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IRRIGATION AUSTRALIA

JOURNAL

FOR IRRIGATION PROFESSIONALS

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Pumps and pumping

ICID Insights
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URBAN
Good design to reduce pollution and irrigate public spaces

Irrigation Australia International Conference and Exhibition 2022
Event update

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ON THE FRONT COVER: Toowoomba engineer Alison McCarthy, winner of the Young Professionals category in this year's WatSave awards for her variable rate irrigation software VARIwise.

WELCOME

CHAIRMAN'S MESSAGE

We have all in some way been affected by COVID-19 over the past year. But with the staunch support of our industry, Irrigation Australia has been able to continue to fulfill its mission through this period – supplying value and service to its members; being the first point of contact and prime source of knowledge for industry stakeholders; and supplying opportunities for professional development within our industry. On behalf of the board, I thank every member for your continuing support.

During its final meeting each year, Irrigation Australia's board reviews its strategic plan and considers its direction for the coming year. For several years now, our review process has been guided by the strategic pillars of advocacy and public relations; training and professional development; membership; certification; and commercial activities.

To ensure the board considerations are relevant to current circumstances, it is important that members supply feedback on how they believe Irrigation Australia has performed recently. If there is anything you think your industry association could be doing better, please contact me, another board member, or CEO Bryan Ward to discuss how we could improve Irrigation Australia services to members.

During my time as chair of Irrigation Australia I have often talked about my desire to elevate the visibility of our industry in the eyes of the public. This time last year we were espousing the benefits of having finally achieved a trade level qualification for our industry. As a progression beyond that, I am incredibly happy to report that the Australian Bureau of Statistics, under their 2021 targeted update of the ANZSCO Proposed Changes, have proposed several areas of the irrigation sector be listed as occupations. These include Irrigation Designer (311116), Irrigation Technician (362712) and Irrigation Assistant (843912).

Previously, irrigation has been informally incorporated within Technicians and Trades Works Not Elsewhere Classified (39999). While the current changes are proposed and not yet formally ratified, the fact that they have reached final proposed change level is testament to the efforts made on behalf of our industry, and the level of recognition irrigation as an industry is achieving.

In the past year, training and certification programs have been well supported by our industry. Although much of this has had to be undertaken online because of uncertainties surrounding travel, there will soon be an opportunity to finalise the hands-on aspect of that training and we will see many newly trained personnel taking part in our industry.

I do think it important to remember that what is learnt during training, and evaluated during certification, is the base standard level of acceptable performance. This must in no way be seen as stifling innovation or preventing original thinking in one's efforts to deliver better results in terms of water use efficiency, system robustness or cost effectiveness.

In the coming year, your board expects to continue its efforts to provide real value and service to Irrigation Australia members, to continue to raise the profile of the industry, and to enhance the industry's continued professional growth by supporting training, liaising on its behalf with all levels of government, and growing the role of regional branches of irrigation Australia in local communities. We also have the Irrigation Australia Conference and Exhibition and ICID International Congress in Adelaide in October 2022.

I believe Irrigation Australia is heading in the right direction, so again thanks to everyone – members, supporters, volunteers, sponsors, and our Irrigation Australia management team – for their ongoing commitment to our great industry.

Andrew Ogden
Chairman

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WELCOME

FROM THE CEO

Irrigation Australia held its AGM at the end of October, and I thought that I would summarise my presentation as a way of keeping members up to date with developments and initiatives taken over the last year.

Importantly, and despite the challenges presented by COVID-19, we ended the year with a financially acceptable outcome, and with the assistance of Job Keeper, kept all our staff employed through those difficult months.

Over the last year, our chairman and board as well as members of regional committees and sub-committees – all volunteers – continued to turn up, virtually and in person, under difficult conditions and maintained the important work of the association. While it is hard to single out individuals, I should note the contribution from chairs Momir Vranes (IACID), Mike Thompson (RWH) and Gennaro Vellotti (Cert Board) and their committees. Also, thanks to Clinton Hort, who recently concluded his time as Chair of the WA Regional Committee after many years of service, and to retiring life member Des Horton, who has been the mainstay of the Melbourne Regional Committee, also for many years.

A key activity that has required much adaptation over the last 18 months is training. Fortunately, our trainers demonstrated that they were very much up to the task. They entered a virtual Zoom world that they were unfamiliar with and managed to successfully navigate the technology and support our students to complete many training courses.

The success of Irrigation Australia is also due in no small part to the generosity of our diverse membership, who represent all sectors of the industry and therefore often have competing interests. Despite this, the one thing we all have in common is the shared objective to have a better and more effective irrigation industry and this esprit de corps is the glue that binds us all together.

When our founding members met in the Dubbo RSL on 25 February 1983 to form what is now Irrigation Australia Limited, they shared the same general objectives that we have today. They noted that one of the basic aims of the association is to provide a forum for the irrigation industry and create a flow of ideas between all levels. This remains the case today, nearly 40 years later.

As evidence of this, membership increased during the year, which brought a small revenue increase. Considering the challenging circumstances of the last year, we were very uncertain about how the impact of COVID and lockdowns in several states might affect membership, so this was a pleasing outcome.

The year ahead continues to look challenging; the economic shock waves from two years of pandemic have not yet worked their way through the economy, and impacts from possible rising interest rates, inflation, exchange rates and business closures could make the next year or two interesting.

Irrigation Australia continues to seek out new opportunities and partnerships and the work we are doing in non-urban water metering and with the Federal Government on an irrigation modernisation project in India are just two examples of how this organisation will need to continue to diversify and add more strings to our bow. We will continue to seek out new opportunities provided they are consistent with our strategic plan.

In our quest to continue to provide value for money for our membership and ensure our internal processes are as efficient as they can be, the board recently approved the purchase of a new Customer Relationship Manager (CRM) system and website. This new system will be industry best practice and addresses many of the deficits that our current system has. So, by April next year, members will see the benefits of this new system, which will significantly improve the accessibility and functionality of our engagement with you.

