its next chapter. There is a profile of Dave in this journal on page 34 and I wish him the very best in his new role.

I will be staying on to assist Dave and will continue to manage the conference, but this will be my last contribution to the journal as CEO.

I have enjoyed my nearly seven years in this role and I am proud of the achievements made by the Irrigation Australia board and staff over that period. I believe that we have made considerable progress as a member organisation through some difficult operating conditions, and the good outcomes reflect both the commitment and effort made by the team at Irrigation Australia and the incredible support of our members.

I also wish to record my thanks to my wife Chris Delphin, who has worked tirelessly beside me as company secretary/business administration manager during most of my time at Irrigation Australia; her support and input have been invaluable. Chris will also be leaving Irrigation Australia later this year as we both head to Penguin in Tasmania to continue the next chapter in our lives.

Farewell, thank you and take care.

Bryan Ward
CEO

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NOVEL CONTAINER PROPAGATION SAVES WATER AND IMPROVES PRODUCTIVITY

SNAPSHOT

- A fruit tree nursery in Victoria is replacing its bare-root fruit trees with an automated container propagation system.
- The trees are grown outdoors in pots, and scales give continuous weight measurements, which trigger irrigation when needed.
- Different varieties are grown in separate irrigation zones, so irrigation can be customised.
- Richard Guthrie, the nursery owner, has seen big benefits, including huge water savings, more efficient land utilisation, less labour-intensive processes, and the ability to locate the trees in ideal locations the property without worrying about soil conditions and other variables.
- Richard believes that this is the future of fruit tree nurseries.

Most fruit tree nurseries grow bare-root trees in the ground but one nursery in Northeast Victoria has adopted an automated container propagation system, and has found that it has big benefits in terms of water savings and productivity.

Galgate Nursery owner Richard Guthrie propagates fruit trees for commercial orchards. Until recently, the nursery grew only bare-root trees in the soil, relying on subsurface drip irrigation. In 2019, Richard contracted MAIT Industries, specialists in monitoring and control systems for agriculture, to develop an automated container propagation system with saving water and moving towards automation.

"Water saving and automation is the way of the future," nursery owner Richard said. "We made the decision that we need to move in that direction. The costs of labour and mechanisation were also a factor. Field growing could not be mechanised any further – having pots removes a lot of heavy lifting and working in the mud."

A new approach

While scales have been used to trigger irrigation in some applications for a while, it is not yet common for this concept to be applied in outdoors container nurseries. Lindsay Parker, national sales manager of MAIT Industries explained, "Previously, scales have been used in hydroponics, typically in protected cropping situations. But using scales in this way is definitely still fairly new. It's almost hydroponics but in an open field."

Continual weighing, automated irrigation

The trees are propagated with the Ellepot propagation system, using plugs that are 120 mm diameter and 240 mm deep. The media is wrapped in paper and placed in special six-cell trays. The tray cells have four open 'ribs' that increase aeration enabling the roots to be air-pruned as they reach the outside.

Richard installed his first container nursery for 15,000 trees in 2019. In 2021, he installed his second system on a block that previously grew bare-root trees in the soil. The new nursery currently holds 36,000 trees in four zones of 9,000 pots.

A nursery in Northeast Victoria has adopted an automated container propagation system that has big benefits in term of water savings and productivity.

In each of the two nurseries, one tray of six pots sits on electronic scales that weigh the tray continuously. This acts as a representative sample for the whole nursery. Irrigation and fertigation begin automatically when the scales fall below the trigger set-point. The system uses drip irrigation, controlled and monitored by MAIT's iNTELLiTROL system – a radio telemetry system that enables both data collection and control.

The irrigation valves are cycled through and if the scale weight remains below the cease set-point, an additional irrigation cycle is triggered. Local weather conditions are measured and recorded along with irrigation events.

Richard separates the varieties according to the irrigation zones, so that run times can be manipulated individually as needed. Last year, in the new nursery, he had one variety occupying three irrigation zones (3 x 9,000 pots) and another variety taking up the final zone (1 x 9,000 pots). Richard has found that two short pulses of around one minute each, repeated as the valves run through their sequence (meaning they may have a three- to four-minute gap between each one-minute cycle), wets up the whole pot better than a single two-minute pulse that may result in run-off.

Water savings and productivity gains

Richard's nursery relies on water from a bore and a spring-fed dam, and the new system makes for significant water savings. Previously, the in-ground trees were watered using subsurface dripline, which used 136 L per tree per season, compared with the gravimetric pot system, which uses only 22 L per tree per season.

Land area utilisation has also improved, going from 37,500 trees per ha in-ground to 125,000 trees per ha in pots. This has several benefits for the nursery. "It means we can consolidate three growing areas into one by intensifying production and this means we don't have to lease additional ground," Richard explained.

"Containerisation also means we can select the perfect site based on climate and not have to worry about soil quality and conditions. It's also much easier to attract labour in a container nursery than in-ground."

The nursery still grows a small proportion of its trees in the ground, but Richard plans to switch over completely to pots soon. Other nurseries are likely to adopt this approach too, according to Richard. "In the nursery industry, the production of fruit trees is the last to move into some sort of container system, so the industry will eventually move to this production system.

"Tree establishment in the orchard is expediated significantly and more evenly than from bare-rooted trees, so orchardists will likely start to demand trees produced in pots."

A tray of six pots sits on electronic scales that weigh the tray continuously.

A two-way street

Richard said that although there were some technical teething issues to start with (and switching to container growing is a huge learning curve for the grower), MAIT was able to help solve every issue that arose.

Importantly, the learning and improving process works both ways. Technology companies like MAIT Industries rely on feedback from end users to continually improve their products. "At least two software changes have been made as a result of feedback from Richard's projects," Lindsay explained. "This will also benefit other users of the system."

As more nurseries adopt such systems, reap the benefits of water savings and automation, and provide feedback to technology companies, more improvements will be made. This in turn benefits future users of the technology.

Acknowledgment. Thanks to MAIT Industries and Galgate Nursery for providing information for this article.

Eve White, Irrigation Australia

Are you attending the **Irrigation Australia Conference and Exhibition in Adelaide?**
Be sure to check out MAIT Industries' stall to find out more about their innovative solutions.

IRRIGATION AT THE AUSTRALIAN NATIONAL BOTANIC GARDENS – AN OVERVIEW

In 2010, the Australian National Botanical Gardens (ANBG) in Canberra completed a non-potable water infrastructure project, extracting water from Lake Burley Griffin. This resulted in considerable savings for the Gardens. The irrigation infrastructure was upgraded last year, further improving irrigation efficiency. This article gives an overview of the irrigation system and the irrigation management strategies used in different parts of the Gardens.

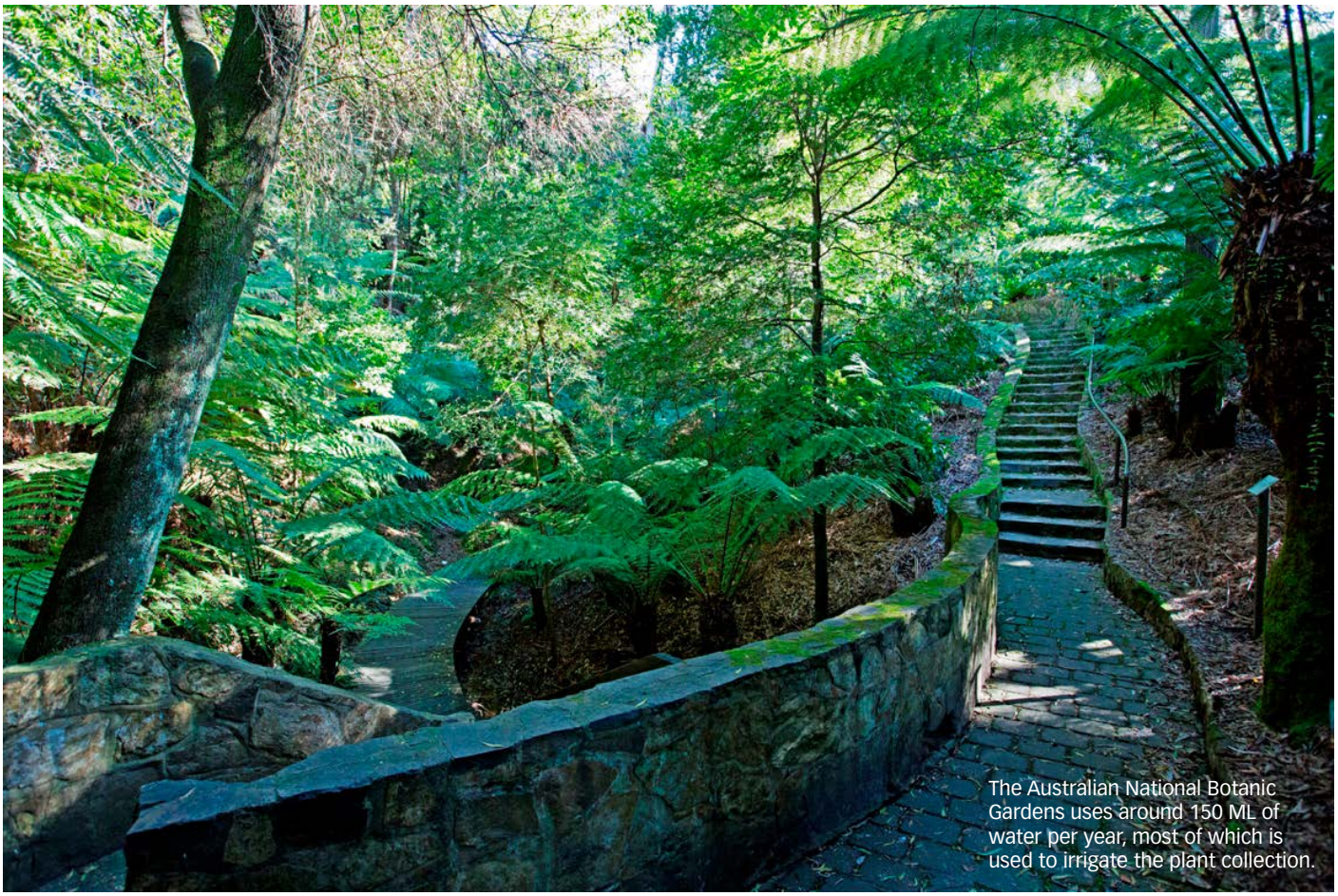
The ANBG uses around 150 ML of water per year, roughly three times the volume used by Canberra households and industry combined. In 2010, the ANBG completed a non-potable water infrastructure project, which extracts water from Lake Burley Griffin saving up to $1 million per annum on potable water supply costs.

Twelve years on from the upgrade, *Irrigation Australia Journal* caught up with Craig Cosgrove, manager, Living Collections and Assets, to find out about the ANBG's irrigation strategy and recent changes they've made.

Non-potable water

Craig says that back when they changed water sources, the main thing they had to consider was human health and safety. "The water that we pump from the lake gets treated at the pump station as a risk-control measure in case people inadvertantly come into contact with it, so it's almost akin to a potable water supply," Craig said.

"We have to be mindful of unintended use by visitors. With our computerised centralised control system we can schedule the majority of watering at night when the gardens are closed. But there's only a certain amount of water that we can distribute in one night. Sometimes scheduling will go through to the morning or the following night. The system



The Australian National Botanic Gardens uses around 150 ML of water per year, most of which is used to irrigate the plant collection.

enables us to do this – we can calculate when we can't get through and supplement the following evening".

The garden also has a back-up supply of standard potable water supply, which is used occasionally when repairs to the pump are needed.

Irrigation system upgrade

Back in 2010, when the infrastructure project took place, ANGB used a computerised irrigation system, Irrinet, as part of their overall water strategy. The system helped the ANBG to be more efficient in its irrigation water use.

The automatic irrigation system featured a series of drippers, overhead sprinklers, micro-sprayers and ground-level low volume emitters, consisting of:

- a dedicated computer running Irrinet software
- 14 solar-powered, radio-controlled water meters on each major line
- four solar-powered, radio-controlled water valves
- a solar-powered weather station that measured rainfall, temperature, humidity, solar radiation and evaporation.

Four solar-powered soil moisture sensors were located in different soil types around the ANBG. These sensors were not integrated into the irrigation system but provided additional information for assessing the soil wetness profile.

In 2021, the system was upgraded to a Toro Lynx system, which has further improved the efficiency and effectiveness of irrigation for the ANBG's living collection.

The system, which relies on smart satellite control in free-standing plastic pedestals throughout the ANBG, is programmed to shut down during rain events, saving irrigation water.

Craig says that by 2021, it was time for an upgrade. The old system had been in use since 2005 and had served them well but it was aging, and components were wearing out. Also, a number of stand-alone satellite systems needed replacing after damage caused by multiple lightning strikes.

"This is another reason why we had to replace Irrinet system – we couldn't operate the whole system through Irrinet," Craig said. "Technology moves so quickly. Our new system is more usable remotely through the app, which didn't exist at the time for the previous style. We can use mobiles or any desk top within the gardens or externally. This usability is really important to us."

The remote access via the app is handy not only for general use but also for out-of-hours, weekend or fire emergencies.

Water use in different areas

The ANBG demonstrates best-practice horticultural water use through appropriate watering times and amounts and reduced watering of lawns.

Open grounds. The automatic irrigation system used in the grounds features a series of drippers, overhead sprinklers, micro-sprayers and ground-level low volume emitters.

Each horticulturist sets the parameters for the automatic watering of their sections using the computerised irrigation control system. They set the days of the week, the volume of water to be used, and the 'cycle and soak' timing periods. Watering is between 5:00pm and 8:00am for short periods (around an hour) to allow the water to soak in and to avoid run-off.

If the automatic weather station registers more than 20 mm of rain, then the irrigation program cancels all watering until further notice. The irrigation officer manually restarts the program to recommence watering.

In hot weather the horticulturists water by hand early in the day, to minimise evaporation, to supplement the evening watering.

Monthly water usage reports for each section help the horticulturists manage their water usage and significant water savings have been made in recent years.

Rainforest. Under the café bridge at the top end of the Tasmanian rainforest is a fogging system. It has a series of small nozzles that emit a mist of water at an average rate of only 17 L/minute. The misters usually come on every day at 11:00 am, 12:00 pm, 1:00 pm, 2:00 pm and 3:00 pm and run for 30 minutes each time. The system has a rain-switch that turns off after 15 mm of rain and remains off until the switch dries out.

The fogger mainly has a pleasing aesthetic effect although it does affect the microclimate for the Tasmanian rainforest plants in the vicinity. The humidity is increased and plants are moistened by the fog.

Nursery. The horticulturists hand-water in the propagation and production areas of the nursery. With such a wide variety of plants that have differing water requirements, overhead watering systems are not well-suited to the nursery. Fungal problems can develop with too much water, especially when watering over-head. Low emission drippers directed at plant level have also been trialled.

Water run-off from the nursery is captured in storage tanks below the nursery. This water can then be used for watering outdoor garden beds.

The system relies on smart satellite control in free-standing plastic pedestals throughout the gardens.

The propagation houses in the nursery are watered once a day, all year round and the production area is watered twice a day in summer and once or twice a week in winter.

Glasshouses. Watering in the glasshouses is by hand using a water-wand and by micro-irrigation - drippers and spray from micro-jets. A misting system increases the humidity in the glasshouses. This system comes on several times a day in summer and less often in winter.

The plants receive additional hand watering as required. Each glasshouse simulates a different environment e.g., sub-tropical, montane, Papua New Guinea - so watering varies.

Hand-watering in the glasshouses is generally done once or twice a day in summer and once or twice a week in winter.

Acknowledgement. Thanks to the Australian National Botanic Gardens for permission to use content from their website and to Craig Cosgrove for providing additional information.

For more information contact the Australian National Botanic Gardens at info@anbg.gov.au

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ELECTROMAGNETIC WATER TREATMENT AND SOIL MICROBES

SNAPSHOT

- A study by Hydrosmart and RMIT has investigated how electromagnetic water treatment affects lettuce growth and soil microbes.
- The team irrigated lettuce seedlings with hard, salty bore water over a six-week period. One group of lettuces was irrigated with the water that had been treated with an electromagnetic field, and a control group was watered with untreated bore water.
- The lettuces irrigated with treated water grew significantly larger during the study.
- Beneficial soil microbes were more abundant in the soil irrigated with treated water, indicating that plants may benefit from treated water, in part through complex interactions within the soil.

Growing evidence suggests that electromagnetic field devices can be an effective way of treating hard water without using chemicals. This technology is used in a range of industrial and agricultural applications to overcome scaling, and to reduce the negative effects of salinity on crops. Research by RMIT University and Hydrosmart now suggests that it may also benefit soil microbes.

How does the technology work?

Studies show that the resonance frequencies emitted by electromagnetic devices may disrupt bonding between minerals and elements, so instead of crystals building, the minerals are dissolved. Large complex crystals, such as sodium chloride, may be broken down into tiny particle form and as a result, scaling in pipes is reduced.

Most studies that have looked at this technology have focussed on how it can reduce scaling, but crops may also benefit from treated water. Salts present in a dissolved form in bore water that has been treated with a specific electrical field are more likely to leach below the rootzone, while salts in untreated water are more likely to remain in the rootzone, and to have negative effects on plant growth. Crops might also benefit from the greater availability of dissolved calcium, magnesium and potassium and other necessary nutrients in treated water.

Hydrosmart and RMIT

South Australia–based company Hydrosmart has been working on electric field technology for more than twenty years. The Hydrosmart device generates an electric field through water, by using a section of PCV or poly pipe wrapped with insulated copper wires connected to a computerised controller. At no time does electric wire contact water, hence it is an electric field, not an electric current. Treated water is then used on crops.

Hydrosmart staff set up a scientific trial in collaboration with researchers at RMIT. Distinguished Professor Andrew Ball's lab took on the project on the strength of a previous trial conducted by Ball and Dr Bob Moore at Flinders University, which showed that particle size could be affected by the treatment. Professor Ball proposed setting up a controlled greenhouse trial on the university grounds at Bundoora.

The biological trial presented here went a step beyond looking at physics and chemistry to also investigate the effects of electromagnetic water treatment on soil microbes. The researchers hypothesised that irrigation with treated water might alter the composition of the soil. For instance, it might increase the abundance of beneficial soil microbes, which in turn might explain increased plant growth that has been observed with treated water.

Lettuce was selected as the trial crop because previous hydroponic trials had shown that Hydrosmart improves lettuce weight. Farmers had also independently reported that soil-grown crops also produce better yield with treated water.

The greenhouse experiment

Bore water of 3,500 ppm total salts, a particularly salty and hard water, was used in the trial. Many farmers have access to water of this quality but do use not it for cropping, owing to its negative effects on plants.

The trial ran for six of the planned twelve weeks, and its objectives were to determine the effect of treated water both on the early growth of lettuce seedlings and the soil microbial population.

Seedlings were obtained from local nurseries and soil from a local garden centre. Two treated rows of plants were each irrigated with pipe sections individually fitted with Hydrosmart. Pipes containing untreated irrigation water were kept far from Hydrosmart units to ensure that they weren't influenced by electric fields. Treated and untreated plots all received the same bore water, only in the case of the treated plots the water had been passed through computer-generated electric fields.

The researchers harvested three lettuces from treated plots, and three lettuces from untreated plots at two-weekly intervals over the six-week period and recorded the weights of the roots and shoots.