Next year also finally brings the postponed 2020 international conference and exhibition back to life, now in Adelaide in October. This event will bring many international delegates to Australia to mingle with our Australian delegates and enables us to showcase our irrigated agriculture to the world. This is your event, you own it, and we need you to support it. We encourage you to make the investment to register, attend or exhibit or as a minimum just attend the free exhibition to make this event a resounding success.

We are also pleased to advise that the 9th ICID Asian Regional Conference will be held in Sydney in 2024 and will be combined the 2024 Irrigation Australia Conference and Exhibition. This means Australia will host two significant international irrigation events in the next three years putting our irrigation industry firmly on the world stage.

Bryan Ward
CEO

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ORCHARD AUDIT SAVES MONEY AND POWER

SNAPSHOT

- Energy audits can help businesses reduce energy use and save money
- This case study by the Queensland Farmers' Federation describes the outcomes of an energy audit for an orchard in South East Queensland
- The farm manager followed the audit's recommendations, which centred around refrigeration upgrades and a new irrigation pump
- The changes resulted in a 9 per cent reduction in energy use and a 53 per cent reduction in energy costs
- The most dramatic improvement was due to productivity gains of 10 to 20 per cent. This was due to the new pump, which enabled a better irrigation flow rate to some parts of the farm

An orchard in South East Queensland has saved money and reduced energy use after implementing the recommendations from a recent Energy Savers Audit. The recommendations included a new pump, and refrigeration and LED lighting upgrades.

The farm

The 27 ha farm, which grows stone fruit, persimmon and figs, produces roughly 5,000 units per ha per year. It is irrigated year-round using groundwater. Since three different crops are produced, there are also three main harvesting seasons, and energy consumption varies between the harvesting and packing seasons. Site operations during the harvesting periods follow a similar process of cooling, sorting, packing then storing.

The 27 ha farm, which grows stone fruit, persimmon and figs, produces roughly 5,000 units per ha per year.

The farm already had a 30 kW solar system installed on the large workshop roof. The annual energy consumption for the site during the 2018–2019 period was 102,000 kWh, of which 32,000 kWh was generated by the solar system and 70,000 kWh supplied by the grid at a cost of $16,000.

TABLE 1. COSTS AND SAVINGS FROM AUDIT RECOMMENDATIONS.

Recommendation	Annual energy savings (kWh)	Annual cost savings ($)	Emission savings (tCO2-e)	Capital cost ($)	Payback period (years)
Pump upgrade	5,000	1,815	4	11,150	6.1
Repair/maintain cold room door seals	615	212	0.5	1,770	8.4
Cold room maintenance	834	274	0.7	550	2
LED upgrade processing room	839	562	0.7	2,162	3.8
Install roof on cold rooms	781	791	0.6	5,500	7
LED lighting upgrade	1,303	408	1.1	3,400	8.3
Maintenance measures	1,309	391	1.1	1,440	3.7
Total	**10,681**	**4,453**	**8.7**	**25,972**	**5.7**

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An energy audit, which reviews energy bills, equipment, and the way a business operates, can be a good investment.

The existing energy consumption on the farm consisted of:

- irrigation: a centrifugal pump already fitted with a variable speed drive (VSD)
- refrigeration system, including four cold rooms
- other minor uses, including lighting, processing line and compressed air systems.

Energy audit recommendations

The energy audit showed how improving the existing systems could save energy and money. Audit recommendations are summarised in Table 1.

A significant item was upgrading the main irrigation pump with a 12 - 17.5 kW VSD, which improved system efficiency and provided greater flow rates to parts of the farm. This represented almost half the projected annual savings in energy consumption and carbon dioxide emissions. A review of irrigation leaks and blockages was also recommended before the upgrade.

Other recommendations to reduce energy consumption focused on the cold rooms, upgrading the lighting system to LED and implementing a regular schedule for maintenance of equipment such as solar panels and refrigeration coils.

The outcome

The grower proceeded with all the recommendations. A measurement and verification (M&V) process was used to compare actual savings with the estimates (see Table 2).

Irrigation system. Implementing the recommendations for the irrigation system has reduced energy consumption from 4.36 kWh/ML/m head to about 3 kWh/ML/m head, an improvement of 33 per cent in pumping efficiency.

The pump upgrade has generated almost four times more cost savings than expected, through productivity gains, which outweigh the net increase in energy use. The increase in flow rate for parts of the farm has improved production by an estimated 10 to 20 per cent, representing $8,000 of extra revenue a year. This will result in 17,500 kWh/year of additional energy consumption at an extra energy cost of around $4,000.

A real-time energy meter was also installed on the pumping circuits, the workshop, packing shed and the solar PV system. The device will allow the business to monitor and understand their energy consumption, aiming to find further demand reductions onsite.

TABLE 2. ESTIMATED AND ACTUAL ANNUAL ENERGY AND COST SAVINGS.

Metric	Savings due to pump upgrade		Savings due to refrigeration and lighting upgrades	
	Estimated	Actual	Estimated	Actual
Energy (kWh)	5,000	5,000	5,681	5,700
Cost ($)	1,815	Electricity: 1,200 Productivity: 8,000	2,638	1,300

TABLE 3. PRE- AND POST-IMPLEMENTATION ENERGY CONSUMPTION, COSTS, AND ENERGY PRODUCTIVITY IMPROVEMENTS.

Metric	Pre-implementation	Post-implementation	Reduction (%)
Energy consumption (kWh)	119,500	108,800	9
Cost ($)	20,000	9,500	53
Energy productivity (kWh/t)	797	725	9

Refrigeration and lighting. Although the actual energy savings from refrigeration and lighting upgrades were the same as the estimated savings, the actual cost savings were lower than estimated – probably because of a lower energy tariff being in place during the monitoring period.

A good investment

Following implementation, the farm has reduced energy consumption by 9 per cent and costs by 53 per cent, including productivity gains, as shown in Table 3, with carbon emission savings of 8.7 t/CO2-e per year.

These savings show the benefits of an energy audit, which reviews energy bills, equipment and the way a business operates. As this irrigator has shown, it is a great first step in moving a business towards a more efficient future by reducing energy use, costs and carbon emissions.

Information. This article is an edited version of a case study from the Queensland Farmers Federation website E: energysavers@qff.org.au. The Energy Savers Plus Extension Program is delivered by the Queensland Farmers Federation with support and funding from the Queensland Department of Energy and Public Works.

USING GOOD DESIGN TO REDUCE POLLUTION AND IRRIGATE PUBLIC SPACES

SNAPSHOT

- Oaklands Park Managed Aquifer Recharge System, in Adelaide, was designed by HydroPlan to capture and clean water from the Sturt River, removing pollutants via a pollutant trap and wetland system before it is stored in an underground aquifer
- The water is recovered in summer and then carried through a network of underground pipes to irrigate 30 council reserves and recreation facilities
- One of these is Tonsley Forest, which has some innovative irrigation features, including the use of existing cable trays in the ceiling of an old factory building to transport water
- Oaklands Park MAR simultaneously reduces water pollution while providing clean irrigation water for public spaces like Tonsley Forest.

When done well, water management and irrigation design can transform a single problem into many opportunities. A prime example of this can be seen in Adelaide's Oaklands Park Managed Aquifer Recharge Scheme (MAR).

Irrigation Australia Journal spoke with John Gransbury and James Sullivan from HydroPlan about some of the innovative design features of Oakland Park MAR, and Tonsley Forest – one of the public spaces that is irrigated with water from the MAR.

Oaklands Park Managed Aquifer Recharge Scheme: good water management and irrigation design can transform a single problem into many opportunities.

Matt Ball from Alano (left) and Hydroplan's John Gransbury at the Oaklands Park MAR site.

Oaklands Park MAR

Oaklands Park MAR, designed by HydroPlan, captures, cleans and reuses water from the Sturt River, an offshoot of the Patawalonga River, which runs along the southern boundary of Adelaide Airport.

This system simultaneously deals with a potential environmental hazard while creating a sustainable stream of irrigation water and boosting wetland and marine biodiversity.

Ensuring good water quality. Water is captured by harvesting pumps and directed through a gross pollutant trap and settling pond to remove sediment before entering the 2.3 ha Oaklands Wetland. A series of cascades, along with aquatic plants, further filters the water, reducing nutrients and suspended matter in readiness for it to be injected into the aquifer below the wetlands.

Continuous testing ensures that the conductivity, pH, temperature, and turbidity of the water are suitable for underground storage.

HydroPlan's John Gransbury, who has been involved in many of the 58 MAR schemes in metropolitan Adelaide over the last 30 years, explains that salinity is a major factor to consider: "There are limits on the quality of water you can put underground. The salinity needs to be lower than the water you're adding it to so you're not degrading the water for other users of the aquifer. Suspended solids are also an important variable to measure to avoid clogging of the aquifer.

The irrigation pipes and control cables are housed in existing cable trays in the ceiling of the old factory building.

"Continuous monitoring of water quality is a condition of regulatory approval so that if the limits in parameters are exceeded, alarms are sent and injection into the aquifer is halted."

From the wetlands to irrigation. From the wetlands, water gravitates into a small underground sump and from here, a submersible pump injects surplus water into the aquifer under pressure through four wells with a total storage capacity of 400 ML.

Each well is equipped with a submersible pump to backflush water to the wetlands for quality and level control, and to move water to a buffer tank from which it is distributed to the irrigation system. An 11.5 km network of underground pipes carries water to council-owned parks, providing a secure, safe and clean source of water to irrigate turf, gardens and trees.

A win-win for water management. As well as relieving the pressure on drinking water supplies, Oaklands Park MAR significantly reduces the pollutant load that would otherwise be released into the Gulf of St Vincent. This benefits marine ecosystems and local biodiversity and gives residents a safe backdrop for recreation.

Using the water for irrigation: Tonsley Forest

Part of HydroPlan's role was to design and manage construction of the purple pipe network that delivers the recycled water from the MAR to over 30 council reserves and recreational facilities.

One of these is Tonsley Innovation District, previously the site of Mitsubishi's Australian factory, now a cutting-edge approach to urban renewal and economic development. This 61 ha site is located 10 km from the Adelaide city centre, providing a hub for high-value manufacturing, innovation and operation.

HydroPlan began working on this project in 2012, together with Renewal SA, the City of Marion, and other contractors and consultants, to develop sustainable irrigation design solutions for the site across car parks, streetscapes and the jewel in Tonsley's crown – Tonsley Forest.

Tonsley forest spans both internal and open sections of the former Main Assembly Building of Mitsubishi motors. Designed by Oxigen Landscape Architects, the gardens within Tonsley Forest both disguise and enhance the industrial history of the site while providing a sustainable footprint and a multitude of uses.

Internal innovation. Some of the most interesting aspects of the irrigation system are inside the buildings. Internal gardens have been strategically positioned to take advantage of the natural light beneath glass panels that existed in the ceilings of the original buildings.

Misters provide water to plants while also having a cooling effect, thereby reducing the use of air conditioning systems and saving energy. The misters also create a distinct ambience and require a low volume of water compared to other sprinkler types.

But perhaps the most interesting aspect of the internal irrigation system, according to James Sullivan, from HydroPlan, is the use of existing cable trays to transport water: "All the irrigation pipes and control cables have been installed through what used to be the cable trays of the building, up in the rafters. This was necessary because all the ground surface was pre-existing concrete. As soon as you start digging that up, it becomes very expensive very quickly. The water supply comes from the ceiling down pipes that follow the pillars in the building."