Lettuces were grown at Bundoora Campus RMIT University in a greenhouse in autumn, 2019. Irrigation was fed by untreated bore water (first and third rows from left), and Hydrosmart-treated bore water (second and fourth rows from left).

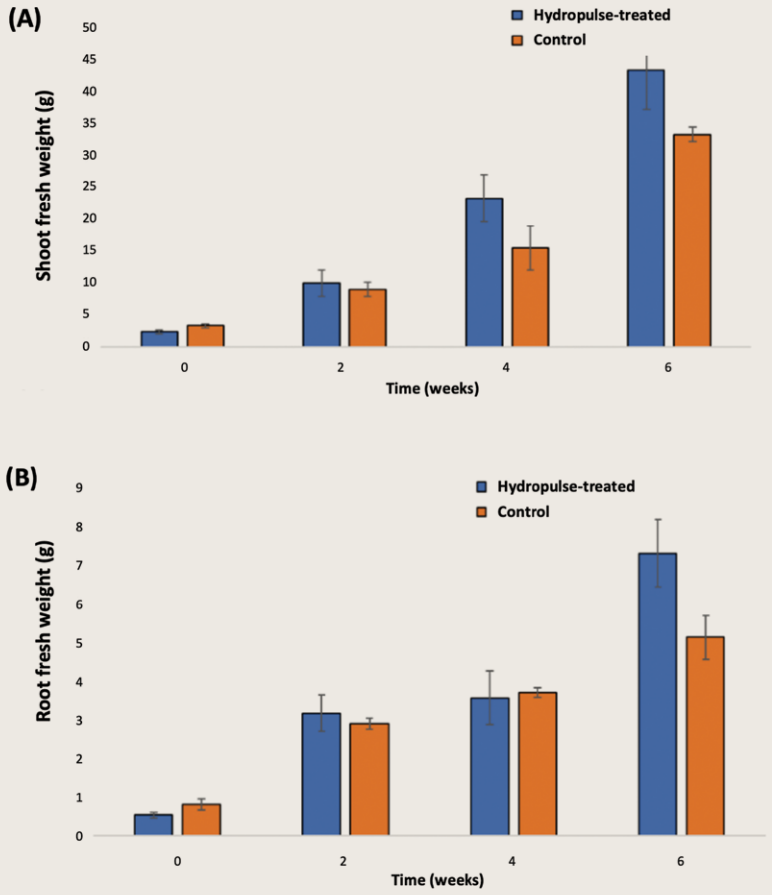

Fig 2. Lettuce weights. Shoots (A) and Roots (B) were weighed from treated and untreated plots of lettuce respectively over a 6-week period.

Planting location and the lettuce selected for measurement, were chosen using a numerically random selection method.

Measurements were made in triplicate allowing statistical analysis.

Shoot and root weight were recorded from the date of planting of the seedlings.

Both shoot weight and root weight were more than 20% greater in the treated than in the untreated lettuce.

This is in accordance with other lettuce trials done using Hydrosmart treated versus untreated water and conduced in Adelaide Hills. The finding is always consistent.

Specifics of the microbial fungi population were gathered .

Figure 1. Lettuce weights. Shoots (A) and Roots (B) were weighed from treated and untreated plots of lettuce respectively over a six-week period. Planting location and the lettuce selected for measurement were chosen using a numerically random selection method, and measurements were performed in triplicate. Shoot and root weight were recorded from the date of planting of the seedlings. Both shoot weight and root weight were more than 20 per cent greater in the treated than in the untreated lettuce.

After six weeks, the researchers used molecular techniques to assess the microbial fungal population of root ball soil, effectively DNA fingerprinting the microbial populations.

Better microbes, bigger lettuces

Over the six-week period, lettuces irrigated with treated water grew bigger than those that received untreated water. This is in agreement with other lettuce trials done using Hydrosmart treated versus untreated water and conducted in the Adelaide Hills.

In the greenhouse trial, the researchers found that beneficial microbes – particularly the fungal species *Coprinus, Coprinellus* and *Phaeoisaria* – were more abundant in soil irrigated with the treated bore water. The role of these species includes breaking down the soil into its constituent nutrients, thus facilitating nutrient uptake by plants. The results of the study indicate that the improved plant growth that is seen with treated water is partly due to Hydrosmart's effect on the soil microbes.

Interactions more complicated than we know

Various studies have shown that electromagnetic water treatment can improve crop growth, although the mechanisms are not yet fully understood. The interesting thing about these findings is that they suggest that the interactions going on in the soil might be even more complex and beneficial than we know.

"This is really exciting," Dr Bob Moore said, when asked to comment on the work of Professor Ball. "There are obviously a whole lot of things going on in the soil. This is the first study that I'm aware of to look at the effect of electromagnetic water treatment on soil microbes."

Source. This is an edited version of an article, reprinted with permission, from the Hydrosmart website.

If you're going to the **Irrigation Australia Conference and Exhibition** from 5 to 7 October in Adelaide, be sure to check out Hydrosmart's technology at their exhibition stall.

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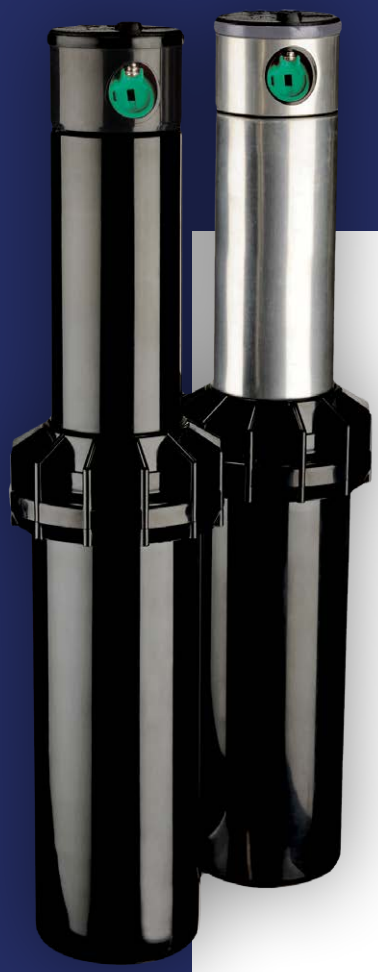

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Council collaboration saves money and water

SNAPSHOT

- Three Adelaide councils have formed an innovative 'cross-council irrigation partnership' – an in-house team to deliver irrigation projects across the three municipalities.
- This approach saves money for the ratepayers and means that jobs can be done as needed, sometimes in short sports off-seasons.
- The team's biggest project to date was an upgrade of the irrigation system at TK Shutter Reserve, which was completed in 2021.
- We spoke to Irrigation Construction Manager Tyron Bennetts about how the partnership works and what the team has achieved over three years of working together.

Three Adelaide municipalities have found that working together on irrigation projects reduces costs for their ratepayers and helps councils get jobs done when and where the work is needed.

FORMING THE PARTNERSHIP

In 2019, staff at the councils of Marion, Charles Sturt and Port Adelaide Enfield (PAE) joined forces to manage and run their irrigation projects with in-house teams. Tyron Bennetts, irrigation construction manager for the three councils, explained that around this time all three councils had a lot of irrigation upgrades scheduled and private contractors were at capacity.

Three Adelaide councils have collaborated to form a cross-council irrigation construction partnership. Left to right: Jarryd Kelly (irrigation construction team member), Steve Smith (irrigation construction team member), Andrew Brumfitt (irrigation construction field leader) Tyron Bennetts (irrigation construction manager).

The in-house team upgraded the entire system, which included new booster pumps and dosing pumps in the pump shed.

"There was almost a situation of market flooding at this time – irrigation work was needed across a lot of South Australian councils, but particularly Marion, Charles Sturt and Port Adelaide Enfield. There were not enough private contractors to handle the workload, and when there's that much work, not only is it difficult to find a contractor, but the prices are a bit inflated."

To overcome these challenges, the three councils collaborated to form a cross-council 'irrigation construction partnership' to upgrade and install irrigation systems in their reserves as needed. Combined, the municipalities manage around 700 irrigated reserves.

HOW IT OPERATES

All irrigation construction team members are full-time employees of the City of Charles Sturt. However, they work out of other council depots as required. In their first year, the team completed 15 projects across the three municipalities, in the second year, 17 and in the third year 12.

Tyron said that the main challenges occurred in the early stages of the partnership and centred around team knowledge and experience, process improvements and aligning expectations. However, after three years of working together, it is now a seamless operation.

"We collaborate to deliver quality works at a lower cost to the rate payers. It's unique, as far as I know – I'm not sure how many other councils around Australia are doing it," Tyron said.

"My role is to work with project managers across each of the councils. Each project manager prepares their plans for their next financial year's works. I then cost all the projects and we build a 12-month schedule, with the work guided by a management team and a steering group."

The management team meets annually and goes through the different councils' needs and puts together an agreed schedule for the year, taking into consideration the amount of work to be done, timeframes, and whether there any high-end projects that need to be planned for, thereby ensuring that the planning is equitable for each council.

Different municipalities have different needs – each council uses different hardware, and the specifications vary slightly between councils. Tyron works with the project manager from each council to take these specific needs into account in calculating the estimates for each project.

With larger projects, the team hires contractors for some components of the work, such as backflow installation, larger scale excavation and all the electrical work, but 95 per cent of the work is completed by the team. On smaller reserves the entire job is completed by the team.

Once up and running, the team hands over the system to the open-space team in the respective council, which then takes over the daily operation and maintenance of the systems.

THE TEAM'S BIGGEST PROJECT

In late 2021, the collaboration completed its largest project to date: an upgrade of the irrigation system at TK Shutter Reserve. "We've been building our skillsets over time," Tyron said. "We have some experienced guys on the team, so we were able to finish this project to a high quality. We're really proud of this project." You can read about the TK Shutter Reserve project on page 18.

COST SAVINGS FOR RATEPAYERS

The cross-council collaboration has several benefits. Not only does it enable irrigation work to be prioritised and completed as needed (sometimes in short sports off-seasons) but it also significantly reduces expenses for council ratepayers – both through economy of scale and reducing the need to outsource work.

THE IRRIGATION CONSTRUCTION TEAM'S BIGGEST PROJECT

The in-house team upgraded the entire system, which included new booster pumps and dosing pumps in the pump shed.

Completed in late 2021, the TK Shutter Reserve irrigation upgrade in Port Adelaide Enfield (PAE) is the irrigation construction team's biggest project to date.

The location: The reserve is the home of the National Premier League South Australia (NPLSA) soccer team, the North Eastern MetroStars. The site has three turf playing surfaces, which surround a synthetic turf game surface. The council has a licence to use more than 16,000 KL annually from a local bore for irrigating the oval, which is pumped into a 100,000 L underground tank.

The problem: The project was part of the council's parks and gardens 10-year capital works program. The old system had been in place prior to the merger of the Enfield and Port Adelaide councils in 1996 and was beginning to have maintenance issues. The use of bore water creates a salinity challenge for reserve managers, so it was important for this to be closely monitored and controlled.

The solution: The system was designed by Glenelg Irrigation. The project took over 12 months from conception to completion, with construction taking place in October to December 2021 during the NPLSA off season. The team replaced the:

- control system: PAE undertook a significant process to determine the best single irrigation control system to be standardised across over 250 reserves, eventually deciding on a Rainbird LX-ME/LX-MEF two-wire control unit with IQ4 cloud control
- pumps: The in-house team worked alongside the pump and electrical contractors to install a new pumping system: a Grundfos Hydro MPC E 2 CRIE 10-6 booster pump and Grundos DDA 7.5-16 dosing pumps in the tank shed, and serviced the bore pump
- mainline: 1,160 m, sizing 63mm to 160 mm
- lateral line: 1,100 m, sizing 25 mm to 80 mm
- sprinklers: 176 sprinklers with 53 Hunter ICV solenoid valves
- old floats and sensors in the tank. A new touchscreen float level makes it easy to control salinity by adjusting relative amounts of mains and bore water with the slide of a finger.

The outcome: a very flexible and low-maintenance irrigation system that should last for years to come. Irrigation Construction Manager, Tyron Bennetts, says the quality of the turf has already improved significantly and predicts further incremental improvements over the coming seasons.

City of Port Adelaide Enfield
CITY OF MARION
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Acknowledgment. Thanks to the councils of Port Adelaide Enfield, Charles Sturt and Marion for providing information and photos for this article.

Eve White, Irrigation Australia

Dealing with plastic waste in the irrigation industry

SNAPSHOT

- Much plastic waste produced in agriculture comes from irrigation equipment.
- The majority could be recycled, but currently most is not.
- Recent government- and industry-led initiatives are aiming to increase recycling of agricultural plastics and to develop a more coordinated approach that makes it easer for people to recycle plastic.
- This article explains how to get involved and what's happening in different regions of Australia.

It's almost impossible to imagine living without plastic, but as we all know, plastic pollution is becoming a huge problem globally for the environment and for humanity.

In Australia, 7 per cent of Australia's plastic waste comes from the agriculture industry, according to a 2018-2019 government report, and a 2015 report produced for Hort Innovation found that a significant proportion of plastic waste in horticulture is in the form of irrigation equipment – largely drip irrigation tubing. Growers must either pay to dispose of the waste plastic in landfill or find other means of disposal. This often means burning or burying it on their farms, practices that are generally illegal and cause environmental pollution.

Many plastics can be recycled, but most plastic waste produced on farms is not, owing to challenges such as contamination by soil, pesticides and fertiliser, collection and transport problems, and the limited economic viability of recycling. But initiatives driven by industry bodies, government, and manufacturers and suppliers – including a number of Irrigation Australia members – are working to change this.

A significant proportion of plastic waste in agriculture is from irrigation equipment – particularly drip irrigation tubing.

With a recent national push towards developing a circular economy, coupled with the increasing economic viability of recycling plastics, these schemes are timely. According to Anne-Maree Boland, a principal with environmental consultancy RM Consulting Group (RMCG), "We're seeing the cost of virgin resin increasing, which means new products made from virgin plastic are becoming more expensive; we no longer have the option of sending plastics overseas for recycling; and the cost of disposing of waste in landfill is increasing."

WHAT'S HAPPENING IN PLASTIC RECYCLING?

Netafim's Recoil program. Since 2006, Netafim has been running the 'Recoil' scheme, a drip line recycling program, which has really started to take off in the last few years, according to Netafim's Director of Services, Peter Durand.

Peter said that the company is committed to developing its own circular economy: "Our number one objective is to use the recycled plastic in our own manufacturing process. Where this is not possible, our recycling partners sell the resin to manufacturers in Australia or overseas for use in manufacturing recycled plastic products."

The cost of hiring a Netafim Recoiler is $100 per day for growers located anywhere within Australia. The pricing is subsidised, and according to Uma Preston, Netafim Recoil coordinator, this is an important component of a sharing economy model that is designed to ensure that Netafim Recoilers are used optimally and that Netafim Recoil clients of all sizes can access the service.

"We have seen strong support for the $100-per-day pricing in regions where there is high demand for recoiling and recycling, such as the Riverland and Mildura. Support in other regions is also building," Uma noted.

Netafim helps Recoil clients estimate how many days they will need to hire a machine, based on how much drip line they need to recoil. Clients then hire the machine for only the time that they are recoiling, minimising costs to them and freeing up the Netafim recoiler for others to use.

National Agricultural Plastics Stewardship Scheme: Victorian Pilot. The National Agricultural Plastics Stewardship Scheme, supported by the Australian Government, is working to develop a viable market to recycle agricultural plastics, based on a similar model to other stewardship programs such as drumMUSTER. The pilot scheme is being run in Victoria's Sunraysia and Loddon regions. It focuses on drip irrigation tubes as well as grain bags and old grape covers.

The program, which is being run by Carl Larsen an associate with RMCG on behalf of the federal government, started in May and will continue through to October 2022. Carl said that while local recycling schemes exist in some regions, this is the first initiative to look at how to coordinate agricultural plastic recycling at a national scale: "We're aiming to come up with solutions that will be part of a broader scheme, rather than just region specific," Carl said.

Construction Plastics Recycling Scheme: Queensland pilot. This pilot scheme focuses on polyvinyl chloride (PVC) pipes. Since PVC irrigation pipes last far longer than polyethylene (PE) or low-density polyethylene (LDPE) drip line, PVC accounts for a much smaller proportion of agricultural plastic waste. But PVC recycling initiatives are important since PVC can be recycled up to six times without significant reduction in material quality. Assuming a pipe lifetime of 100 years, the PVC material in PVC pipes has a lifetime of excess of 600 years!

Netafim Recoil machines are available for growers anywhere in Australia. Pictured: Richard James from Loxton Irrigation in the Riverland Region of South Australia. *Photo by Michael Hitch.*

The Master Plumbers' Association Queensland (MPAQ) and Plastics Industry Pipe Association of Australia (PIPA) in conjunction with Vinidex, Iplex, Tradelink, and Reece, are running this pilot scheme, supported by the Queensland Government. The aim is to educate people about the recyclability of PVC pipes, change end user behaviours and collect data on waste generated during construction. The insights will be used to develop long-term solutions for the collection of PVC pipe and fitting off-cuts within the plumbing industry.

During 2022, while the scheme is running, clean PVC offcuts and fittings can be deposited in bins at nine locations in south-east Queensland.

Cindy Bray, Executive General Manager of PIPA, told *Irrigation Australia Journal:* "Our partners include plumbing merchants and pipe manufacturers. Part of the success of the scheme is to ensure the distribution footprint doesn't increase, so we have been trialling collection points at the locations that the pipe manufacturers are already delivering pipes and fittings to.

"These merchants' stores have bins on site which, when full, are collected from the manufacturer. The manufacturer processes the offcuts, and this material is then used back into the manufacture of new plastic pipes."

Other initiatives. Some manufacturers, including Vinidex, Iplex and Rivulis, facilitate recycling of specific types of plastic in some regions (see table for details). Some councils, such as Queensland's Lockyer Valley Regional Council and Bundaberg Regional Council, also incentivise recycling by allowing irrigators to deposit uncontaminated drip tape, free of charge, to be collected by recycling companies.

Launch of the Construction Plastics Recycling Scheme: Ian Paterson (Vinidex), John Salmon (Chair of Construction Recycling Scheme), Penny Cornah (MPAQ), Rob Marshall (Tradelink), Cindy Bray (PIPA), Hon Meaghan Scanlon MP, Minister for the Environment and the Great Barrier Reef and Minister for Science and Youth Affairs, Emily Lane-Chen (Reece) and Ben Folmer (Reece).

COORDINATION IS KEY

Although large volumes of plastic waste are produced in agriculture – particularly within the irrigation industry – a large-scale approach to coordination, retrieval and transport has been lacking. Endeavours like Netafim's Recoil program and the pilot programs taking place in Victoria and Queensland are hoping to change this. According to Anne-Maree Boland, "We know industry wants to do the right thing and this pilot provides an opportunity to work with industry leaders, collect end-of-life agricultural plastics and turn these products back into new ones to help farmers reduce waste and save money."