More work to be done

Both the Oaklands MAR and Tonsley Garden have won industry awards for their innovative designs. The Tonsley project is ongoing; further irrigation design will be required to service additional garden areas that will be established over the coming months.

Acknowledgment. This article is based on web content from Hydroplan, with supplementary information from interviews with John Gransbury and James Sullivan. Here, you can read the original blog post about Oaklands Park.

COOLING URBAN AREAS: THE BENEFITS OF LIVING TURF

SNAPSHOT

- A recent study confirmed that irrigated living turf results in far cooler land surface and air temperatures than synthetic turf
- Data collected in summer over different surface materials showed that the surface temperature of irrigated natural turf was 4.9 °C cooler than the baseline average. Long pile and short pile synthetic turfs measured 11 °C and 3 °C *warmer* than the baseline average, respectively
- Similarly, on hot days, the air temperature over irrigated living turf was between 34 and 42 °C – far cooler than synthetic surfaces, which measured from 42 to 70 °C
- Surrounding areas, including indoor spaces, can also benefit from the cooling effect of natural turf, which may result in reduced air conditioning use.

A recent study has confirmed what many in the industry already know: that using irrigated living turf, rather than synthetic turf, in outdoor areas can have a strong cooling effect on the local area. Importantly, the research quantified the key benefits directly and indirectly by measuring air temperatures as well as modelling the cooling effect on surrounding areas and energy savings.

Synthetic turf, made from plastic fibres that replicate blades of grass on a base layer of polypropylene, is often used in place of living turf. It is promoted as low maintenance and high wear and tear.

A downside to synthetic instead of natural materials, however, is that they contribute to the urban heat island effect – the accumulation of heat within cities – which can negatively affect both human health and the economy.

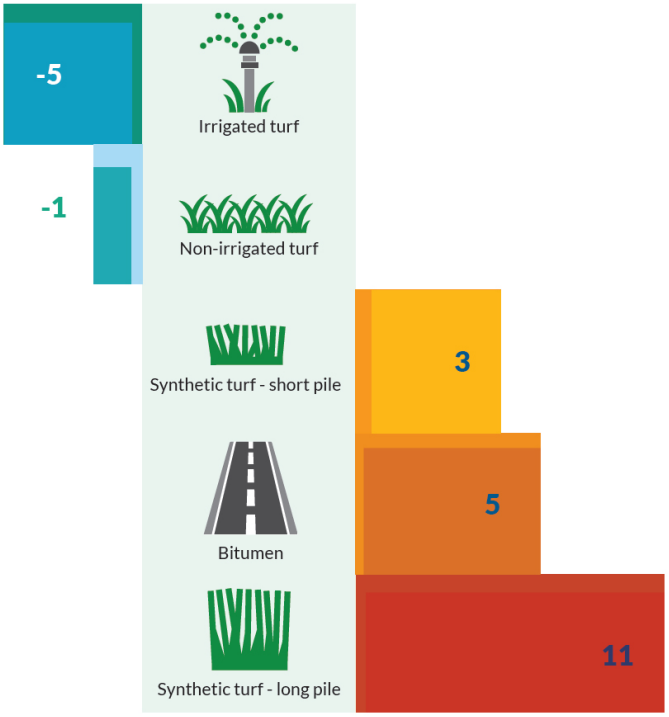
The study, funded by Hort Innovation and delivered by Seed Consulting Services, looked at how different outdoor surface materials affect land surface and air temperatures and whether living turf can cool the local environment.

Irrigated turf means cooler air

The researchers compared land surface temperatures over different materials: unirrigated and irrigated living turf, long pile and short pile synthetic turf, and bitumen. Temperatures were measured over hundreds of examples of each material during hot weather in Victoria, New South Wales and South Australia.

The surface temperature of irrigated natural turf was 4.9 °C cooler than the baseline average. Non-irrigated natural turf showed a weaker effect but was still cooler, by 1.3 °C, than the baseline average. The cooling influence of non-irrigated turf varied widely between states and depended on seasonal rainfall. Long pile and short pile synthetic turf showed the opposite effect, measuring 11 °C and 3 °C warmer than baseline temperatures, respectively.

Warming and cooling in degrees celsius of surface temperature



When it comes to how humans experience heat, the temperature of the air around us has a more direct impact than land surface temperature – but the two are related, since land surface temperature affects air temperature. With this in mind, the study also looked at how the land surface temperature of different materials affects air temperature at 1.2 m above ground level (a height that represents the middle of the average human body).

The researchers found that the air temperature over living turf was on average 10 °C cooler than over bare ground and non-irrigated living turf, and a dramatic 23 °C cooler than the temperature over synthetic materials (playing court, bitumen, and synthetic turf).

On the hot days that the data were collected, the average temperature over irrigated living turf was between 34 and

42 °C – far cooler than the alternative surfaces, which measured from 42 to 70 °C. The highest air temperature of all built surface materials was recorded over the synthetic turf, which reached over 70 °C.

Benefits for surrounding areas

The study also looked at whether the cooling effect of irrigated living turf can extend beyond the immediate area of turf to nearby areas dominated by other surface materials. This is not a straightforward question to answer because the interaction between land surface temperature and air temperature is complicated, being influenced by wind and other variables.

The researchers concluded, however, that in large areas of open space, such as around sports fields and parks, the cooling benefits of living turf can outweigh the warming effects of surfaces such as synthetic turf and bitumen. In these areas, the localised warming that does occur appears to be quickly mixed with cooler surrounding air, especially when there is a light breeze. As such, people walking or playing sport over these surfaces benefit from 'borrowed cooling' from nearby cooler areas.

Energy savings

Through computer modelling the researchers simulated how the urban heat island effect, which is influenced by outdoor surface materials, affects indoor temperatures. Where surface materials lead to an increase in air temperature of 1.85 °C, annual cooling energy use and associated costs could be increased by about 50 per cent for Sydney and Adelaide and up to 72 per cent in Melbourne.

Irrigated turf important into the future

Australia's predicted warmer, drier future means that:

- larger areas of open space will become dried grass, increasing the problem of urban heat islands
- increased irrigation will be needed to maintain living turf.

This highlights the need for local government, developers and residents to continue to proactively work together to ensure that suitable water sources, some of which may be alternative (e.g., recycled stormwater), continue to be available into the future.

Information. The report was funded by Hort Innovation and delivered by Seed Consulting Services. The full report can be viewed on the Hort Innovation website.

On hot days, the temperature over living turf was found to be 4.9ºC cooler than the baseline average.

Tight specifications are a challenge for emergency irrigation

A recent request from a rural client to design and install a pump system that could provide emergency irrigation for a dryland farming and cropping research facility tested the design and installation skills of Tony Giddings from Gosford Irrigation and Water Solutions.

The property, located near Boorowa in south-west New South Wales, has frontage to a local creek, which was used as the water source for the emergency irrigation system, which was designed to be operated only for drought protection.

TIGHT SPECIFICATIONS

According to Tony, there were several challenges that had to be overcome when designing the pump sets to ensure they would operate efficiently and effectively.

"The first challenge was that the creek that was used to supply emergency irrigation water to the farm also supplies Boorowa with town water, and it was essential that any extractions did not affect this supply," he said. "This was monitored five kilometres from the farm and was based on a specific measured flow over Boorowa weir, which meant that we couldn't access water when the flow went below this level."

To ensure flow did not go under the level specified, a secondary check is also completed by farm staff at a creek crossing 30 km from the farm.

The next, and probably biggest, challenge was developing a design for the pump stations that would deliver irrigation water to several different cropping areas that were in different directions from each other. At the same time, it was essential to ensure they all communicated and worked with each other and that they conformed to the job as specified.

With these constraints, it was decided that the hub of the system would be a 60 ML holding dam, which could be filled when water levels as monitored at the weir allowed. Water level data is transmitted through GSM every six hours, and this is confirmed by a manual check at the creek crossing.

When all systems are "go", the holding dam can be filled using a trailer-mounted Goulds ISO 150x125-315 37 kW 4-pole pump. Being trailer mounted, the pump can quickly be relocated away from the creek bank where it is normally sited if there is heavy rain or flooding is likely. If the water level in the creek is rising, the farm managers are notified via software connected to the central monitoring system.

A second pump station on the holding dam is used to fill two other smaller dams as well as irrigate some crops.

A 60 ML holding dam is the hub of the system. The dam is filled when water levels in the creek allow.

This trailer-mounted pump is used to fill the holding dam and can be relocated away from the creek when during heavy rain and when a flood is likely.

This pump is a Lowara triplex booster system e-SV vertical multistage pump set using two 66SVs and a 33SV, all LNPSH pumps.

The system and all pump stations are remotely monitored so staff can identify any issues immediately.

The pump sets on the two smaller dams are a single Lowara 33SV 425 V pump set and a single Lowara 10SV pump set.

All panels are INCA control, and the primary pump station can be monitored remotely using a mobile phone, with inter-connections to the other pump stations.

DAM AND TANKS ARE FULL

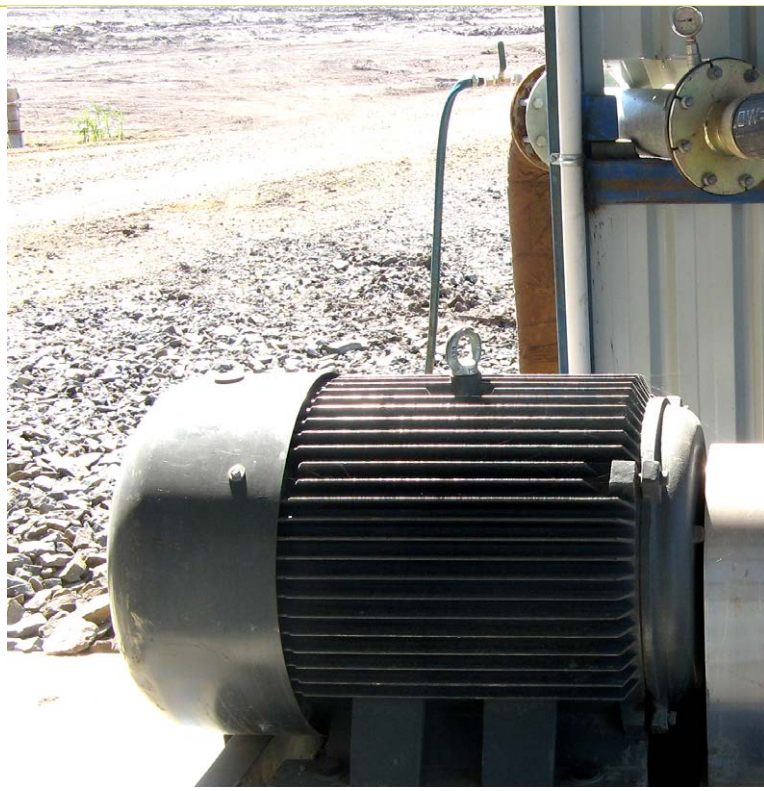
John Veasey from Brown Brothers Engineers, who supplied the pumps, control panels and weir level monitoring devices explained that aspects of the system were modified to fit the application during construction and commissioning with Tony while they were on-site.

"Fortunately, we were able to offer flexibility around product selection and had a number of alternatives to work with ensuring he had the right solution," he said.

The new system was commissioned in February-March this year and has been doing its job, as planned, by operating efficiently and keeping the dam and tanks full.