Eve White, Irrigation Australia

SERVICE	WHERE	WHAT	DETAILS	FIND OUT MORE
Netafim Recoil	Various regions around Australia	Drip line	Netafim Recoiler machines are available across Australia and NZ. The grower completes a Recoil request form and Netafim sends a retrieval machine to the nearest Netafim dealer. Using the retrieval machine, the grower recoils the drip line. Netafim arranges transport to the recyclers.	See the Netafim website or call Uma Preston, Recoil coordinator: 0452 537 266
National Agricultural Plastics Stewardship Scheme: Victorian Pilot	Sunraysia and Loddon regions, Victoria. Drop-off sites are in Mildura, Swan Hill and Ouyen.	Drip line, grain bags, grape covers	During the pilot, growers can drop off grape covers, irrigation tube and grain bags for recycling, free of charge. Farm collection is available for a fee for large quantities. Plastic must be clean, separated and tightly rolled or coiled. Retrieval equipment is available for dripline if needed.	Visit the RMCG website
Construction Plastics Recycling Scheme	Nine drop-off points in south-east Qld	PVC pipe offcuts and fittings	Must be clean and free of tape, screws, nails etc. Offcuts can be deposited in boxes at drop-off points.	See the MPAQ website
Rivulis	Lockyer Valley, Qld, and the permanent crop areas of southern NSW, Vic and SA	Drip tape and plastic mulch	In the Lockyer Valley, growers can stockpile their used drip tape at a central location, often on-farm for larger operations. The recycling operator organises collection. Tape should be separated from plastic mulch. In southern NSW, Vic and SA, Rivulis offer a free service of dripline winding machines.	Call Gilad Sela, Southern Australia regional manager: 0429 181 984 Guy Boyd, Northern Australia regional manager: 0419 797 905
Vinidex	Townsville, Toowoomba, Brisbane, Sydney, Melbourne, Perth	PE and PVC pipes	Vinidex recycles decommissioned, unused or offcut plastic pipes and fittings	Call 131169 or visit the Vinidex website
Iplex	Across Australia	PVC and PE pipe offcuts and fit-tings	Plastic should be clean and should not contain other materials (screws, tape, rubber etc). Drop off at central location by appointment.	Visit Iplex website.

Who's a good candidate for solar water pumps and what are the benefits?

Solar water pumps have become increasingly popular in irrigation due to their eco-friendliness and lower costs of operation. However, there are instances in which solar pumps may not be the best solution. In this article, we discuss who is the right candidate for solar pumps and explore the benefits of switching.

OLD MYTHS, NEW TECH

People still often think that solar energy is dependent on constant sunshine to generate power. However, recent significant advances in solar technology have meant that pumps can run around the clock. Innovations such as hybrid power pumps and a focus on maximising efficiencies to pump more water with less sunshine have changed the game.

Take this example from a sugarcane farm in central Queensland that recently switched from diesel to solar for their irrigation. A hybrid solar pump solution was installed by Lorentz – a leading German solar pump brand that is distributed in Australia by ReAqua. The savings were significant with a 73 per cent cost reduction from $116 per ML to $23.14 per ML.

"Our farm management strategy is no longer constrained by energy costs, and we are much more able and willing to irrigate according to crop need rather than worrying about the enormous expense of turning on the pumps," said Josh Killer, one of the farm owners.

"This hybrid technology will empower irrigating farmers to water to suit the needs of their crops, not to fit in with power tariffs," he said.

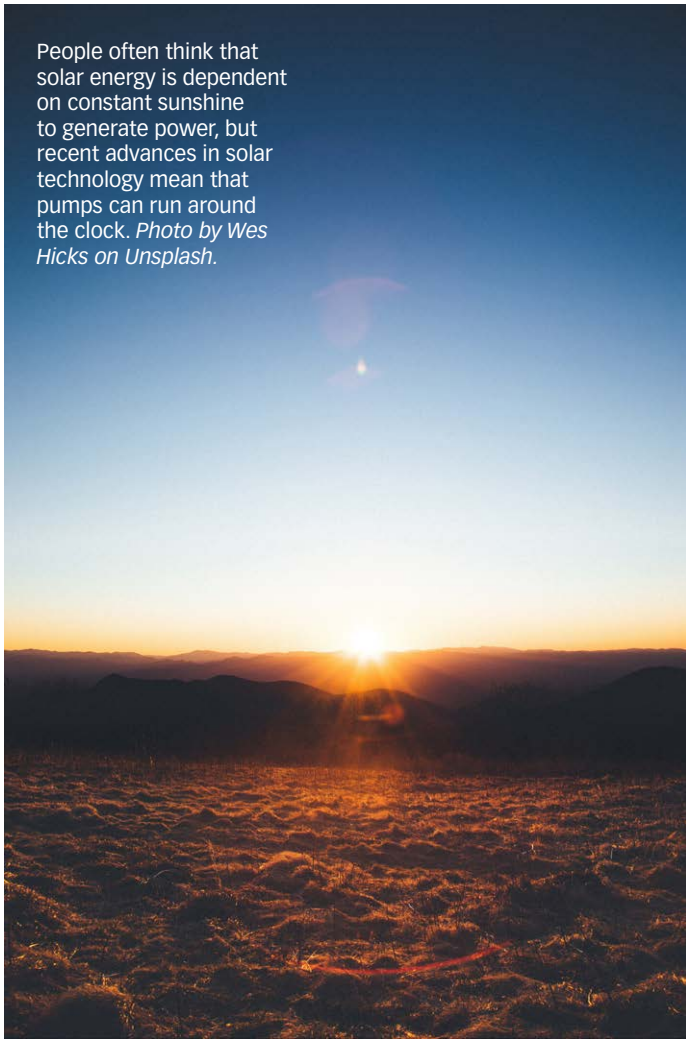
"It also has a major value-add – it is putting long-awaited lifestyle choices into irrigated farming. The system can be operated remotely via a mobile phone or other smart device. A farmer can be at home in their living room, or on holiday, and still be able to turn their pumps on and off," said Dale Holliss, Deputy Chair of the National Irrigators Council and member of the Energy Consumers Australia Board advisory committee.

LEAVING DIESEL IN THE DINO AGE

Diesel-powered water pumps have been the norm for decades. Fossil fuels were the standard until alternative energy became more advanced. For this reason, it can be difficult for farmers and agribusiness owners to switch to solar. Having said that, those who run or have run a diesel pump are aware of the high costs and maintenance requirements associated with diesel pumps.

While a diesel pump may have the benefit of lower up-front investment, it has considerable disadvantages compared to a solar-powered pump. For instance, with increasing oil prices, the cost of filling up with diesel can add up quickly. On top of that, diesel pumps are notorious for having high maintenance and repair costs.

Another disadvantage is logistics. The time it takes to travel to get diesel and to fill the pumps is time wasted, which could be used for more critical tasks. If a grower gets the diesel delivered, that's an additional expense.



People often think that solar energy is dependent on constant sunshine to generate power, but recent advances in solar technology mean that pumps can run around the clock. *Photo by Wes Hicks on Unsplash.*

WHY SOLAR PUMPS?

First, let's talk about the elephant in the room: the cost of solar pumps. While the initial investment of a solar pumping system can be much higher than traditional diesel pumps, the payback period can be as little as a couple of years.

What is the payback period? The payback period is the amount of time before you recover the initial investment in terms of profits and savings.

For the sake of simplicity, let's say the cost of purchasing and installing a solar pump system is $10,000 and the system is going to save around $3,600 per year on energy bills, the solar power payback or 'break-even point' will be 2.7 years.

Formula: $10,000 / $3,600 = 2.7

In fact, farmers can now get a precise payback period from their closest solar pump dealer, based on variables such as:

- location in Australia (used to understand expected sun irradiation)
- how much water is required per day for their irrigation requirements
- water source (bore/dam/creek/well)
- in the case of a bore/well, depth of the bore
- elevation from the water source to the final destination, such as a tank
- pipe length and diameter from water source to destination
- cable length from controller to the pump.

A local dealer should be able to use the above details to provide a payback period in a matter of minutes.

There are five main benefits of switching to a solar pump. These include:

1. Low maintenance

Solar pumps inherently have lower maintenance costs than diesel pumps. This is because the power source is natural sunlight. Additionally, solar pumps tend to have a much simpler mechanism. The system is streamlined with solar pumps, especially in terms of converting the energy source to electric power that allows water pumps to be operable. For this reason, solar pumps tend to last longer – typically more than 20 years – and maintenance costs are lower.

2. Convenience

Solar pump systems are easier to transport, store, and move around in the field. Also, unlike with diesel pumps, farmers don't have to drive out to fill the pump with fuel. Once set up, the pump does the work with minimal supervision and maintenance.

Solar pumps can be used on small, medium or large farms.

3. Reduced energy costs

A 100 per cent solar solution has minimal to ZERO energy costs, enabling farmers, who for many decades have relied on costly non-renewable energy sources, to substantially reduce their energy expenses. However, it's more common for farmers to use hybrid solutions. A solar diesel hybrid system can be automated to switch seamlessly to diesel power at night or on overcast days. Irrigators can reduce their power costs by using solar energy while still benefiting from power on demand offered by diesel.

4. Remote monitoring and management

One of the advantages of a solar pumping system is that it gives the user a lot of control. For example, there are now systems available that allow farmers to monitor and manage the power output of their solar pumps from the convenience of their smartphone.

5. Long-term profitability

Since farmers can save thousands of dollars every year by switching to solar pumps, they have the opportunity to double or triple their profits.

WHO IS A GOOD CANDIDATE FOR SOLAR PUMPS?

Farmers looking to switch to solar. Essentially anyone with a diesel or mains powered pump looking to switch to an energy source that's more cost-effective and eco-friendly.

Small, medium and large farms. Solar pumps are versatile and can be used on small, medium and even large farms.

Farmers thinking long-term costs. While solar pumps tend to be costlier upfront, the payback period can be as little as two to three years. In most cases, the long-term savings and financial benefits outweigh the initial costs.

WHO WON'T BENEFIT MUCH FROM SOLAR PUMPS?

Farms that need continuous ongoing power. Farms that require continuous ongoing power, including throughout the night, are more likely to require mains power due to the sustained constant energy requirements. For instance, a farm could choose to operate during the nighttime due to extreme daytime temperatures. They might also require emergency water pumping during heavy rain as a means to offset flooding.

Farms in rainy regions. While solar technology, especially when used as part of a hybrid system, allows operation during cloudy weather and nighttime, a substantial amount of sunlight is best to reap the benefits of solar energy. Some of the wettest places in Australia are Cairns in the far north of Queensland and the west coast of Tasmania around Strahan. In wetter areas, cloud coverage will limit the potential of a solar water pump.

CASE STUDY

The problem: Replace a stationary diesel engine that consumed up to 70 L per hour (375,000 L per year).

The solution: ReAqua's 500 kW solar diesel hybrid system was used to irrigate Jon's cotton and wheat crops by pumping 8 ML of bore water each day using solar alone, and flicking to diesel once the sun sets, pumping another 7 ML.

The outcome: Their current expenditure to pay for 350,000 L of diesel each year was halved, which means they will be able to pay this investment back within five years.

The payback period for ReAqua's solar diesel hybrid system on Jon's farm is five years.

Acknowledgment. Thank you to ReAqua for providing this article.

ReAqua will be showcasing their solar-pumping solutions at an exhibition stall at the **Irrigation Australia Conference and Exhibition** in Adelaide from 5 to 7 October. Visit them there to find out more.

MANAGING FLOODPLAIN HARVESTING AND AQUIFER RECHARGE

SNAPSHOT

- In NSW legislation, farmers must meter their take of floodplain harvest water, but water given back to the government via seepage is not accounted for. Instead, farmers should be financially encouraged to enhance seepage to replenish aquifers.
- Seepage is a complex process but it is theoretically possible to monitor.
- Once we have reliable methods to measure and monitor seepage, seeped water could be returned to landholders as groundwater rights, in part.
- Seepage ownership rights could encourage alternate water storage that reduces loss through evaporation and allows for reliable, longer-term storage suitable for permanent and higher value water use crops, stock and domestic use.
- This article proposes some essential elements to consider to get the legislative framework right.

The NSW Government is in the process of implementing regulation of what they call *floodplain harvesting* (FPH), which in the USA is called *capture of overland flow.* Other states of Australia are observing this regulation process with the intent of implementing their own version.

In the NSW legislation, farmers are now allocated an allowance of floodplain harvest water and must meter their take to show that they are not exceeding their allocation. In this situation, water taken from a floodplain is metered and licenced, but water given back to the government via seepage is neither metered nor licenced.

This article by David Allen looks at how the USA and Australia can learn from each other's management of FPH and aquifer recharge, and proposes a legislative approach for Australia that could incentivise farmers to make on-farm water savings.

What the USA is doing

In contrast to Australia, in the USA, governments of some states are financially encouraging enhancement of seepage for replenishment of aquifers because they have extracted groundwater unsustainably until they have created a water scarcity crisis. Aquifer replenishment in the USA is done effectively by floodplain harvesting to high seepage reservoirs that recharge over-utilised aquifers via prolific seepage. In the Central Valley of California, an unprecedented airborne electromagnetic mapping program is currently being conducted to search for the best sites to build ring tanks for enhanced recharge of aquifers.

Understanding seepage

Figure 1 shows an infiltration experiment where the likely seepage of the floor of a potential reservoir is being quantified. A small steel ring is fitted into the soil and kept full of water. After some time, the ground beneath is dug up and the wetting front is measured. A ring tank used for floodplain harvesting can be thought of as an upscaled version of this experiment.

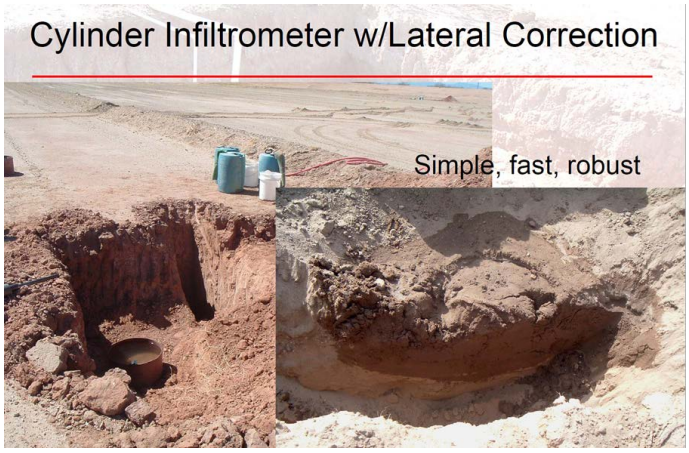


Figure 1. Measuring near-surface infiltration rate with a single ring infiltrometer and subsequent measure of lateral infiltration by visual inspection. (from Milczarek, M. 2022. State of the Art Techniques in Characterizing, Design and Operating Optimum Surface Spreading Groundwater Recharge Projects. 11th Int. Symp. on Managed Aquifer Recharge.)

To visualise how seepage might occur, take a look at the three schematics in Figure 2. Figure 2(a) shows a fictional schematic of a ring tank under which no seepage is occurring. This perhaps indicates the present concept of FPH as defined in NSW legislation.

Figure 2(b) presents a more realistic scenario. Just like in the experiment in Figure 1, the reservoir has a mound of stored water beneath, but given enough time, this storage connects with and merges with the groundwater reserves beneath the regional standing water level. Because most ring tanks are on floodplains made up of numerous prior stream sands, along with over-bank floodplain clay deposits, the simple scenario of Figure 2(b) is also only rarely encountered. Most ring tanks are more like Figure 2(c) with sand deposits beneath that drain water unevenly from the surface. For managed aquifer recharge, the focus is on connecting the sands to the surface water, while if the goal is to prevent seepage, the opposite must be achieved.

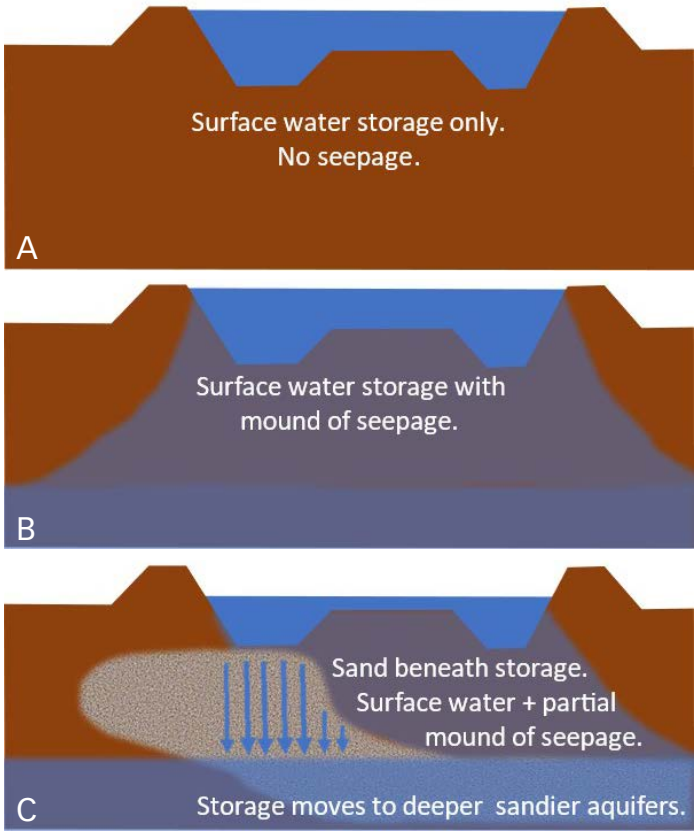


Figure 2.
(A) Many people see reservoirs as just surface water storage with no concept of what happens beneath. Only in unstructured compacted clay or with plastic liners can this approach reality. NSW FPH laws treat reservoirs as this case because they provide no rights for seepage losses returned to Commonwealth ownership as groundwater.

(B) Real reservoirs have the visible above-ground part and hidden groundwater mounds beneath that also form part of the water storage. It is rare for the mound to be simple and symmetrical like shown here.

(C) Deeper below most reservoirs built on unconsolidated alluvium are isolated deposits of silt, sand, gravel or even pebbles, cobbles or boulders. These are left by prior streams and other past geological events. The surface layer of soil tends to hide such features. Many reservoirs drain into such features such that a mound never properly forms beneath them. Identifying these features and enhancing seepage into them leads to opportunity to use the reservoirs for managed aquifer recharge. This is now popular in the USA.

Metering of FPH

Floodplain harvesting metering has potential to improve water security and increase water savings for farmers, should government encourage seepage metering as follows:

In the new NSW FPH legislation, farmers are required to meter water either with a water-level gauge and stage tables, which convert level to water volume, or by measuring inflow. Wet up and seepage occurring while filling a ring tank is excluded from a licence when using the level-gauge metering method, but it is included by the inflow measurement method. Either way, if a level gauge and stage tables are used, and the farmer is allowed to increase acquisition rate, access the level-gauge data, and augment it with good weather-station data, then it should be possible to model and calibrate seepage and evaporation.

Once this science is refined, which will take effort, errors on measurement go down, ability to check for unmetered inflows and outflows and tampering increases, and reliable measurement of seepage quantities will become achievable. Seeped water can then be returned to landowners as groundwater rights in part. Such seepage ownership rights encourage alternate water storage that saves water from evaporation and allows for reliable, longer-term storage suitable for permanent and higher value water use crops, stock and domestic use. The proportion of aboveground to underground storage can vary considerably depending on site geology and reservoir design but the underground storage is not subject to evaporation loss, which severely limits efficiency and longevity of water storage in the aboveground portion of ring tank storages.