Acknowledgment. Thanks to Brown Bros Engineers Australia, who supplied the information for this article.

Top eight ways to improve energy efficiency in pumps



Pumping systems are energy intensive, accounting for nearly 25 per cent of the energy consumed by electric motors, and 20 to 60 per cent of total energy use in some industrial, and water and wastewater treatment facilities. While system changes in pumping requirements, normal wear and tear, and buildup in pipes can lead to decreased efficiency over time, specifying the right pump for a particular application is also crucial. Properly matching pump performance and system requirements can reduce pump energy costs by an average of 20 per cent in many cases. This article from *Pump Industry Magazine* looks at the top eight things pump users can do to improve energy efficiency.

1. BE WARY OF OVERSIZING A PUMP

A pump is generally considered to be oversized when it is not operated within 20 per cent of its Best Efficiency Point (BEP), but if the duty point is between 50 and 110 per cent of the BEP flow rate, it is usually considered acceptable. This range allows for a margin of error in case the actual resistance curve is overestimated.

There are several reasons a pump can be oversized. One reason is that the pump is sized early in the planning and design phase using estimated values for pipework and fitting losses. Because of the need to estimate the equipment requirements, as well as the possibility of the published literature having different reference values for flow resistance coefficient or fittings losses, some error can occur when specifying the pump.

Another reason a pump may be oversized is to allow for the system design to be expanded in the future, where a correctly sized pump for the current conditions would be unable to meet predicted additional demand. Sometimes a "safety margin" will be added and a larger pump installed to cater for a future expanded system.

Other reasons oversizing may occur, include the following:

- a pump was urgently needed and the right size was out of stock
- a pump was selected from the spares inventory because of budget constraints
- a new pump was bought to replace an existing pump that was already oversized
- a pump was oversized to account for expected buildup of corrosion products on the pipe interior, which would increase the pump total head requirement
- a "safety factor" added to increase pump capacity and head to counter the effects of wear.

Whatever the reason for oversizing, it will have the knock-on effect of increasing energy costs due to higher performance in terms of flow and pressure requiring more power from the motor, which can lead to unnecessary energy consumption. It is not uncommon to find applications where oversized pumps are being used because engineers have specified a pump with a margin of safety in terms of the pump's duty compared to what the application requires. For example, rotodynamic pumps, such as centrifugal pumps, are known to be typically oversized by 20 to 30 per cent.

While some oversizing can be good to compensate for uncertainties in the design process, a pump operating as close as possible to its BEP will significantly improve its energy efficiency and reduce energy use.

An oversized pump can be identified in several ways, including:

- if it needs to be throttled to achieve system requirements
- if it has a high bypass flow rate
- if its flow rate that varies more than 10 to 20 per cent from the pump's BEP flow rate
- if there is excessive flow noise
- if bearings and seals need frequent replacement
- if it operates intermittently, e.g. pump cycling.

2. TRIM OR REPLACE THE IMPELLER

If a pump is oversized, a relatively cost-effective way to reduce pressure and flow is to trim or replace the impeller.

To ensure efficient operation it is important to specify the right pump for a particular application and to regularly maintain it.

Trimming involves machining the impeller to reduce its diameter. This should be limited to about 75 per cent of the pump's maximum impeller diameter. Shaving the impeller more than this will result in the clearances between it and the casing become too big, resulting in greater flow recirculation and reduced pumping efficiency.

Trimming the impeller reduces its top speed and decreases the amount of energy imparted to the pumped fluid, resulting in the pump's flow rate and pressure decreasing. This means that where an impeller is creating excessive head, a smaller or trimmed impeller can improve efficiency.

Pump casings and shafts are designed to accommodate impellers in a range of sizes, and many pump manufacturers provide pump performance curves indicating how various models will perform with different impeller diameters or trims. The impeller should not be trimmed any smaller than the minimum diameter shown on the curve.

3. USE A VARIABLE SPEED DRIVE (VSD)

VSDs allow the pump to operate near its BEP at any head or flow by varying the rotational speed of the motor to achieve the actual head and flow demand of the application, rather than what the pump can produce.

One of the main reasons for using a VSD is to improve energy efficiency by reducing unnecessary energy consumption in a situation where it slows the motor down on a pump that was oversized at the specification stage. The second major reason for using a VSD to improve energy efficiency is where duty demands on the pump at different times vary significantly.

The amount of energy that can be saved by using a VSD depends on the application and its requirements. In the water and wastewater industry it can often save more than 30 per

cent of energy used; when used with irrigation pumps, power consumption can be reduced by up to 75 per cent; and when fitted to a vacuum pump for use in dairy applications, energy savings of between 40 to 63 per cent can be made. While VSDs do come at a cost, in many cases the cost savings in terms of their operation and energy savings can justify the investment.

4. PUMPS IN PARALLEL

An alternative to using VSDs for a system where there are multiple different duty requirements is to install several pumps to provide flexibility in the flow rates that need to be delivered. Compared to a single pump, installing several pumps enables greater operational flexibility of the system and it will be more efficient. The system also can continue to function if one pump fails, and there are lower maintenance requirements. A common configuration is to install a small pump to operate low flow rates and large pumps to cope with the maximum design flow. This ensures none of the pumps need to operate far from their BEP.

Key to achieving these benefits is correct pump selection for parallel pumping and to ensure pumps operate in the most optimum combination. Incorrect selection can compromise reliability and overall system efficiency. This is a common problem and it can cause issues such as one of the pumps operating at shut off, resulting in overheating and failure. To select an optimal pump combination, calculate the energy effectiveness (gmp/kW) of each pump and then select the single pump or pump combination that yields the highest energy effectiveness.