Regional groundwater levels

One more concept is important in considering managed aquifer recharge from FPH ring tanks – the management of regional groundwater levels. Figure 3 shows two ways of managing groundwater and their implications for seepage and groundwater storage. The image on the left is typical of Australian management and the one on the right of historical USA measurement. California is presently trying to transition to a management model similar to the Australian model, and to do so they have to artificially recharge a lot of water into aquifers – eventually bringing down their energy of re-extraction costs.

These management models are important to managed aquifer recharge because having aquifers partly full facilitates more long-term groundwater storage – too full allows no storage and creates waterlogging, and too empty increases pumping costs and problems too numerous to discuss here.

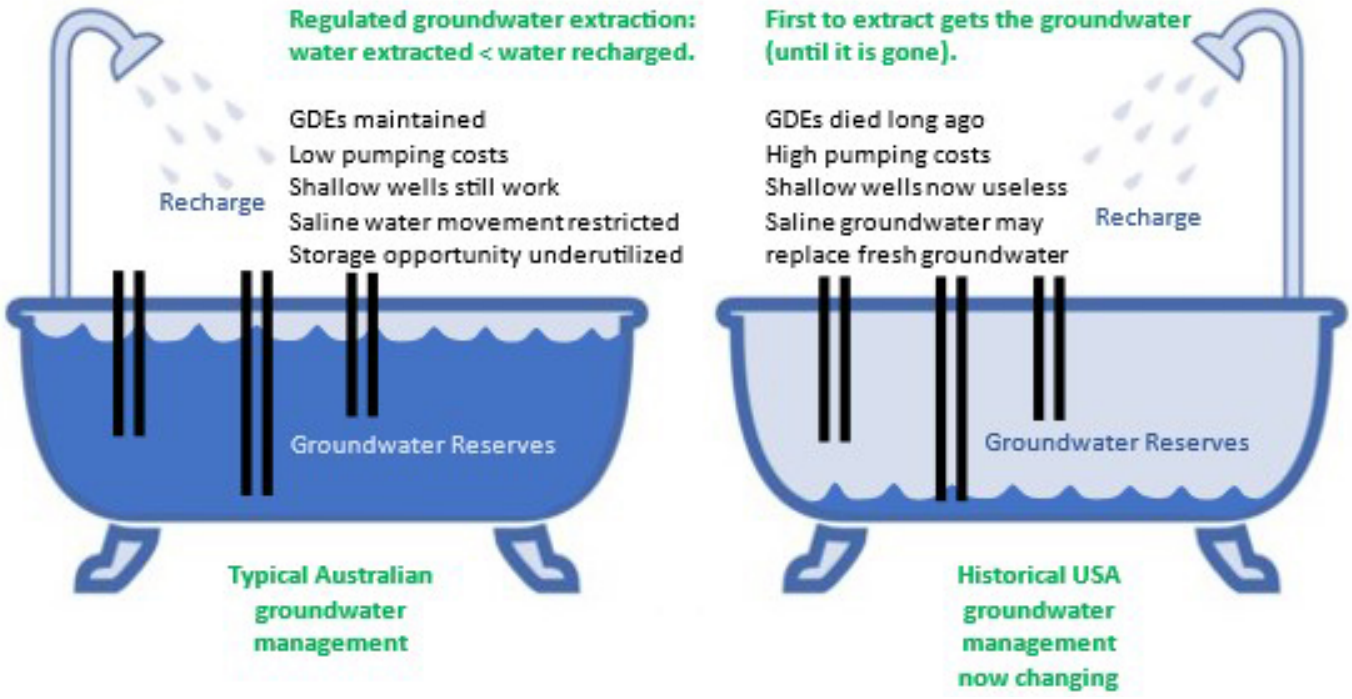


Figure 3. Different approaches to groundwater regulation have very different short- and long-term consequences. GDE = groundwater-dependent ecosystems.

Getting the legislation right

New South Wales FPH legislation is compelling farmers to make a big start on the investment necessary for measurement of seepage from their ring tanks, but at the same time is locking that investment up in a minimalist legal framework and very restricted internet of things (IoT) platform. Potentially, the legal framework for FPH could also be one that is suitable for seepage rights recognition such that water savings can be made.

To transform NSW FPH practice into one that saves water and encourages long-term water storage by giving of a seepage right, I suggest the following need occur:

1. Granting of, clarity on, and encouragement of use of, partial rights to seepage from metered FPH ring tanks.

2. Optional additional metering and data analysis to measure evaporation and seepage from reservoirs and to drive down uncertainty of seepage quantification. Farmers would only be able to access seepage rights to the extent that they drive down their uncertainty of seepage measurement. Figure 4 shows what one seepage metering station looks like. Investment in such metering is principally a management cost, whereas having additional sensors is a relatively small cost. Data analysis will become automated once uptake increases and seepage metering research occurs and so will become low cost.

3. Researchers will need to gradually refine seepage measurement analysis, and for this to be affordable they will need to flexibly manage and gradually refine what data is collected and saved. Ideally this will be via an IoT platform of their choice that meets government standards. Government may provide one such IoT platform as a lowest common denominator facility but should not be forcing all farmers to such restrictive use of their metering investments.

4. Metered data management should be subject only to auditing, in the way that financial accounts are audited for tax purposes, rather than restrictive monopolistic control by government. There are numerous possibilities for value adding to farmers' metering investments that can only occur with an auditing, rather than a restrictive monopolistic approach to the IoT platform. There should be a choice of IoT platform, provided such platforms meet auditing requirements. Government will need to define their requirements for water balance accounting for seepage estimation to varying degrees of accuracy. Some field inspection for leaks on valves will be required too.

5. A change of investment focus from inhibiting seepage to using seepage as a storage option, particularly to reduce loss of long-term water storage to evaporation. Some ring tanks may become partitioned to high seepage and low seepage cells and some may have enhancement work and de-clogging conducted. Groundwater monitoring and extraction works may be enhanced potentially using existing wells or horizontal wells beneath reservoirs so that seepage may be extracted in useable quantities in a timely manner.

Improving water security in droughts and saving water from evaporation by use of managed aquifer recharge from farm reservoirs is perhaps not easy to achieve viably but FPH management and legislation should be adapted to help provide rather than prevent any reward in the form of on-farm water savings achieved by managed aquifer recharge. The same investment put into metering for FPH compliance should be able to be used also for evaporation and seepage metering and for provision of a partial right to water stored by seepage. Otherwise, farmers are simply forced, by the laws of physics, to give government back water they are licenced to keep and will be discouraged and prevented from using practical means of improving water use efficiency.

Dr David Allen, Groundwater Imaging, Dubbo, NSW. Ph 0418 964097.

Figure 4. A storage water level, evaporation and seepage monitoring station. A small float in the upper right marks the position of the pressure transducer, which is pulled out to and back from its resting place using ropes in conduit and a pulley.

Are you attending the **Irrigation Australia Conference and Exhibition** in Adelaide from 5 to 7 October? Be sure to check out Groundwater Imaging's technology at their exhibition stall.

SEE YOU AT THE GREATEST IRRIGATION SHOW ON EARTH!

Are you attending the Irrigation Australia International Conference and Exhibition from 5 to 7 October in Adelaide? We're expecting a great turnout of delegates from Australia and further afield. The week promises to be huge.

The conference theme is 'Irrigation for the future – challenges, innovations and opportunities'. The event is also a great opportunity to invest in your future – to find out about the latest technology, trends and research, and to connect with likeminded people.

The conference is running concurrently with the 24th International Commission on Irrigation and Drainage Congress. Registration is great value since it enables you to attend sessions within both events, and of course, the all-important social events. The industry exhibition also forms part of this event, and it's free for all to attend, whether you're a conference delegate or not.

HAVE YOU REGISTERED?

It's not too late!.

Find out more and register here.

WHAT TO EXPECT

- ✔ 84 conference presentations at the Irrigation Australia Conference by experts in water management, policy, technology and more
- ✔ 70 presentations at the ICID 24th Congress by international guest speakers
- ✔ Informative workshops: Murray-Darling Basin, Renewables in Agriculture, Women Working in Water Forum, Fish and Irrigation, Geosythetics
- ✔ The exhibition: more than 100 leading irrigation industry suppliers will be showcasing their products (5, 6 and 7 October)
- ✔ A range of technical tours covering some of Australia's most exciting irrigation and water management projects
- ✔ A great social program: all delegates are invited to the welcome reception and Outback Spectacular dinner
- ✔ A unique opportunity to make lasting friendships and connections with others in the industry

SPEAKER PROGRAM

The program features an impressive line-up of some of the best minds in the industry – professionals from R&D organisations, tech developers, governments, universities, industry bodies, water corporations and more. You'll get an overview of what's happening right now as well as insights

The conference and exhibition provide an unprecedented opportunity to share ideas, knowledge and best practice between Australia and the world.

into the future of our industry in the areas of science and policy, technology, water management, sustainability and everything in between. The program details will be updated on the conference website as they are finalised.

WORKSHOPS

The workshops will be a highlight of the conference, giving attendees a unique opportunity to take a deeper dive into topics that are important to the irrigation industry in our changing world. A selection of the workshops on offer are described below. For a comprehensive list of workshops and other conference events, check in regularly with the conference website. URL https://www.icid2022.com.au/

Geosynthetics

This full-day workshop features presentations from experts about how geosynthetics can be used to enhance the performance of canals, reservoirs and dams. The event will be of particular interest to the engineering community specialising in water storage, transport and distribution.

The presentations will focus on how geosynthetics can be used as a cost-effective and durable solution for seepage control, drainage, surface erosion control, stabilisation of weak subgrades and soil reinforcement in canals and other water-retaining structures. You'll hear case studies from around the world, focussing on different geosynthetic materials. We'll also explore how geosynthetics can contribute to durable infrastructure with a very low carbon footprint, often at lower cost than traditional lining methods.

This event is organised by The International Geosynthetics Society (IGS) in collaboration with Irrigation Australia and the International Commission on Irrigation & Drainage (ICID).

When? Tuesday 4 October 2022, 8:45am to 6pm.

Want to know more? Visit the conference website

Renewables in Agriculture


Karin Stark from Farm Renewables Consulting.

This workshop will be chaired by Karin Stark, who lives on a cotton and wheat farm in Narromine NSW and is the director of Farm Renewables Consulting. In this session, sponsored by Grundfos, you'll learn about how agriculture can prosper from Australia's energy transformation. Hear from speakers from industry, government and academia who will provide their perspectives on:

- how farmers will cut costs, reduce emissions and build business resilience both through on-farm adoption of renewables and hosting large scale solar and wind developments
- what else can be done to support this transition
- how microgrids could be enabled by a modernised grid
- and what's on the horizon for agriculture including energy storage, hydrogen and electric farm vehicles.

When? Thursday 6 October 8.30am to 1:00pm

Want to know more? The winter 2022 issue of the Irrigation Australia Journal featured an insightful interview with Karin Stark on page 33. You can also find out more on the conference website .

Murray–Darling Basin

In this workshop, facilitated by Isaac Jeffrey, CEO of the National Irrigators Council, you'll get insights into the Murray–Darling Basin Plan over two sessions: 'Finalising the Basin Plan' and 'Preparing for the future'. You'll hear the perspectives of a range stakeholders, and each session will be followed by a Q&A with the panellists.

When? Thursday 6 October 2022, 2pm to 5:15pm.

Want to know more? Visit the conference website.

One Basin CRC


Mike Stewardson, interim CEO of the One Basin CRC.

The One Basin CRC is a national consortium of 85 partners that will develop and commercialise opportunities for Australia's irrigated agriculture and rural water industries to be more productive, resilient and sustainable. Key features of this approach are its cross-sectoral partnership, regional place-based R&D program and deliberate design to overcome historic barriers to innovation.

This ten-year program is commencing in 2022 with the support of a $50 million grant from the Commonwealth CRC Program and more than $106.5 million total commitment from partners.

The session will explore this unique industry-led research program. You'll hear an overview of the new One Basin CRC by Professor Mike Stewardson, interim CEO and will learn about some of the initial collaborative research activities from various partners. It will conclude with a panel discussion of this and other approaches to collaborative research in irrigation landscapes.

Mike told *Irrigation Australia Journal,* "Anyone with an interest in improving the water supply value chain from water sources to the full range of potential water uses will have an interest in the work of the One Basin CRC. This includes irrigators, water utilities, water management and policy agencies and the businesses that service these groups.

"Attendees will gain an understanding of how the One Basin CRC will operate and what value it might have for their organisation."

When? Friday 7 October 11:15am to 12:45pm.

Want to know more? Visit the conference website.

Women Working in Water forum

This forum, with a focus on women who work in the water sector, has three components – a breakfast, a panel discussion, and a world café event – to encourage discussion and engagement in a social environment. The aims of this event are:

- to highlight the important role that women have working in the water sector and to recognise the significant contribution that women make to the irrigation industry both in Australia and globally
- to encourage the next generation of young professionals to consider the irrigation industry as a great career opportunity
- to help address the gender inequality that exists in our industry

The breakfast will be chaired by the Hon Karlene Maywald, the South Australian Water Ambassador at South Australian Government – Department of Environment and Water. The keynote speaker will be Rosalie Auricht, CEO of the Renmark Irrigation Trust in South Australia. You'll also hear from Professor Andrew Campbell, CEO of Agricultural Centre for International Agriculture Research (ACIAR), the event's sponsor. You can express your interest for the invitation-only breakfast via the link below.

A panel discussion will follow, also moderated by Karlene. Each panellist – speakers chosen for their skills and experience in this arena – will talk about their water journey and experience as a woman working in water. Professor Andrew Campbell will provide a male leaders' perspective and the audience will have the opportunity to ask questions.

Following the panel discussion, the panellists will move to a world café format. The panellists, who will include Louise Whiting, senior water management specialist at FAO, and Katharine Cross, strategy and partnerships lead with AWP, will host individual tables. Young irrigation professionals are encouraged to attend and participate, moving from table to table at a designated time to hear and share experiences.

When? Thursday 6 October: breakfast 7 to 8am; panel discussion 8:30 to 10:30am; world café 11:15 to 1pm.

Want to know more? You can register your interest in the invitation-only breakfast here.

Not planning to attend the conference? You still have the chance to attend this forum. The event sponsor, Hunter, has made a limited number of free places available for young professionals: send an email marked to the attention of Chris Delphin to: icid2022@irrigation.org.au.

Further details are also available on the conference website.

AN INSPIRING WATER WOMAN: KARLENE MAYWALD

Karlene Maywald is passionate about the water sector and supporting women working within it. From 2004 until 2010, during one of the worst drought periods in living memory, she served as South Australia's Minister for Water Security and the River Murray. She has sat on many national ministerial councils and is managing director of Maywald Consultants Pty Ltd, providing water policy and government relations advisory services.

Karlene found the time between international trips to speak to *Irrigation Australia Journal* about the challenges and changes facing women in the industry and what people can look forward to at the Women Working in Water Forum.

IA. What can people expect at the Women in Water Forum?

Karlene. This is a forum for men and women to hear the remarkable stories and experiences from some fabulous leaders working in water who happen to be women. The world café will explore the challenges and the triumphs of being a woman working in water.

Rarely do we get to hear from such an incredible line-up of successful women working in water. It's a powerful session. We particularly encourage young water professionals to come along and hear some gems from those who are living the women working in water stories!

IA. What unique challenges do you think women face in the industry?

Karlene. There are many challenges. The industry continues to be heavily dominated by men and pay disparity continues to be an issue. We are, however, making some very good progress in recent years with more women rising to leadership positions. It can be very lonely at the top, particularly when juggling family and career.

IA. Traditionally, women have been underrepresented in the water sector. Is this changing?

Karlene. Women continue to be underrepresented; however, there have been some positive signs in recent years. A more concerted effort to educate young girls about the career opportunities in water is needed to encourage more participation.

IA. What are you most looking forward to at the forum?

Karlene. Hearing from our inspirational panellists who will share their own journeys, the challenges and the twists and turns along the way.

24th ICID INTERNATIONAL CONGRESS
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- Women Working in Water Forum
- Renewable Energy Workshop
- One Basin Workshop
- Geosynthetic Workshops
- Murray Darling Basin Workshop
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Ken Baldwin


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IRRIGATION AUSTRALIA

UP CLOSE

Following Bryan Ward's decision to retire from his role as CEO of Irrigation Australia and make the big move south to the cooler climate of Tasmania, the organisation conducted an extensive recruitment process for his successor. In August David Cameron was announced as new CEO. Dave is set to commence in the role on 12 September.

Dave brings to Irrigation Australia a wealth of skills and experience in financial management, marketing, training, events and operations. Dave has a strong background in consulting and government roles, and in 2020 received the Australian Water Association (Queensland) Distinguished Service Award. For the past 11 years he has been CEO of the Queensland Water Directorate (qldwater), a member organisation for Queensland's urban water industry.

We got up close to Dave to find out about his background, his passions and his priorities as CEO.

IA. Can you tell us a bit about your background?

Dave. I was born in Gayndah and grew up in Maryborough but have been living in Brisbane since 1988 – currently in Pullenvale on an acre and half, which has no useful purpose other than providing a nice gap between us and the neighbours.

Like most people running little associations it's been pretty crazy reshaping things to cope with pandemic challenges, so a lot of my 'spare' time has been filled up with work. However, I am still a cricketer of sorts and always have a long list of chores at home. I have a few guitars but as a hobby it's not exactly compatible with cricket fingers (Google photos of Ian Healy's hands!).

My wife is a learning and development professional currently working at QUT, and I have two kids. My daughter is completing a double degree in teaching/performing arts and my son is currently laying flooring and odd jobs while trying to decide if he has the drive to keep pushing his representative hockey ambitions.

IA. What about your professional background?

Dave. I thought I was going to be a journalist at one point in the late 80s, but then changed to focus on public policy, thinking that I might be an adviser or lobbyist once I started working in the Queensland Government.

Eventually I fell into research management, eight years at a CRC, some consulting, and then the urban water/sewerage services industry through qldwater. qldwater's major work is around data management for members, regional alliances, skilling, advocacy and events.

My qldwater role has been a great experience, with lots of travel to regional Australia. In May this year, I spent some time around Indigenous communities in the Cape that most people never get to visit. I even saw a bloke wearing an Irrigation Australia cap in Kowanyama, if you believe in omens!

IA. What do you see as the big issues in the irrigation industry in Australia right now?

Dave. Clearly, climate, water availability challenges, and water efficiency are important. I've done a lot of strategy development in my current role, and I think the good thing is that I have no pre-conceptions and am keen to listen to members and hear their thoughts on this.

IA. What are you most looking forward to in your role as CEO?

Dave. I'm still to meet a lot of people but I went through a comprehensive selection process and the board representatives responsible for that did a great job of conveying their passion for the sector. There are lots of parallels in the work I've been doing with qldwater. Perhaps for now, I'll just say that I'm looking forward to a change of scenery, a new set of challenges and enthusiastic stakeholders. I'm really impressed with the business and what Bryan and his team have been able to achieve since 2016 and I hope to be able to build on that with a different set of eyes.

IA. What's the most recent book you've read, and where are you planning your next holiday?

Dave. Embarrassingly, I'm not very good at finishing books these days. I have four half-read books on the go: autobiographies of Ben Folds and Dave Grohl, a Weber cookbook and one called Tea and no sympathy, which is about grade cricket and is too blokey to take in large doses. If you ask me about Netflix, you might get a better response (although thinking about it, there are maybe 20 unfinished things in my 'continue watching' list!).

I still need to retrain myself to plan a holiday. My 50th was meant to be NZ, but lockdowns scotched that. I was going to spend a week in January fishing on North Stradbroke Island and not doing much else but the whole family got Covid.

REGIONAL ROUNDUP

What's going on in the regions and with membership by Tracy Martin, Irrigation Australia's National Membership and Regions Manager.

Melbourne. The Melbourne committee has been assisting Greater Western Water, South East Water and Yarra Valley Water to organise and deliver a 'Greening communities with smarter irrigation workshop', which was held on Tuesday 9 August at RSEA Park – St. Kilda Football Club in Moorabbin. This partnership event focused on driving efficiencies and improving the productivity of council green assets. It gave industry leaders the chance to present on new and best-practice irrigation and their successful results.

The half day program covered:

- how to conduct an irrigation uniformity test
- managing an increasingly precious resource
- smart irrigation for healthy communities
- delivering alternative water to Public Open Space
- irrigation Design
- technology for irrigation efficiency
- optimised performance using water data.

The event has proven to be highly successful with a large turnout of attendees who gave positive feedback. From the level of engagement during the Q&A session, it was evident that people had been listening with interest.

The Committee and water businesses should be very proud this successful event. Well done to everyone involved.

If you are an irrigation contractor or own an irrigation retail business based in Melbourne, be sure to find out how your business can benefit from becoming a Waterwise Garden Irrigator and Waterwise Irrigation Design Shop programs. The programs, which are designed to optimise water-use efficiency and reduce water use in garden irrigation systems, can be completed as self-study. Underpinning the programs are best practice standards for irrigation system specifications, installation and design.

To learn more visit www.waterwiseprograms.com.au OR contact Irrigation Australia on (08) 6263 7774.

South Australia. The SA regional committee met in June and members provided input into a discussion between Irrigation Australia and the Office of the Technical Regulator (the state government office that regulates on-site recycled water installations) around pipe colour standards for non-drinking water.

The Committee is working on delivering a number of events throughout the next 12 months. As these are finalised, members and industry colleagues will receive notifications/invitations to participate via email.

Western Australia. The WA committee is continuing to deliver a suite of activities that underpin the partnerships with Water Corporation and the Department of Water and Environmental Regulation (DWER).

In May, the regional committee had a productive meeting with Water Corporation representatives to review last financial year's irrigation initiatives. Participants agreed that the successful initiatives of last year would be replicated as well as introducing future demand delivery activities. Water Corporation acknowledged the vital role that Irrigation Australia plays in the success of these water-saving programs.

The first year of the Waterwise Council Training Program has wrapped up, with 32 parks and gardens council staff from Gold Waterwise Councils successfully completing the Irrigation Efficiency competency-based course. The program is expected to be even bigger this year, with four courses planned, providing this vital training for up to 49 approved participants. The WA Region is currently finalising venues and logistics and working with DWER to streamline the registration process for approved applicants.

Irrigation Australia WA will be delivering three Waterwise Garden Workshops within the Perth Garden and Outdoor Living Festival to be held 28 to 30 October 2022.

Attendees will learn about:

- climate change in Perth
- lawn care
- lawn alternatives
- efficient Irrigation
- controllers

- a demonstration garden
- soil improvements
- mulches

All participants will receive a 'goodies bucket' providing them with water efficiency resources and samples to take home. All attendees will be entered into the major prize of a Waterwise garden irrigation system donated by Rain Bird Australia.

Waterwise Professionals can participate in the Weather-based Irrigation Rebate. Water Corporation is offering Perth and Peel residential customers a rebate of up to $300 for the purchase and professional set-up of selected weather-based irrigation products.

These products use local weather data to adjust the watering times for your garden, ensuring it gets the water it needs without overwatering. By only watering as much as your garden needs, you can reduce watering by around 15% while keeping plants healthy. To learn more about this initiative, visit the Waterwise Programs website or call (08) 6263 7774.

WATERWISE IRRIGATION PROGRAMS ON FACEBOOK

Have you checked out Irrigation Australia's Waterwise irrigation programs on Facebook?

Waterwise-endorsed members are fully trained in water efficient practices and can design, install, repair and maintain domestic irrigation systems.

There are two categories:

- **Waterwise Garden Irrigator** - for professional installation and maintenance services
- **Waterwise Irrigation Design Shop** - for expert advice and quality parts

The Facebook page aims to provide the wider community with #waterwise tips and advice and promote members.

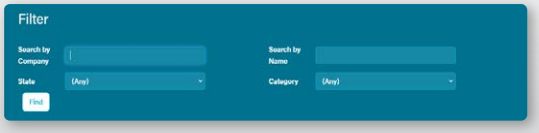
Use the QR code and jump on Facebook to find out more and keep up to date.

Find an Irrigation Specialist

If you are looking for an irrigation specialist, then the Irrigation Australia website is your one-stop shop.

Just click on 'Member directory'

Then you can search for a professional in your area by state, category, postcode, name or company name.



Click to visit out website

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NEW IAL STAFF

When you call Irrigation Australia, the voice on the other end of the line is likely to belong to Martine Haarhoff, who came on board as business administration assistant in July. We caught up with her to get some insights into her role at Irrigation Australia and her life outside of work.

IA. What does your role entail?

Martine. My role is at the frontline of the business, most often being the first person that members encounter when they phone. I support and assist membership and training activities and the associated day-to-day general operations of the company. This can mean everything from membership enquiries and processing payments, customer database and website maintenance, online store processing and preparation, meter seal orders and despatch, and assisting the wider Irrigation Australia team wherever I am needed most.

IA. What are you most enjoying about working at Irrigation Australia so far?

Martine. I am thoroughly enjoying discovering a new and vital industry sector. I aspire to be the go-to person who knows enough about all aspects of the business to be genuinely and efficiently helpful.

IA. Can you tell us a bit about your professional background?

Martine. I have worked in administration and project support for the last 15 years across government and the private sector. I am a bubbly and enthusiastic organiser who loves a chat and getting to know the people around me. My favourite part about what I do is meeting people and establishing relationships along the way. I am looking forward to meeting as many members as possible over the next few months and look forward to catching up with members, suppliers, and industry stakeholders at the October conference.

IA. How do you spend your time outside of work?

Martine. I am the mother of a delightfully precocious little girl who keeps me on my toes and reinvigorates the way I view the world every day. I also support family units during the early transition period after the arrival of a new baby, which is hugely rewarding for me.

IAL BOARD DIRECTORS

FLEXIBILITY KEY TO TRAINING

A training update by Geoff Harvey, Irrigation Australia's National Training, Certification and Marketing Manager.

Flexibility is key to professional development. Did you know that Irrigation Australia offers flexible training options to suit everyone's personal requirements and commitments?

At some point, everyone wants to learn and to expand their professional development and knowledge. However, the steps involved with starting this journey are often overwhelming: Where do I start???

Students training for their Certificate III in Irrigation Technology AHC32419 at Toro in Adelaide.

Installing a pressurised irrigation system during a training session for Certificate III in Irrigation Technology AHC32419 at Carina Leagues club (Brisbane).

Irrigation Australia here to help. The process needn't be overwhelming. The training and certification team at Irrigation Australia can help you tailor a career path and identify training options that will suit your personal needs.

For example, you can sign up to complete a full qualification in Certificate III in Irrigation Technology AHC32422 over an 18-month to two-year period, or you can do it gradually over a longer period by completing short, accredited courses. These might include: the Irrigation Efficiency training course, which consists of three competencies, the Electrofusion and Butt Welding of Poly Pipe training course, which has two competencies, and the Certified Meter Installer/Validator training course, which comprises six competencies, to name a few.

Before you know it, you will have completed the full qualification of 22 competencies and will be a qualified irrigation technician.

But if you have no need or desire to complete the full Certificate III, you have 11 nationally recognised skill sets to choose from, each comprising five to eight competencies. These skill sets are:

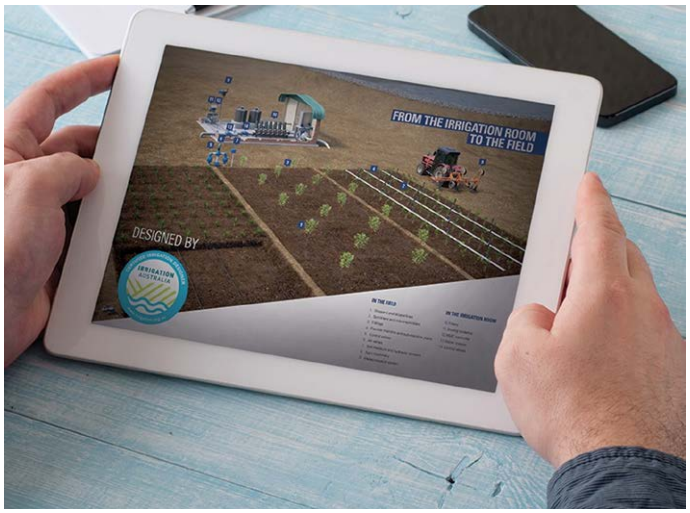
- Irrigation Installer
- Irrigation Operator
- Irrigation Contractor
- Irrigation Manager
- Irrigation Systems Efficiency
- Meter Installation and Validation
- Irrigation Retail Sales
- Irrigation Sales
- Irrigation Agronomist
- Irrigation Systems Auditor

How do you complete these skill sets? Again, your options are flexible! You can register for training courses through Irrigation Australia; your previous training can be recognised; or you can obtain them through the Recognised Prior Learning (RPL) process. You can even use a combination of these methods.

Either way, the training and certification team at Irrigation Australia can help you decide on the best path to take to get recognised for your achievements.

Easy to track your progress. For some people, another concern is how to keep track of their progress. This too can seem overwhelming, particularly when the process can take months or years and might involve different approaches to completing skill sets. But Irrigation Australia not only helps you plan your study path from the get-go but also keeps track of it. You can see everything you've done and have yet to do to achieve your goals via a student portal.

Become certified in your profession. Once you have obtained or partly completed a qualification, you can then apply to become certified.



There are various ways of completing the skill sets.

What is certification? Certification is a designation earned by a person to certify that he or she is qualified to perform a job. To remain certified, professionals must regularly update their training and professional development, so certification is also a way of ensuring that people's skills remain current.

Certification indicates that the individual has a minimum set of knowledge, skills, or abilities in the view of the certifying body to perform their job to the satisfaction of water managers and their customers. It's a minimum benchmark expected by the irrigation industry.

Irrigation Australia has now 12 certification disciplines that form part of our certification program as follows:

- Certified Irrigation Technician (CIT)
- Certified Irrigation Designer (CID)
- Certified Irrigation Installer (CII)
- Certified Irrigation Operator (CIO)
- Certified Irrigation Contractor (CIC)
- Certified Irrigation Retailer (CIR)
- Certified Irrigation Manager (CIM)
- Certified Meter Validators & Installers (CMI)
- Certified Irrigation Agronomist (CIA)
- Certified Storage Meter Installer & Validator
- Certified Poly Welder – Electrofusion
- Certified Poly Welder – Butt Welding

The Centre of Irrigation Excellence (COIE) is the place to go if you are looking to update your irrigation skills and knowledge. The COIE is your platform to browse through the upcoming industry training provided by Irrigation Australia. You will find pathways for qualifications, certifications, and short course training options to improve your irrigation and business skills.

You can check out training activities provided through the COIE website, or give us a call on (07) 3517 4000 to discuss your options with one of our Irrigation Australia training and certification team.

Why wait? Get started today!!

For more information on any of the above training courses please contact Geoff Harvey geoff.harvey@irrigation.org.au or 0418 888 876

CERTIFICATES III AND IV – REGISTER YOUR INTEREST

Certificate III in Irrigation Technology AHC32419 (trade level). This qualification reflects the skills and knowledge required to become an irrigation installer, operator, retailer or technician for residential, commercial or agriculture industries. This is an in-depth irrigation training program which is assessed against nationally recognised Competencies towards Certificate III in Irrigation Technology AHC32419 (Trade Level). The program also uses subject matter experts for specialised topics such as hydraulics, troubleshooting and basic irrigation design.

Interested? Register here.

Certificate IV in Irrigation Management AHC41119
This qualification reflects the technical and supervisory skills and knowledge required to operate as supervisors and specialists in the irrigation industry. It applies to irrigation installation site managers and managers of irrigation systems in the irrigation servicing, horticulture and agriculture industries.

Interested? Register here.

IRRIGATION TRAINING INFORMATION AT YOUR FINGERTIPS

Check out Irrigation Australia's new training course booklet. This comprehensive publication provides essential details on training courses offered by Irrigation Australia.

- Certificate III in Irrigation Technology
- Certificate IV in Irrigation Management
- Centre Pivot and Lateral Move
- Meter Installation and Validation
- Introduction to Irrigation | Agriculture
- Introduction to Irrigation | Urban
- Irrigation Pumps and Systems
- Irrigation Efficiency
- Urban Irrigation Design
- Commercial Irrigation Design
- IRRICAD Design
- Irrigation Installer
- Storage Meter Installation and Validation

CERT IV PROVIDES PRACTICAL KNOWLEDGE FOR FAMILY BUSINESS

On a beautiful winter's day in Brisbane, an enthusiastic group of irrigation professionals met at the Gabba to complete the practical component of their Certificate IV in Irrigation Management. One of the students was Peter Walls, business manager of family-run business Bobs Irrigation, a company that was started by his father twenty years ago. We caught up with Peter to find out about his thoughts on training and how he'll apply the skills in his daily work.

IA. Can you tell us a bit about what you do?

Peter. We currently employ 11 staff (two admin, two operation managers, and seven field technicians). We look after the residential, commercial, and industrial sectors. We work with small clients that would like a service on their micro-sprays through to large commercial companies that require turn-key solutions.

My role as the business manager is pretty random at times! I make the majority of day-to-day decisions for the business. My job also involves working on our backend management software, working with our staff to overcome challenges presented to us by our clients, working directly with our clients to help them get the best out of their irrigation systems, while also jumping on the tools to help out.

IA. How important is it to you that your staff have training/certification?

Peter. My approach to training is to ask the question: how is it going to equip our team with the knowledge and understanding to better educate and inform our clients? Having a deeper understanding about how water interacts with the soil and how we put it there builds a confidence not only in our staff but in our clients as well.

As the irrigation industry evolves, it is also important that we are following the regulations and standards set out by the governing bodies. Training and education is one of the most important factors in creating a professional and standardised industry.

IA. What training had you done prior to your Certificate IV in Irrigation Management?

Peter. I have completed the Certificate III in Irrigation Management and also started the pumping and hydraulics course. I have also done various brand training to better understand different products.

IA. What are the main things you've learnt in the course that will help you in your work?

Peter. The content on soil profiles was such a practical block that we can use every day across our job. Getting a better understanding around environmental issues and procedures was also important to help our team make better choices in the residential market where these issues can be overlooked.

IA. Is there anything you'd change about the course?

Peter. I think it would be good to include modules that train students in communication and people skills, cloud-based irrigation management software and also looking at how to read and monitor a larger range of sensors.

TRAINING DIARY

DATE	COURSE	LOCATION
6 September	Certificate III in Irrigation Technology	Blended
13 to 16 September	Meter installation and validation (4 half-day sessions)	Virtual classroom
27 September	Certificate IV in Irrigation Management	Blended
18 to 20 October	Meter installation and validation (3 full-day sessions)	Brisbane QLD
15 November	Certificate III in Irrigation Technology	Blended
22 to 25 November	Commercial Irrigation Design (4 half-day sessions)	Virtual classroom
29 November to 1 December	Meter installation and validation (3 full-day sessions)	Brisbane QLD
13 to 18 December	Urban Irrigation Design (4 half-day sessions)	Virtual classroom

MAKING IT EASIER FOR ALL AUSTRALIANS TO INVEST IN WATER EFFICIENCY

The Water Conservancy is a not-for-profit organisation that runs a range of programs to encourage Australians to use less of our most precious resource – water. This article describes the latest initiatives and how you can get involved.

Certified products save water

Choosing water-efficient products is one of the easiest ways to help conserve water and reduce water bills. Smart Approved WaterMark (SAWM) and associated labels like Waterwise in Western Australia and the Australian Government's Water Efficiency Labelling and Standards (WELS) scheme help shine a beacon on water efficient products.

The Water Conservancy's SAWM program provides a national mechanism to identify water-saving products and services. SAWM has been Australia's trusted mark of excellence for water efficiency for more than 18 years. Products that bear 'the mark' are certified as quality, sustainable, water-saving innovations.

Seeking innovative irrigation products

Within the irrigation industry, certified products, such as water and nutrient management software SWAN system, improve water and nutrient efficiency by up to 20 per cent, which reduces costs for water, energy, fertiliser, and labour. Other product categories, such as sprinklers or mulch, can help improve the overall efficiency of home gardens.

Our portfolio of certified products continues to grow, including recent additions such as the Airgarden and GO Organics Garden Mulch, and we would love to see more innovative irrigation products in our portfolio. Find more on how to apply for certification here.

Within the irrigation industry, certified products, such as water and nutrient management software SWAN system, improve water and nutrient efficiency by up to 20 per cent. *Photo by SWAN Systems.*

Changing behaviours

The SAWM program is just one of many initiatives run by The Water Conservancy. The organisation encourages all Australians to be water efficient, not only by choosing water efficient products but also through behavioural change.

The Water Conservancy's 2021 research *Billions of water-using minutes* found that the average person runs taps for 68 minutes per day – a whopping 635 billion minutes per year! The research also revealed that 80 per cent of Australians do not consistently use only rainwater in the garden. This report highlighted a stark contradiction between our attitudes and actions, specifically how much we say we value water and how we use it.

Join us for Water Night!

How can we encourage people's actions to better align with their attitudes? One way is through annual national events such as Water Night. The aim of Water Night is for all Australians to become more conscious of their water use and to increase education, understanding and sustainability efforts to help conserve our most precious resource – water.

Water Night will be held on Thursday 20 October 2022, during National Water Week. On Water Night, we ask all Australians to go **from 5pm to 10pm** without using their taps, so that they can see for themselves just how reliant they are on them and how subconscious that use is.

We have financial sponsors and in-kind supporters from across the water industry and our campaign continues to build its reach nationally. Interest from sponsors is still coming in thick and fast for this year's event. Find out about Water Night sponsorship opportunities here.

New webinar series

In other news, the Water Conservancy has launched its new webinar series; regular sessions will cover a range of topics from understanding water attitudes and water consumption to improving water literacy and more. Contact info@thewaterconservancy.org if you would like to be involved.

Information. Learn more on the Water Conservancy website.

RUBICON WATER WINS WATSAVE AWARD

Irrigation Australia member Rubicon Water has won the technology category of the 2022 ICID WatSave Award. Farmers are already seeing the benefits of Rubicon's canal automation project in Karnataka, India, which is expected to save a whopping 1.35 ML of water annually.

Rubicon Water has been announced as the winner of the 2022 ICID WatSave Award for their project 'Leveraging canal automation technology to improve Karnataka's precious water resources'.

Rubicon's paper was submitted by Irrigation Australia ICID National Committee (IACID) and took out the award in the technology category.