5. OPTIMISE PIPING

While piping can be optimised once installed, it can be hard to fix. It is important to spend time when designing a pumping system to get piping right from the start to ensure pressure drops are minimised by avoiding sharp bends and sudden changes in pipe sizes. Low loss valves and fittings should be used, and pipe selection should balance the initial cost of the pipe with the cost of pumping fluid through it, for example large pipes might be more expensive, but pumping costs will be lower as there are less friction losses.

By optimising the piping, frictional pressure drops will be limited, which in turn will improve energy efficiency as the energy required by the pump to overcome such losses is reduced.

6. REVIEW THE MOTOR

As oversized pumps reduce the energy efficiency of the system, so oversized motors can also contribute to this. Reasons for specifying an oversized motor include to cater for a possible future increase in pumping capacity, and in situations where there are load fluctuations and voltage imbalances and where the correct sized motor is not available when sourcing equipment.

There are options on the market to avoid oversizing the motor, with some being developed that can accommodate short-term overloads and therefore do away with the need to oversize. Installing high efficiency motors provides a range of benefits, including energy cost savings, reduced breakdowns from improved design and construction, and reduced sensitivity of power factor and efficiency to voltage and load fluctuations.

7. CONTROL SYSTEMS

It is not uncommon for pumps to operate unnecessarily, resulting in more energy being used than is needed. Installing a control system will enable pumps to be controlled remotely, allowing them to be started and stopped depending on pumping requirements at the time. For example, where multiple pumps are in operation but only one is required for the current flow rates, the other pumps can be stopped and restarted later when a high flow rate is needed.

8. PUMP WEAR AND MAINTENANCE

Pump wear will significantly reduce energy efficiency, with losses ranging from 10 to 25 per cent. Most wear occurs in the first few years of operation and will cause a pump's BEP to move to the left on the pump curve. Signs of wear include cavitation, increased clearance between fixed and moving parts, and wear in rings and bearings and packing adjustment on the pump shaft.

While wear is inevitable, routine maintenance will help reduce the efficiency losses caused by wear and slow the process. This can result in energy savings of between 2 and 7 per cent. Proper upkeep and maintenance includes replacing worn impellers, inspecting and repairing bearings, replacing bearing lubrication, inspecting and replacing packing and mechanical seals, replacing wear rings, and checking pump/motor alignment. When the pump gets to the stage where it's running too inefficiently and maintenance is not improving it, replacing it is the best option to reduce long-term energy costs.

As well as pump maintenance, cleaning and maintaining pipework will also improve system energy efficiency.

PRIORITISING CHANGES

This article has looked at eight ways that energy efficiencies can be realised in a pumping system. Which of these can be implemented to achieve energy efficiency will depend on a range of factors such as the application and budget. Any changes need to be prioritised depending on the degree of energy efficiency likely to be realised for a certain application and its individual requirements, as well as the type of pump in operation, e.g. centrifugal pumps typically have the best overall potential for energy savings compared to other pumps.

Acknowledgment. Thanks to *Pump Industry Magazine* for permission to reprint this article.

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Is it worth doing electric irrigation pump performance assessments?

SNAPSHOT

- An inefficient pump could be costing you money
- Pumps may run inefficiently because of wear, incorrect pump selection for the duty or if the duty has changed from the original
- Two useful indicators of pump performance are: the energy used to pump each ML, and this figure divided by the total dynamic head of the system
- Electric motors can run well for years, but recent designs are more efficient (over 90 per cent efficiency); even if your motor is still running well, it might be worth upgrading
- Efficiency is relatively easy to calculate, and this will give you an indication of whether you should change your motor or pump

Irrigation pump performance is often not as good as it should be. Sometimes a problem that could be easily fixed can cost a lot in unnecessary energy use. In my experience, as long as water is coming out where it's supposed to, end-users don't often consider pump performance. But some quick checks will indicate if the pump performance needs attention.

I analysed 30 pump tests conducted over the last 15 years and found a median pump efficiency of 56 per cent and an average efficiency of 54 per cent. The best was 77 per cent and the worst was 12 per cent. This is much lower than the median and average efficiencies that these pumps are designed to operate at (74 and 71 per cent, respectively).

There are several possible reasons for reduced efficiency:

- pump wear – impellers are the usual culprits, but so are casings, shafts and seals
- incorrect pump selection – the pump was never properly matched to the duty
- the duty has changed from the original – the pump might have been well matched to the duty at the start, but the irrigation system has since changed.

Most recent centrifugal pumps are designed to operate with at least 75 per cent efficiency, and most turbine pumps are designed to operate with at least 85 per cent efficiency. Operating at less than best efficiency results in unnecessarily high operating costs and energy usage.

IMPROVING EFFICIENCY SAVES MONEY

How much money would be saved by improving pump efficiency from 54 to 71 per cent?

Peter Smith analysed 30 pump tests conducted over the last 30 years and found a median pump efficiency of 56 per cent – much lower than the intended 74 per cent.

If the pumping cost is $70.00/ML, the saving is calculated as follows:

Cost saving per ML:

= $70.00 – ($70.00 x (54 ÷ 71))

= $70.00 – ($70.00 x 0.76)

= $70.00 – $53.20

= $16.80

If 300 ML is pumped during a season, the total cost saving is $16.80 × 300 = $5,040.

If the cost of replacing the pump is $6,000, it would be paid for in a little over one season. After that, the savings are all increased profit.

Note that reducing pump efficiency by 17 per cent (from 71 down to 54 per cent) increases pumping costs by 32 per cent (from $53.20/ML to $70.00/ML).