The WatSave nomination was prepared by Sumith Choy and Varun Ravi from Rubicon Water and N Srinivas Reddy and Satya N Jaddu from Medha Servo Drives. The project covered an area of 400,000 ha and expected water savings upon completion are 1.35 million ML per year.

More than 4,000 automated flow control gates are being installed, along with sophisticated software and communications infrastructure that will precisely manage the delivery of water to farmers located along approximately 1,500 km of canals. In addition, 60 microclimate weather stations and soil moisture probes will be strategically installed to help farmers make informed irrigation scheduling decisions.

Local communities are already benefiting from the project. Farmers located on the end of the network have received water for the first time in decades and others are reporting the best crop yields that they've seen in years.

Sumith Choy said, "We're delighted to accept this award …The benefits that our technology is creating for water conservation and how it's positively affecting the lives of local farmers is humbling to witness.

"[This is] a tremendous outcome for everyone involved. We look forward to helping more irrigation regions around the world improve the management of their precious water resources"

The award will be presented at the ICID 24th Congress in Adelaide.

ABOUT THE ICID WATSAVE AWARDS

Improving water efficiency is the imminent challenge facing agriculture today. There is a need to innovate and change existing water policies, management practices and water-saving techniques. This necessitates a holistic approach involving all the stakeholders, including farmers, industry, and government.

In recognition of this need, ICID initiated the WatSave Annual Awards in 1997 to identify and promote exceptional water conservation/saving practices in agriculture. They are presented every year to individuals or teams that have achieved real, tangible savings, and not promising research results, plans or good ideas/ intentions to save water.

The award consists of an honorarium of US$ 2,000 and a citation plaque. An autonomous international panel of judges determines the winners every year. The awards fall into four categories: Innovative Water Management, Technology, Farmers, and Young Professionals.

Find out more about the awards here.

This project scope includes the installation of more than 4,000 automated flow control gates.

THE 24TH ICID INTERNATIONAL CONGRESS AND 73RD IEC MEETING

The countdown is on to the 24th ICID International Congress and 73rd IEC meeting!

It's not too late to register for this prestigious event, which will be held 3 to 10 October at the Adelaide Convention Centre. Find out more and register here.

EVENT SCHEDULE

DATE	EVENT	LOCATION	CONTACT/ INFORMATION
3-10 October 2022	73rd IEC Meeting and 24th ICID Congress	Adelaide, Australia	bryan.ward@irrigation.org.au http://www.icid2022.com.au
25–27 January 2023	10th International Micro Irrigation Conference	Dakhla, Morocco	http://10imic.ma/
16–22 April 2023	74th IEC Meeting and 4th World Irrigation Forum (WIF4)	Beijing, China	gaolh@iwhr.com
6–13 November 2023	75th IEC Meeting and 25th ICID Congress	Visakhapatnam (Vizag), India	rsdte@nic.in

IRRIGATION AUSTRALIA'S COMMITTEE ON IRRIGATION AND DRAINAGE (IACID)

Momir Vranes, Chair, IACID
M: +61 451 955 215, +93 729 28 26 63,
E: momir.vranes@irrigation.org.au

Bryan Ward, Member, IACID
P: +61 7 3517 4000, E:bryan.ward@irrigation.org.au

Geoff Harvey, Member, IACID
M: +61 418 888 876, E:geoff.harvey@irrigation.org.au

Peter Durand, Member, IACID
M: +61 407 975 401, E: Peter.Durand@netafim.com

Peter Hayes, Member, IACID
M: +61 418 842 700, E: grapwine@senet.com.au

Eddie Parr, Member, IACID
M: +61 412 359 131, E: ammenviroservices@gmail.com

Carl Walters, Member, IACID
P: +61 3 5822 7700, E: carlw@gbcma.vic.gov.au

Richard McLoughlin, Member, IACID
M: +61 419 698 777, E: amc79740@bigpond.net.au

Karlene Maywald, Member IACID
E: Karlene.maywald@gmail.com

Michael Scobie, Member IACID
P: +61 7 4631 1394, E: Michael.Scobie@usq.edu.au

Isaac Jeffrey, Member, IACID
P: +61 2 6273 3637, M: +61 423 876 813, E: ceo@irrigators.org.au

Christine Delphin, Secretariat
P: +61 7 3517 4000, E: chris.delphin@irrigation.org.au

UNPRECEDENTED ENVIRONMENTAL WATER DONATION IN THE SOUTHERN MURRAY–DARLING BASIN

Can the same pool of water be used to simultaneously benefit agriculture, the environment, and investors? Natural capital investment company Kilter Rural says that it is possible.

Kilter Rural, which was established in 2004 to deliver profit with impact, operates two water investment funds and an agricultural fund. Last financial year, the company donated 3.8 GL of water to the environment, and approximately 2,300 ha have been directly inundated as a result of the donations. This year the fund is set to donate an unprecedented 5 GL, which aims to assist high-value wetlands.

The donation is the outcome of a partnership between The Nature Conservancy Australia (TNC), Kilter Rural and the Murray–Darling Wetlands Working Group, provided through the $90 million Murray–Darling Basin Balanced Water Fund.

It is providing critical habitat for water birds, with monitoring already showing an increase in bird diversity and bird abundance following inundation of wetland areas to date. The donation is also supporting the return of endangered species such as the southern bell frog and Murray hardyhead fish.

First Nations communities have gained access to water for their traditional lands under the program, to support cultural obligations and threatened species management, through the watering of areas on Aboriginal lands of key environmental and cultural importance.

Cullen Gunn, CEO, said, "We are very pleased with the fund's performance – both environmental and responsible returns to investors to date. The fund demonstrates that it is possible to use the same pool of water for the benefit of both agriculture and the environment, recognising the importance of both groups"

The recently announced donations are thought to be the largest private water donations in Australian history.

ABOUT THE FUND

- The fund invests in permanent water entitlements in the Southern Murray–Darling Basin.
- Kilter generates income by leasing its water entitlements to irrigation farmers and every year a percentage of the water is donated to the environment.
- When water is scarce and agricultural demand is higher, more water is made available to agriculture. When water is abundant and agricultural demand is lower, more water is allocated to the wetlands. This mimics the Basin's natural boom-or-bust cycle.
- These environmental water donations are in addition to the environmental water targets of the Murray-Darling Basin Plan.
- The fund has been donating water since 2015 and has delivered an annualised return of 13.93 per cent to its investors since inception.

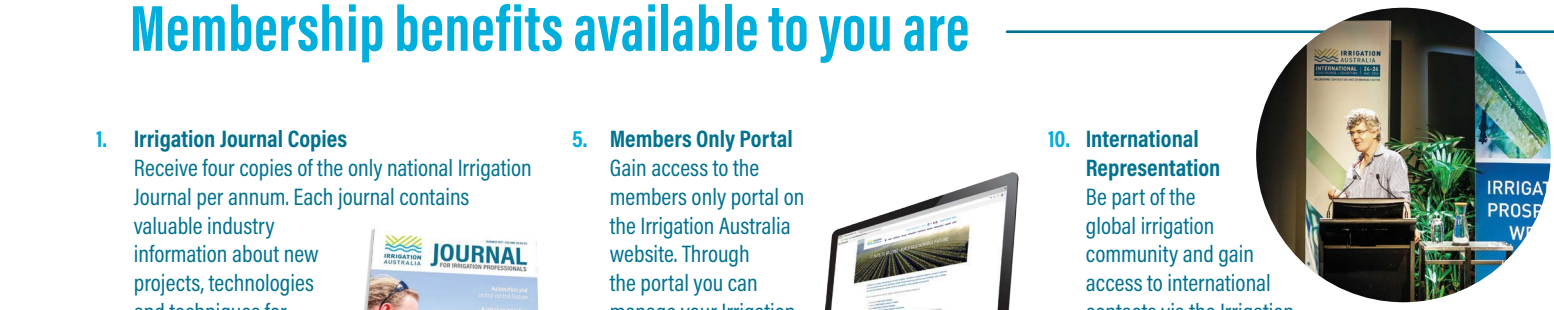
Information. For more information, visit the Kilter Rural website

Kilter generates income by leasing its water entitlements to irrigators and every year a percentage of the water is donated to the environment. *Photo by The Nature Conservancy Australia.*

IRRIGATION AUSTRALIA

Make the most out of your Irrigation Australia membership

Membership benefits available to you are



1. **Irrigation Journal Copies**
Receive four copies of the only national Irrigation Journal per annum. Each journal contains valuable industry information about new projects, technologies and techniques for Agriculture, Landscape & Domestic Irrigation

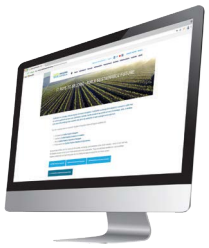
2. **Training Discounts**
Receive significant member discounts on nationally accredited irrigation training and qualifications delivered by Irrigation Australia in major cities and regional towns.

3. **Certification Discounts**
Receive significant member discounts on the joining fee and renewal fee to the Certification Program administered by Irrigation Australia.

Certification is a voluntary, national program of industry recognition. Certification adds instant credibility with customers, increases job opportunities and demonstrates your commitment to efficient water management. Visit our website to learn more **www.irrigationaustralia.com.au**

4. **Conference & Tradeshow Discounts**
Member discounts on attending and exhibiting at the Irrigation Australia Biennial International Conference & Exhibition.

5. **Members Only Portal**
Gain access to the members only portal on the Irrigation Australia website. Through the portal you can manage your Irrigation Australia membership, access members only documents, presentations and other materials.



eKnowledge

6. **Access to eKnowledge**
Irrigation Australia eKnowledge repository has vast resources of technical papers, conference papers, Irrigation Journals and FAQ's available only for Members.

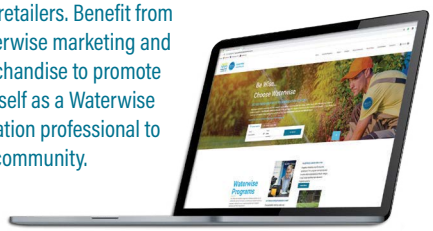
7. **Discounts on Publications and Merchandise**
Irrigation Australia offers a wide range of books, eBooks and other merchandise through its online store. Members receive significant discounts on materials.

8. **Invitations to Regional Meetings & Events**
Irrigation Australia hosts a number of regional meetings, events and site visits across Australia. This is a great opportunity for members and industry colleagues to come together to discuss new challenges, technologies and network.

9. **Monthly Electronic IrriNews Newsletter**
Receive our monthly Irrigation Newsletter with the latest information on upcoming training, events as well as new products, information and industry news.

10. **International Representation**
Be part of the global irrigation community and gain access to international contacts via the Irrigation membership of the International Commission on Irrigation and Drainage (ICID).

11. **Discounts on Waterwise endorsement** Receive significant member discounts on the Waterwise endorsement programs, relevant for domestic irrigation contractors, installers, landscapers and retailers. Benefit from Waterwise marketing and merchandise to promote yourself as a Waterwise irrigation professional to the community.



See **www.waterwiseprograms.com.au** for more information.

Additional Membership Benefits

(EXCLUDES PRIMARY PRODUCERS, INDIVIDUALS & RETIRED MEMBERSHIP CATEGORY)

12. **Free Online Job Listing**
List your upcoming job vacancies on Irrigation Australia's online job board which attracts significant targeted views every month.

13. **Free Listing on Irrigation Australia's Website**
List your business on Irrigation Australia's Website Directory which attracts significant page views every month.

14. **Journal Advertisement Discounts**
Receive significant discounts on advertising in the Irrigation Journal. Circulation is more than 2000 copies per quarter.

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THE NEW FEDERAL GOVERNMENT'S PLAN TO SAFEGUARD THE MURRAY DARLING BASIN

The Australian Labor Party released a plan to 'future-proof' Australia's water resources. This included a five-point plan to safeguard the Murray–Darling Basin (Basin). This article considers the five-point plan in its broader context.

The Basin

The Basin is a large geographical area of south-eastern Australia where water flows through a complex system of interconnected rivers and lakes. It covers more than one million square kilometres and flows throughout five Australian states and territories. It supports approximately 40 per cent of Australia's agriculture. Over 2.2 million people, including many Indigenous Australians, live in and rely on the Basin. The Basin supports hundreds of species of plants and animals, including 95 threatened species and 16 wetlands which have been recognised for their international importance. However, the Basin is plagued by increasing salinity, invasive species, algal blooms and erosion. These issues have been linked to insufficient water flows, with recent research revealing that net inflows to the southern Basin have decreased significantly since 1965, putting the viability of the Basin at stake.

The five-point plan

1. Delivering on water commitments. In 2012, the Basin Plan 2012 (Plan) was adopted by Federal Parliament with the aim of achieving healthy river ecosystems that also support water-dependent industries and provide communities with access to sufficient water supplies. The Plan initially aimed to recover 2,750 GL per year from the amount of water used in the Basin prior to the Plan. However, the Plan was amended to target 2,075 GL per year plus 450 GL per year of efficiency measures by 2024.

Efficiency measures are activities that change water use practices to save water, such as more effective infrastructure and enhancement of farm productivity. However, many of the projects that would deliver the additional water have been slow to begin and are thus running behind schedule. The Plan requires the federal government to 'buyback' water from farmers to make up for any deficit of the 450 GL per year target after 2024.

The Murray–Darling Basin supports approximately 40 per cent of Australia's agriculture. *Photo by Zac Edmonds on Unsplash*

In this context, the federal government pledges that 450 GL per year will be delivered by 2024. The federal government sets out to achieve this by, in part, determining the cause of the delays in the delivery of projects. In doing so, the federal government aims to avoid the need to engage in buybacks, although they state that they will do so if needed.

2. Increasing compliance and improving metering and monitoring. As discussed in our previous article, there has been a shift to a 'zero-tolerance approach' to water theft with the recognition that 'water theft is not a victimless crime'. To this end, Victorian water corporations have been increasing their use of compliance strategies, particularly prosecutions and the issuance of infringements.

The federal government plans to commit $29 million to improve metering and measuring throughout the Basin and will implement a policy of 'no meter no pump'. This would greatly improve the government's capacity to detect and deter water theft. In furtherance of this aim, the federal government also plans to strengthen the powers of the Inspector General of Water Compliance who would work alongside governments and water corporations to minimise water theft.

3. Restoring transparency, integrity and confidence in water markets and water management. The management of the Basin has a long and contentious history, with controversies culminating in the South Australian Royal Commission Report in which the Murray Darling Basin Authority (Authority) was described as negligent. More recently, a Senate Report raised concerns that the current arrangements are inefficient and confusing for stakeholders and potentially undermine the accountability of governments. Similarly, a recent ACCC Report identified significant deficiencies in the current water trading arrangements.

The federal government pledges to restore integrity and confidence in decision-making by making the Authority's modelling and data available to the public and ensuring market surveillance is conducted.

4. Increasing First Nations ownership and involvement in decision-making. Approximately 75,000 Indigenous Australians, representing over 40 different First Nations cultural groups, live in the Basin. The Basin plays a profound role in the interests, values and cultural identity of many of these Indigenous Communities. Environmental damage to the Basin degrades many spiritually and culturally significant sites and hinders the carrying on of traditional activities such as fishing, ceremonies and harvesting medicinal plants.

In 2018, the federal government committed $40 million to acquire water rights for Indigenous Australians in the Basin. The new federal government pledges to deliver the $40 million of cultural water promised in 2018. The federal government states that it will work with First Nations people to better inform the work of environmental agencies and distribution of the Basin's water.

5. Updating the science. Changes in global and regional climate patterns are having significant impacts on the availability of water throughout the Basin. Many of the effects of climate change remain uncertain and the timeframes are indeterminate. The federal government has pledged to update the scientific knowledge of the Basin by committing $8.5 million for an upcoming review of the CSIRO Sustainable Yield study and investing $3.5 million into an independent study into how climate change was impacting Ramsar wetlands.

While the federal government's five-point plan may be ambitious, its implementation would represent a positive shift in managing the Basin as a precious resource. This will be a space to watch closely over the next several years.

Acknowledgment. This article was written by Dr Joseph Monaghan, partner at Holding Redlich, Christopher Watt, lawyer at Holding Redlich and Jacob Atkinson, graduate at Holding Redlich. Joseph practices in water law, having completed his doctorate on the Murray–Darling Basin Plan. Christopher and Jacob have degrees in law and environmental science. Joseph has experience in water theft law having acted on behalf of Victorian water corporations.
Email: joseph.monaghan@holdingredlich.com.

A HOLISTIC APPROACH TO IMPROVING AGRICULTURAL WATER EFFICIENCIES: ON-FARM AND OFF-FARM WATER SAVINGS

SNAPSHOT

- Water losses in irrigation areas result predominantly from a lack of measurement and control, with only about 40 per cent of the water diverted being used by crops.
- Off-farm water use efficiency can be improved dramatically by installing automatic measurement and control systems. There are many examples of this from around the world, and some case studies are described in this article.
- At the other end of the system, irrigators are increasingly adopting accurate measurement and remote-control technology to improve their on-farm operations.
- A holistic approach that looks at water use efficiency at all points in the system is crucial in our changing climate.

Factors including climate change and increasing demand for water have led to forecasts highlighting a sombre reality that 40 per cent of the world's population will be experiencing severe water stress by 2050 if we do not make supply and efficiency improvements.

Irrigated agriculture currently consumes 70 per cent of the world's fresh water with many irrigation areas having low water distribution efficiencies due to losses within the canal systems. Water losses in irrigation areas result predominately from a lack of measurement and control, with only about 40 per cent of the water diverted for irrigation being used by crops.

This article by Rubicon Water outlines the significant progress that has been made in this area in recent decades.

Measurement matters

Business management guru Peter Drucker once said, "If you can't measure it, you can't manage it". This mantra is entirely apt for the irrigation sector, and thankfully, advances in technology are creating significant opportunities for water savings to be achieved from water source to down to the crop.

A holistic approach that maximises water savings throughout the supply system, both on and off farm, is crucial. Combining precise irrigation scheduling, delivery, and application technologies throughout irrigation areas has the potential to result in huge water savings for governments, irrigation districts, farmers and the environment.

Substantial water savings can be achieved by installing accurate measurement and control systems to reduce losses and provide farmers with an on-demand service.

Off-farm improvements

On the distribution side, the key objectives of modernisation projects are most often to facilitate increased agricultural production, use less water, or a combination of both. Sophisticated canal automation solutions are necessary to meet both objectives.

Reducing water loss. Between 20 and 46 per cent of all water losses within a system are estimated to be due to 'spills' – water that flows out of the system unused. Spills are caused by an inability to precisely control water in manually operated canal systems, often due to operators intentionally releasing more water than is required in order to prevent inadequate or inconsistent water deliveries to farm outlets.

Prior to modernisation efforts, most distribution losses within Australia's Murray-Darling Basin canal distribution systems were due to spills. This theme in system losses can typically be generalised across unmodernised irrigation networks around the world. Losses present in many forms, from the abovementioned spills to leakage, seepage, unauthorised use and evaporation. These system losses can be significantly reduced by introducing modern control structures to detect areas for remediation, lining of aging channels or exploring the prospect of replacing them with pipeline systems.

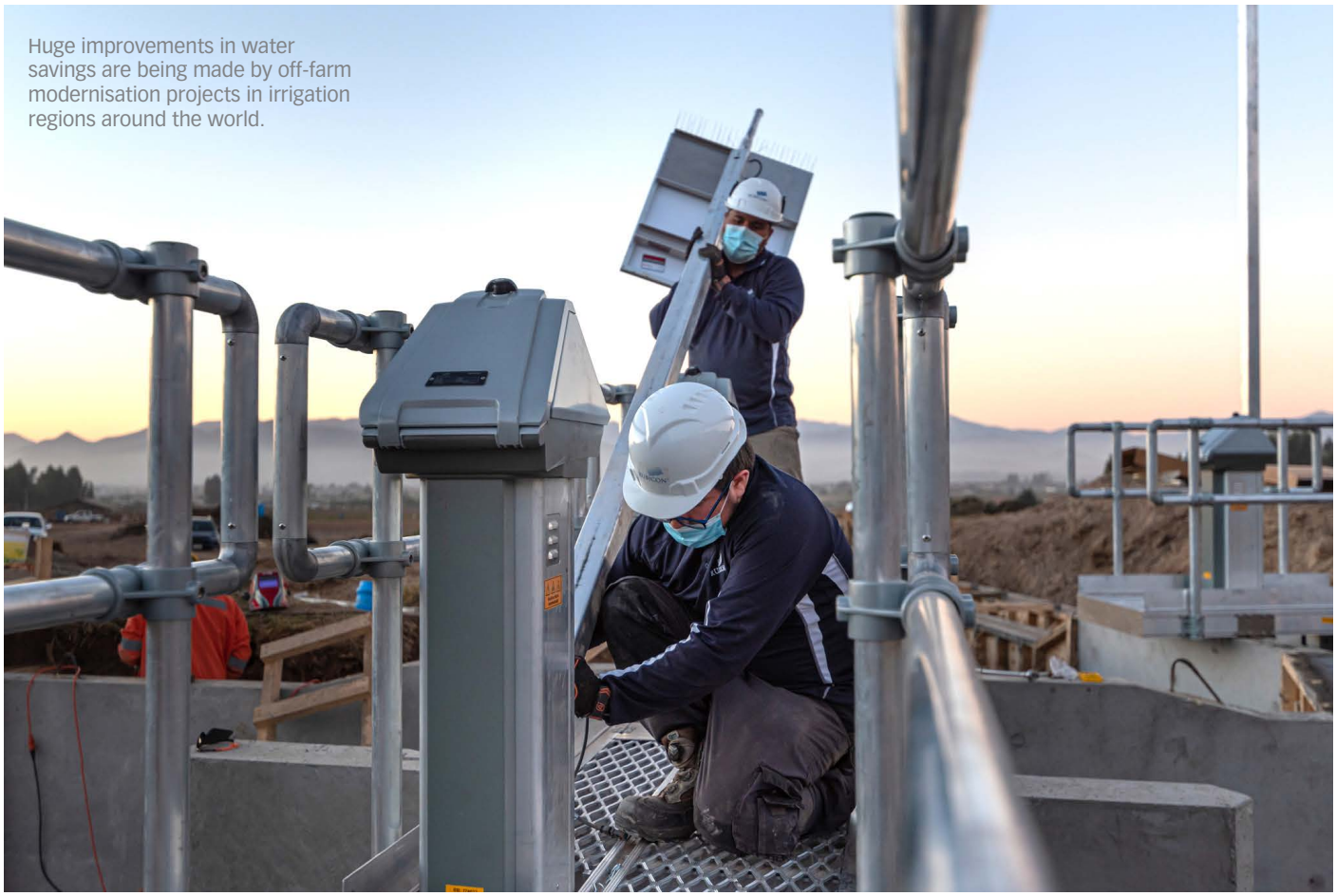
Substantial water savings can be achieved by installing accurate measurement and control systems to reduce losses and provide farmers with an on-demand service. This precise on-demand delivery to farms ensures that only the correct amount of water is diverted, leaving more water in storage for future use.

Automated systems are achieving distribution efficiencies (i.e., the percentage of water diverted from the source that successfully arrives at the intended destination, typically a farm service point) better than 90 per cent in modernised areas. As a result, farmers located along the network receive a better and more equitable service.

Global examples. A benchmark example can be witnessed in Australia's Murray-Darling Basin, where automation has played a key role in making the Basin arguably one of the most efficient food bowls in the world. Over the past two decades, more than 20,000 automated gates and metering devices have been installed to increase water distribution efficiencies from 50-70 per cent (prior to modernisation) to more than 90 per cent in modernised areas.

A similar approach is currently being rolled out in the Indian state of Karnataka, where more than 1,250 km of channels are being automated to accurately supply water to more than 400,000 ha of irrigated land. In addition, microclimate weather stations and soil moisture probes are being strategically installed to assist farmers in making informed irrigation scheduling decisions. These investments are leading to improved water efficiency and serviceability for downstream farmers.

As a humbling early insight, farmers located at the end of the network have received irrigation water for the first time in decades, along with reporting significant improvements in crop yield. Upon completion, water efficiencies within the network in northern Karnataka are expected to improve by 20 per cent. (In August this year, Rubicon Water was announced as winner of the technology category of ICID's



Huge improvements in water savings are being made by off-farm modernisation projects in irrigation regions around the world.

annual WatSave Awards for this project – see page 42 of this issue for more.)

Similar outcomes are being achieved in hundreds of irrigation regions throughout the world. In the United States, for instance, an irrigation district located in the state of Nebraska has essentially eliminated unintentional spills throughout their systems following the introduction of automated control systems.

Channel wasteway data from the United States Bureau of Reclamation government website highlighted that water losses for the 2016–2019 seasons averaged between 13.5 and 21.5 ML per day. But in 2020, following the implementation of the automated network control infrastructure, average losses reduced to just 0.8 ML per day! The district can now deliver the savings to farmers or retain in the reservoir for future use.

On-farm improvements

Significantly improving distribution efficiencies to the farm gate is one element. An equally important element, however, is the need to replicate these efficiencies at the farm level.

With water supplied on demand and at the desired flow rates, farmers be confident that their investments in on-farm application technologies can be leveraged. Irrigators are increasingly adopting accurate measurement and remote-control technology to improve their on-farm operations. This technology, combined with accurate water deliveries, is enabling irrigators to apply the optimal amount of water to crops to save water, labour costs, energy and improve overall on-farm productivity.

The introduction of automated irrigation infrastructure, along with in-field sensors for soil moisture, micro-climate inputs, water levels, plus irrigation scheduling tools and communications via IoT-enabled nodes will help farmers know, with precision, when to irrigate their crops and how much water to apply.

Looking forward

Huge advances have been made in water use efficiency, as illustrated by the case studies described in this article, yet much is still to be achieved. Successes such as these can be used to inform proven water management strategies for irrigation areas around the globe.

A single search on the status of water systems such as the Po River in northern Italy, or Lake Mead in the western United States will illustrate the importance of dedicating resources to protecting the longevity of our most precious resource: water.

In the face of climate change, with increasing variability of extreme weather patterns and areas of the world facing unprecedented threats to the viability of food security, a holistic approach to water management is vital.

Acknowledgment. Thanks to Rubicon Water for supplying this article.

Visit Rubicon Water's stall at the **Irrigation Australia Conference and Exhibition** to find out more about their innovative solutions that are improving the management of water from the source to the crop.

Irrigators are increasingly adopting accurate measurement and remote-control technology to improve their on-farm operations

AROUND INDUSTRY

PROFESSOR CRAIG BAILLIE FIRST HEAD OF SCHOOL FOR QUEENSLAND UNIVERSITY

One of Australia's top agricultural engineers has made history, becoming the University of Southern Queensland's first Head of School and Dean for Agriculture and Environmental Science – a new school that was unveiled earlier this year.

Professor Craig Baillie, an internationally renowned researcher and experienced academic leader, boasts an impressive career spanning more than two decades. His focus on precision agriculture, energy conservation and irrigation modernisation has earned him many accolades, including the prestigious Fulbright Scholar Award.

Born and raised on a cotton property in Central Queensland, Professor Baillie's passion for improving farming operations was fuelled by his childhood.

"Growing up in Emerald, I understand first-hand the need for improved farming technologies," Professor Baillie said. "Building new technologies for the people who need it most, our farmers, is one of the most important things a researcher can do."

Information. To find out more, visit the USQ website.

One of Australia's top agricultural engineers Professor Craig Baillie has become the University of Southern Queensland's first Head of School and Dean for Agriculture and Environmental Science.

RIVULIS AND JAIN IRRIGATION SYSTEMS TO MERGE

Rivulis and Jain Irrigation Systems are set to merge, with the goal of creating a climate and irrigation leader globally. The merged company will be called Rivulis (In alliance with Jain International), and will be led by current Rivulis CEO Richard Klapholz, with dual headquarters in Singapore and Israel.

The combined entity is expected to have substantial market coverage, and it will focus on innovative products, real-time digital solutions, and sustainability. In their joint announcement, Rivulis and Jain emphasised that the company aims not only to make micro-irrigation accessible to growers and to feed the planet, but also to enable a more sustainable and climate resilient future for all.

Information. To find out more visit the Rivulis website.

CADSULT IDS AND HYDROGOLD JOINT VENTURE

Irrigation and design consulting company CADSULT IDS recently announced its merger with consultancy Hydrogold. This partnership will focus on expanding the companies' combined services throughout Southeast Asia and other international locations. Troy Fiscus of CADSULT IDS has a wealth of design experience while Hydrogold's John Pryor has worked on more than 300 golf courses in more than 30 countries.

NEW NATIONAL SUPPORT OFFICE FOR THINK WATER

The Think Water Group's national support office has relocated to nearby Shailer Park, Logan, Queensland. The Irrigation Australia Corporate Member has 30 Think Water franchises Australia-wide and 21 across New Zealand.

Information. Visit Think Water's website to find out more.

A TRAILER-MOUNTED PUMP SET FOR A FLOOD-PRONE GOLF COURSE

SNAPSHOT

- The Beenleigh RSL and Golf Club in Queensland is prone to flooding and needed a mobile pumping solution that could be easily moved in rising floodwaters.
- Brown Brothers Engineers and Nutrien Water (Nerang) came up with a user-friendly trailer-mounted system complete with a new pump set.
- The new system has also improved irrigation capability for the golf course.
- This project could provide a useful model for other flood-prone areas.

The Beenleigh RSL and Golf Club, in south-east Queensland, is known for its beautiful undulating 18-hole course that features natural water hazards. But the course managers also face water hazards of their own – regular floods that damage both the course and its irrigation infrastructure.

The solution was found, by Brown Brothers Engineers and Nutrien Water (Nerang), in a custom-made mobile booster set that can be moved to higher ground during a flood.

Floods and toads

The golf course is next to the Albert River, and floods occur regularly, the most recent one being in February this year.

Jason Lavender, course superintendent, explained that for some years, the golf course had relied on a mobile solution for the existing pumps, but it wasn't a perfect system, and it was time for a change.

"The old pumps were on a platform on wheels that needed eight people to get it out in rising water and hook it up to a vehicle to tow it. And flood waters rise fast here! In the recent flood, we got it out of the pump shed, but we had more rain than was forecast, and it turned out that we didn't move it high enough – it ended up going under."

The pump shed was also submerged. It was repairable, luckily, with the replacement of the electrical panels.

The suction line got washed away, ending up more than 100 m from the shed, and after the flood, when the team attempted to install the new system, they encountered a problem when it came to priming. Jason said, "We dragged the suction line back, put it in water and attempted to prime it but it seemed to be blocked. We investigated and found cane toads in the line!".

With insurance costs continuing to rise and irrigation infrastructure being expensive to replace when damaged or washed away, an innovative solution was needed.

Pictured above: The pump shed was submerged, and toads caused priming problems.

The Beenleigh RSL and Golf Club, located in the heart of Mt Warren Park, south-east Queensland, is known for its beautiful undulating 18-hole course that features natural water hazards.

Plans for a new system

Irrigation water is sourced from a primary dam on site, which is run-off fed. A second dam is also on site and set up to feed the primary dam if needed.

Prior to the big flood in February, Nutrien Water and Brown Brother Engineers had already designed a new pump system, which was ready to be installed at the course. In fact, it was scheduled to be installed in early March, just a week after the course flooded.

The mobility of the system was one issue that needed addressing but there were problems with the three existing pumps too, with the set operating at about 50 per cent capacity, according to Jason. It was time for an entirely new system – both pumps and trailer.

A mobile pump set

Beenleigh RSL and Golf Club approached Steve Moncrieff, project manager from Nutrien Water at Nerang, who consulted Brown Brothers Engineers about the design of a trailer-mounted pump.

The solution they came up with was a trailer-mounted custom dual booster set with jockey pump, complete with INCA control panel. The pump set was built so that it can easily be disconnected and moved to higher ground in the event of flooding.

The team decided on Lowara e-SV Series pumps owing to their hydraulics, combined with their high-efficiency motor (IE2), to deliver maximum efficiency and lower lifecycle costs. An INCA control panel was mounted on the trailer along with the pumps. The control panel was mounted with a quick-release Clipsal three-pin electrical connection so that the course staff can easily and safely disconnect the power to the panel and move the whole pump unit as flooding occurs.

The pumps and control panel are mounted on a trailer. The control panel is mounted with a quick release three-pin electrical connection so the course staff can easily and safely disconnect the power and move the whole pump unit.

Steve from Nutrien, who supervised the installation (by Prolinks), said that there were no real issues with the installation, "The main difference to a traditional system is that it was a bit higher off the ground than usual, being on the trailer. Brown Brothers took this into consideration in the design to ensure there was no vibration or movement. But essentially the methodology is no different to installing a pump set in a shed."

Jason said that the new system is far more user-friendly than the previous cumbersome system. "The pumps can be moved by two people in 15 minutes. It's just a process of hitching the trailer to a vehicle and towing it to higher ground." Another shed is located near the clubhouse, above the flood zone, where they will move the trailered pump set to if flooding is forecast.

Irrigation improvements

The new system has increased the course's irrigation ability from a maximum of 12 to 13 stations with the old Wilo system to 33 stations comfortably with the new Lowara system, thus more than doubling its capability. The valves are controlled by a Rainbird control system. The increase in stations will significantly shorten the irrigation window needed on the course, saving power and giving course managers more flexibility in terms of when and how they irrigate.

And what about the toads? Jason doesn't anticipate a repeat of this problem. "We don't expect this to happen in future, providing the suction pipe doesn't get washed away. We learn from our mistakes, I guess!"

A model for others

Already, council representatives and managers of other golf courses have visited the site to learn about the club's trailer-mounted system.

Steve said that this is the first trailer-mounted pump set that he's worked on, but he expects that we'll see more mobile systems like this in the future: "This is not something that has been done much before, simply because it's not the traditional approach and it hasn't occurred to people to do it. I think it could become an option for many flood-prone golf courses and sports grounds."

Acknowledgments. Thanks to Brown Brothers Engineers, Nutrien Water (Nerang) and Beenleigh RSL and Golf Club for providing information and images for this article.

Brown Brothers Engineers is a major partner of the **Irrigation Australia Conference and Exhibition** 5 to 7 October in Adelaide. If you're heading to the event, make sure you visit their exhibition stall to find out more about their pumping solutions.

STATE ROUNDUP

SNAPSHOT

- An independent review has found that the 450 GL of water for the environment of the Murray–Darling Basin will not be recovered by the 2024 deadline. The NSW Irrigators' Council has responded to the review, saying that recovery of more water would a have large economic impact.
- Three new units and two new skill sets have been developed by Skills Impact in collaboration with industry experts to capture the skills required to trade water and understand the intricacies of Australia's complex trading market.
- The newly formed One Basin CRC has announced its board.

MURRAY–DARLING WATER FOR THE ENVIRONMENT REPORT

An independent review commissioned by the Australian Government has found that the 450 GL of water for the environment of the Murray–Darling Basin will not be recovered by the 2024 deadline.

The $13 billion Murray-Darling Basin Plan, passed into law in 2012, was supposed to address the problem of overextraction of water from the Murray–Darling Basin. It aimed to deliver 450 GL of water to the environment over a ten-year period. Initially it relied on water buybacks but in 2015 the Coalition government replaced the buyback scheme with water efficiency programs.

The *Second review of the Water for the Environment Special Account* found that it is not possible to reach this target through the current efficiency measures program, even if the time and budget limits were removed. The report concluded that the current program will only be able to return around 60 GL of the promised 450 GL to the environment.

Commenting on the report, Dr David Adamson, a senior lecturer in the School of Economics and Public Policy at The University of Adelaide, who worked on The Murray–Darling Basin Plan, said the efficiency program had several flaws:

- it was incapable of returning sufficient water
- it cost more than the buy-back program
- it had the capacity to increase farm debt
- it locked new irrigators out of the market.

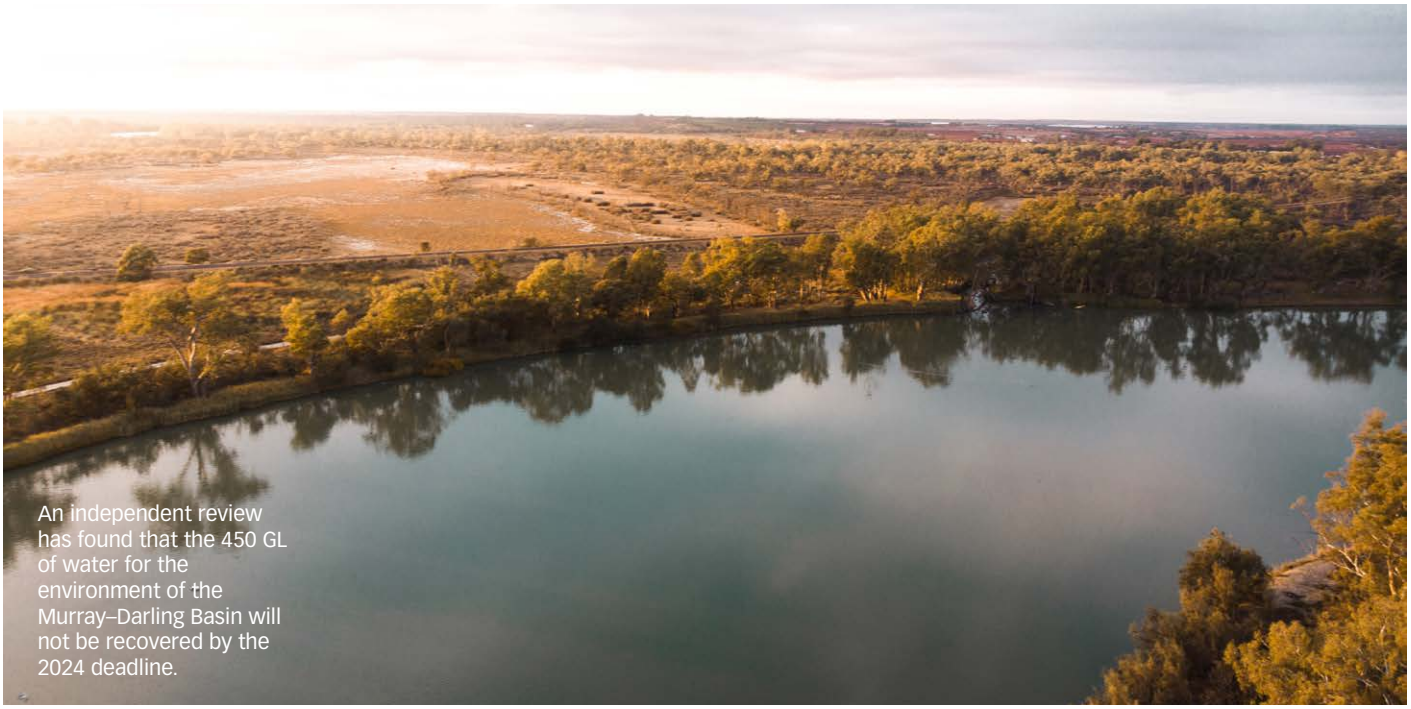
The NSW Irrigators' Council has responded to the review, saying that to date under the Plan, 2106 GL has been recovered, and this has effectively dropped irrigation, town and industry's share of inflows from 35 per cent to 28 per cent.

NSW Irrigators' Council CEO Clair Miller said, "Our analysis demonstrates the substantial socioeconomic and water market impacts of recovering even more water from what's left to grow food and fibre."

The Council recommends that the funds should instead be reinvested into measures to address environmental challenges such as feral species and habitat loss and improve biodiversity and conservation outcomes.

Information. The *Second review of the Water for the Environment Special Account* can be accessed online here. and the NSW Irrigators' Council report, *450 GL 'upwater'*, that responds to the review can be viewed here.

Source. Scimex website and NSW Irrigators' Council website.



An independent review has found that the 450 GL of water for the environment of the Murray–Darling Basin will not be recovered by the 2024 deadline.

NEW WATER LITERACY SKILLS STANDARDS

Skills Impact, an organisation that works to ensure nationally consistent skills standards and qualifications, has developed three units and two skillsets to capture the practical skills required to trade water and understand the intricacies of Australia's complex trading market.

This project was initiated in response to the 2020 Keelty Report, a federal government inquiry into the management of the Murray-Darling Basin resources, which identified the need for improved water literacy in education, including via Vocational Education and Training (VET).

Industry experts helped create the new national VET skills standards to support farmers and others in the water sector to navigate Australian water markets. The experts provided feedback on the units and skill sets, as well as advising which qualifications these units should go into. The project incorporated feedback from employers, registered training organisations, associations and government bodies.

The three units describe the skills farmers and others with water entitlements require to correctly engage with water trading practices, including the purchase and selling of water, navigating carry over water or continuous accounting options and how to procure, receive and monitor water. The units are included in the Certificate III in Irrigation Technology and the Diploma of Agribusiness Management.

The two skill sets support the skills required by agricultural managers, workers and farmers in participating effectively in Australia's multifaceted water markets. They were published on the National Training Register website on 31 July 2022.

Information. For more information, visit the Skills Impact website.

ONE BASIN CRC BOARD ANNOUNCED

The One Basin CRC, which commenced on 1 July this year, has announced the full membership of its board. The members include Chair, Dr Wendy Craik AM and seven directors: Leeanne Bond, Alexandra Gartmann, Peter Hayes, Dr Rohan Henry, Kate O'Callaghan, Fiona Simson and Dr Raelene Ward.

Together, the members have knowledge and experience spanning all geographical regions of the Murray-Darling Basin, and their combined expertise includes governance, finance, technology, training, and policy within the water, environment, and agriculture sectors.

The One Basin CRC is a focused collaboration developing policy, technical and financial solutions to support and reduce exposure to climate, water and environmental threats in the Murray–Darling Basin. It comprises 85 partners from across the water, agriculture, technology, and environment sectors and will work with regional communities including First Nations and governments. This partnership responds to three shared opportunities to enable regions to:

- diversify economic opportunities to build resilience in the face of increasing water scarcity
- transition irrigated agriculture for a drier future, and
- design smart connected water infrastructure to maximise efficiency and capacity for meeting multiple demands.

Information. For more information, visit the One Basin CRC website.

BUMPER YEAR FOR AUSTRALIAN AGRICULTURE

Australian agriculture had a bumper year in 2020–21, with a 17 per cent increase in value to $70.9 billion, according to recent data from the Australian Bureau of Statistics (ABS).

This increase was mainly attributable to cropping – total crop values rose by 41 per cent compared with the previous year, while livestock results were mixed, with the value falling by 6 per cent.

Amanda Clark, ABS Program Manager of Agriculture Statistics, said, "Many farmers reported crop yields being at 'once in a lifetime' levels, with records broken in many regions for key commodities."

With drought-breaking rainfall and improved seasonal conditions, the production and value of irrigated crops such as cotton recovered from recent lows, up 451,300 tonnes to 566,000 tonnes and gross value up $1.2 billion to $1.5 billion in 2020–21. Many broadacre crops, such as wheat, barley, and canola also saw above-average yields and record production.

Source. The Australian Bureau of Statistics (ABS) website, accessed 6 August 2022.

SOCIAL MEDIA FOR BUSINESS

This article from the Australian Government Business website provides some tips on getting started with social media to market your business and connect with your customers. Learn about the different types and the pros and cons of using social media.

About social media

Social media is online communication that allows you to interact with your customers and share information in real time. You can use social media to:

- reach your customers better
- create online networks
- sell and promote your products and services.

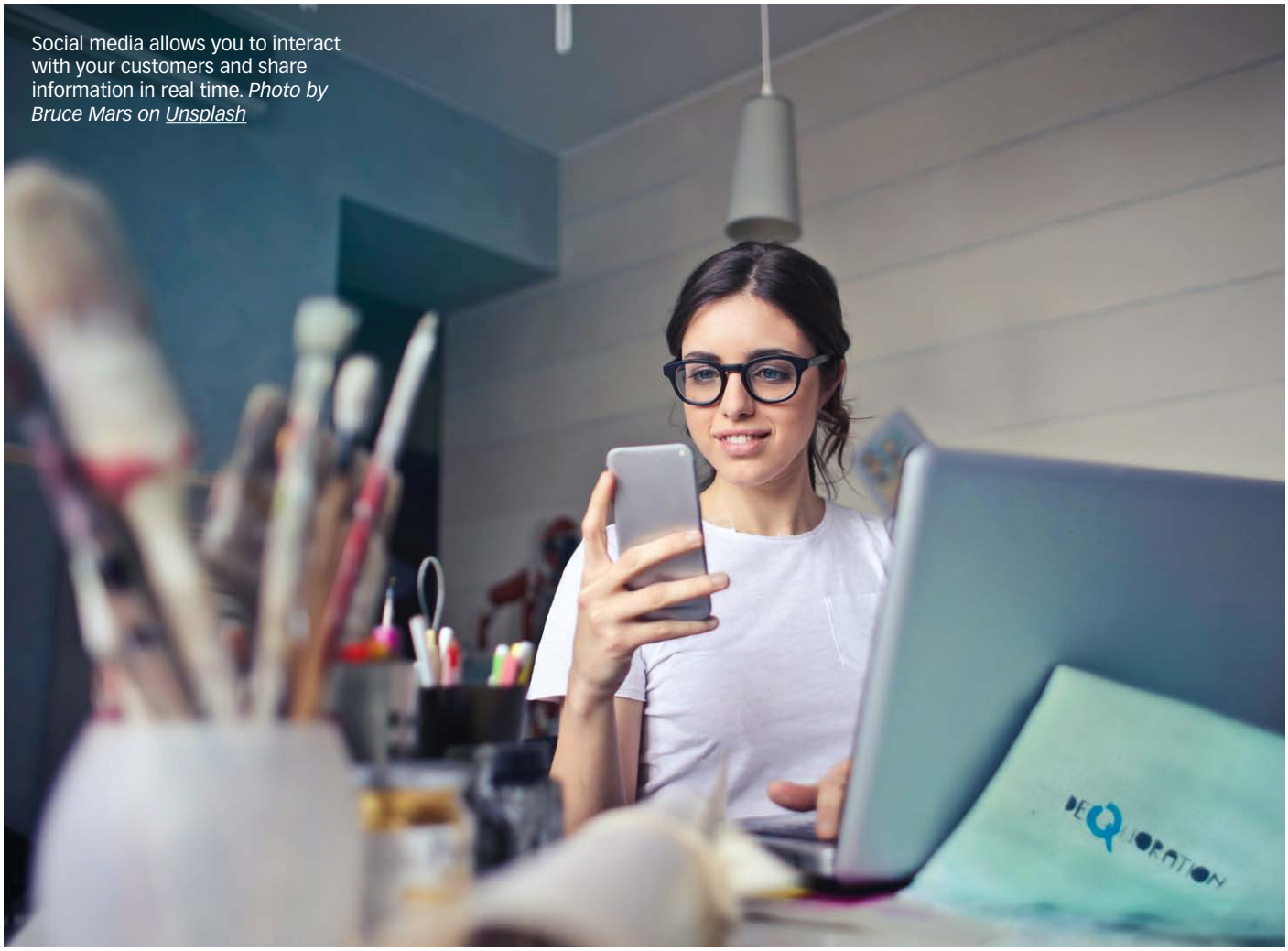
However, there is risk in using social media for your business. Tread carefully and learn both the pros and cons before you start.

Benefits of social media for business

Social media can help you engage with your customers and find out what people are saying about your business. You can also use social media for advertising, promotional giveaways and mobile applications.

Social media can help your business to:

- attract customers, get customer feedback and build customer loyalty
- increase your market reach, including international markets
- do market research and reduce marketing costs
- increase revenue by building customer networks and advertising
- develop your brand
- exchange ideas to improve the way you do business
- recruit skilled staff, for example through job networking sites like LinkedIn



Social media allows you to interact with your customers and share information in real time. *Photo by Bruce Mars on Unsplash*

TYPE OF SOCIAL MEDIA	DETAILS	EXAMPLES
Social networking sites	Social networking sites allow you to create your own profile or page, network with others and share information (including promotions, images and video). Creating a business profile can help you to attract followers, get new customers and develop your brand.	Facebook, Pinterest, Instagram
Job networking sites	You can use job networking sites to build a professional business profile and connect with networks of skilled people for recruitment and development.	LinkedIn
Blogs	Blogs are online journals of thoughts, observations, promotions, links, images and videos. Blogs are typically public. They allow readers to comment on posts and interact with you. You can host them in-house or through a blogging platform that provides the software and website hosting.	Blogger, WordPress
Micro-blogs	Micro-blogs can send short messages to a network of followers. They can be useful if your business has a lot of information to share.	Twitter, Tumblr
Video-sharing sites	Video sharing sites let you upload and share your videos. Users can then comment on and share your videos with others.	YouTube, Vimeo
Podcasts and vodcasts	Podcasts are audio files with blog-style or lecture-style content. Vodcasts are podcasts in video format. You can either have them available for download, streaming or live stream.	
Social-news communities	Social-news communities are websites where members share interesting news or links to others in the community. It's not recommended to use social-news communities to sell your products and services.	Digg, StumbleUpon, Reddit
Private social network services	Private social network services allow you to share information in your private network. They are useful for businesses that want to develop a secure organisation-only network to share knowledge.	Yammer
Location-based services	Location-based services helps you connect and interact with other people and businesses in your area, and sometimes to recommend or rate businesses.	Foursquare

- increase traffic to your website and improve its search engine ranking
- keep an eye on your competitors.

Disadvantages of social media

Social media may not suit every business. If you launch your social media presence without planning, you could end up wasting valuable time and money.

Disadvantages of social media include:

- needing additional resources to manage your online presence
- social media is immediate and needs active daily monitoring
- you may get unwanted or inappropriate behaviour on your social media site
- the risk of getting negative feedback, information leaks or hacking
- the risk of having false or misleading claims made on your social media (by your business or a customer). These claims can be subject to consumer law. For example, if a customer or fan posts misleading or deceptive information, particularly about competitor products or services, you might receive a fine.

To avoid the risks, have a social media strategy with policies and procedures in place before you start.

Types of social media

Not all social media platforms will be right for your business. Save time and effort by choosing social media platforms that your target audience will use. Below is a brief guide to help you understand some of the options available.

Create your social media strategy

Doing the ground work before you start is critical to a successful social media presence. Develop your social media strategy to:

- create compelling content
- engage with your customers at the right time
- generate sales.

A social media strategy describes how your business will use social media to achieve its communications aims. It also outlines the social platforms and tools you'll use to achieve this.

Follow your strategy and don't overwhelm your customers with unnecessary posts. Remain focused on reaching your specific goals and tailor your messages around these.

Source. Australian Government Business website, accessed 5 July 2022.

Information. Learn more about social media and consumer law on the Australian Competition and Consumer Commission website..

CSIRO REPORTS PINPOINT NEW IRRIGATION OPPORTUNITIES

In 2021, the National Water Grid Authority (NWGA) commissioned CSIRO to undertake several desktop-based rapid national appraisals.

The appraisals identify potential new opportunities for (i) groundwater-based irrigation, (ii) the use of low-cost desalination in irrigated agriculture, and (iii) managed aquifer recharge (MAR) to support irrigated agriculture.

The main aim of the appraisals was to provide the NWGA with an evidence-based approach to help it prioritise investment in new water infrastructure opportunities, but the appraisals might be equally useful for private or other government organisations.

Here we give a brief outline of the three rapid appraisals.

Rapid appraisal of new groundwater-based irrigation infrastructure opportunities across Australia

This assessment looks at the potential for future groundwater-based irrigation development in 49 intermediate to regional-scale groundwater systems across Australia. It found that:

- most of the areas with potential for new or expanded groundwater-based irrigation opportunities are found in the NT and WA, largely in the more remote but regionally extensive fractured, fissured or porous highly productive sandstone, dolostone or limestone aquifers that are yet to be fully developed.
- other areas are worthy of targeted investigations to confirm their potential prospectivity for new or expanded irrigation. These occur largely in the remote to semi-remote parts of NT and Queensland.
- some groundwater systems have already been extensively developed for irrigation or other purposes and are either fully allocated, close to full allocation or are over allocated. Most of these occur close to urban areas on the east and west coasts, or where the local-scale groundwater systems provide limited regional opportunities to benefit multiple stakeholders. For some of these groundwater systems, there may be potential to establish MAR schemes or desalinisation.

Review of low-cost desalination opportunities for agriculture in Australia

The potential for using desalinated water in agriculture in Australia was initially assessed by the National Centre of Excellence in Desalination (NCED) in 2014. This report re-evaluates those earlier findings and examines the feasibility of expanding the use of desalination technology to supply water for agriculture in Australia. The report explores:

- the viability of using desalination technologies to support agricultural resilience to drought and climate variability
- the opportunity to use desalination technologies to increase agricultural productivity and profitability
- the best opportunities to use these technologies in terms of water resource constraints, geographic location, energy sources and agricultural production approaches
- technological, environmental, economic, production and implementation challenges that must be addressed to expand the use of desalination technologies in Australian agriculture.

The project determined that a collaborative and holistic approach ensures the effective deployment of desalination schemes for agriculture. Desalination schemes are best developed as a collaborative effort between desalination infrastructure providers and agribusinesses that intend to use this alternative water supply. Schemes should:

- lead to increases in farming profitability, offsetting the cost of the desalination scheme through increases in agricultural productivity, resulting from water security and improved-quality, 'fit-for-purpose' water
- be sustainable: sustainability of desalination schemes is critical for successful outcomes.

Therefore, instead of the question 'How cheaply do we need to make desalination for agricultural applications?' we should be asking 'How efficient should the integrated water and food production be for profitable delivery of food?'

Rapid appraisal of managed aquifer recharge (MAR) opportunities for agriculture

Managed aquifer recharge involves recharging water to aquifers for later use. In Australia, there are currently 14 known applications of MAR for agriculture in varying stages of development, providing a total capacity of around 70 GL per year.

This appraisal identified the factors for an agricultural MAR scheme to be viable, including: an ongoing demand for water for high value agriculture;

availability of water for recharge; a suitable aquifer for storage with the capacity to store water for recovery and use; a suitable location for the MAR scheme, typically in areas of low topographic relief; and the organisational capability, institutional arrangements and supportive policies to operate the scheme.

These factors were used to assess MAR potential in 17 further irrigation areas. Of the high-potential aquifer storage areas (≥ 50 GL), the Lachlan (NSW), Namoi (NSW) and Bundaberg (Qld) areas all have 500–750 GL of water entitlements, an ongoing demand from irrigated agriculture and have 750–1200 GL of dam storage.

The report also discusses novel remote sensing techniques that can complement existing spatial assessment techniques to improve understanding of aquifer suitability for MAR operations; the role of supportive policies; and areas for future research.

WHAT IS A RAPID APPRAISAL?

As the name suggests, a rapid appraisal is a quick, low-cost way of collecting data using multiple evaluation methods and techniques. Rapid appraisals are typically used to develop a preliminary understanding of an issue. **Source.** WikiEducator. Accessed 28 April 2022.

Acknowledgment. The rapid appraisals were commissioned by the National Water Grid Authority, and the outlines published here are based on the executive summaries of the reports, modified and published with permission from CSIRO Land and Water.

Information. For more information and to download the original reports, visit the CSIRO website.

NEW PRODUCTS

SENSOTERRA
IRRIGATION TECH STARTS WITH SMART SOIL MONITORING

Water scarcity and increasing prices for fuel and fertilisers, combined with more severe droughts, mean Australian farmers and growers must use resources even more efficiently.

Irrigation technology is rapidly becoming standard for optimised water management – from stand-alone watering systems to fully integrated cloud-based platforms. However, to manage something, it first needs to be measured. Accurate, real-time soil moisture data can be fed into automated irrigation systems and can also support manual irrigation decisions. Interpreting the data based on soil type and behaviour makes the information more actionable and precise.

Key issues with traditional monitoring systems are the cost, complexity of installation, high maintenance requirements, and the difficulty of integrating the data with other systems. Smart, wireless IoT sensors challenge the status quo, making it significantly easier and cost effective to get an accurate picture of the soil moisture levels in orchards and fields.

Challenging the status quo. Sensoterra's newest generation wireless soil moisture sensors are revolutionising how soil moisture data is monitored. Their benefits are as follows:

- Sensors are low-cost, meaning that more sensors can be placed and more fields measured for less money.
- The open (push) API means easy integration with existing water management platforms and solutions, and data can also be retrieved with the free Sensoterra app.
- Installation takes less than a minute, and sensors can be hammered in with a rubber mallet (patented).
- Sensors are 100 per cent maintenance free, with a built-in battery which runs for up to eight years.
- High precision and accuracy are achieved with an extensive (and growing) library of standard soil calibrations.
- Different lengths are available for all types of crops and plants.

Many sensors are already deployed across Europe, North America, the Middle East and Australia, saving growers up to 50 per cent on water and fuel. Sensoterra is currently looking to expand the network of integration partners across Australia.

Information. Visit the Sensoterra website.

Sensoterra device in vineyard with the soil moisture data shown on a screen.

IRRIGATION AUSTRALIA

IRRIGATION AUSTRALIA OFFICE

PO Box 13, Cannon Hill, Queensland 4170
T 1300 949 891 or 07 3517 4000 F 07 3517 4010
W www.irrigationaustralia.com.au
CEO: Bryan Ward E bryan.ward@irrigation.org.au

EDITORIAL
Editor | EVE WHITE
E evewhiteediting@gmail.com

ADVERTISING
BCB Media | Managing Director | Brian Rault
T 0411 354 050 E brian.rault@bcbmedia.com.au

DESIGN & PRODUCTION
Uber Creative | Director | Annette Epifanidis
T 03 8516 4717 E connect@ubercreative.com.au

TERMS & CONDITIONS