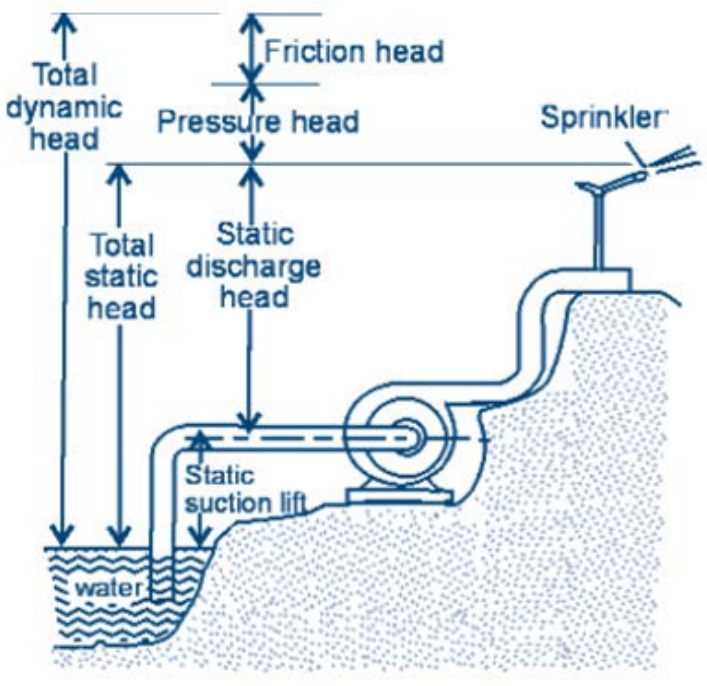
INDICATORS OF PUMP PERFORMANCE

A good indicator of poor pump performance is the energy used to pump each ML. For the 30 pumps tested, this ranged from 99 kWh/ML to a whopping 740 kWh/ML, with a median of 337 kWh/ML. This figure will vary for each pump site but the key is to monitor if it changes over time. As things wear, energy use creeps up.

Another good indicator is this figure divided by the total dynamic head of the system (in metres). For the 30 pumps tested, this ranged from 3.8 kWh/ML/m to 24.7 kWh/ML/m, with a median of 5.53 kWh/ML/m. This figure is handy because it can be compared with any other pump site. The benchmark is from 4 to 5 kWh/ML/m. If your pump is not in this range, it is not operating efficiently. The reasons could be any of the three mentioned above, and further investigation should be undertaken to find out. Do not assume that the pump must be worn – it is not uncommon, for example, for changes to be made to irrigation systems, or for a pump bought at a clearing sale that is totally unsuited to the duty to be installed. Again, it is important to monitor if this figure changes over time. As things deteriorate, it creeps up too.

MODERN ELECTRIC MOTORS MORE EFFICIENT

Inherent in most of the figures above is the efficiency of the electric motor driving the pump. Electric motors are generally quite efficient even after many years of service and when operating at partial loads.



Obtaining a figure for the efficiency of your pumping unit requires only three measurements: power used, amount of water pumped and the head (or pressure)

However, while some decades ago, 85 per cent was considered an acceptable efficiency, efficiencies of 90 to 93 per cent are now common in new electric motors. Upgrading to a new motor, even if the old one is in good order, could be cost effective.

If you were using 90,000 kWh over a season at $0.20/kWh, the cost is $18,000. The cost saving from improving the motor efficiency from 85 to 93 per cent is:

Cost saving per season:

= $18,000 – ($18,000 x (85 ÷ 93))
= $18,000 – ($18,000 x 0.91)
= $18,000 – ($16,380)
= $1,620

If the cost of replacing the electric motor is $3,500, it would be paid for in about two seasons. After that, the savings are all increased profit.

WORKING OUT EFFICIENCY

Obtaining a figure for the efficiency of your electric pumping unit requires only three measurements: power used, amount of water pumped and the head (or pressure).

The formula is:

Pe = (Q × H) ÷ kW

Where

Q = flow rate (L/s)
H = Total head (metres) – pressure gauge reading at the pump outlet plus an estimate for suction head
kW = power usage – measure the kWh consumed in 1 hour from the power meter

Example:

Q = 95 L/s (measured from flow meter)
H = pressure gauge at pump 440 kPa (45 m) plus suction lift estimate 4.1 m = 49.1 m
kW = 150 kWh in 110 minutes = 82 kW

Pe = (Q × H) ÷ kW
= (95 x 49.1) ÷ 82
= 4664.5 ÷ 82
= 57 per cent

This is an approximate figure of the efficiency of the electric motor and pump unit. It provides a guide for whether to investigate further. If this figure is above 70 per cent, further investigation is probably unnecessary. If it is between 50 and 70 per cent, further investigation is warranted. If it is below 50 per cent, urgent investigation should be undertaken.

To obtain more accurate figures and professional advice on whether changing your motor and/or pump is beneficial, contact a certified irrigation consultant.

Peter Smith, Sapphire Irrigation Consulting

PRESSURE IS ON TO MAKE DOMESTIC IRRIGATION SYSTEMS WORK

All irrigation designers are aware of the pressure from their clients to make sure their systems work well and efficiently, using only the water required to keep plants in the desired condition. A critical part of the design process is making sure that the water is supplied to the irrigation network at the correct pressure and flow.

In commercial situations, such as in public parks and playing fields, the scale of the job usually means that a pump can be used to ensure that supply pressure and flow is correct. A big issue when the design depends on the pressure supplied through the mains water system is that a range of other variables come into play.

Domestic irrigation systems operated using mains water pressure can be subject to changes beyond the control of the irrigation designer and installer. A significant example is a water supply authority changing the supply pressure to the block where the system has been installed. Pressure changes in supply could be as much as 500 kPa.

Pressure check is important

The Australian Water Services Association (WSAA) is the association to which all water authorities that supply more than 50,000 households belong. In private correspondence they noted that the practice of pressure reduction is relatively widespread and known to effectively reduce leakage. Reducing pressure is typically done, not to extend asset life, but to reduce leakage rates and ensure assets are operated within tolerance. The upper maximum pressure depends on the supply, water utility and pipe specification. Some authorities aim for operating pressures around 70 m head, and others as high as 120 m. The lower limit is 15 m, with a preference for higher than 25 m.

Sydney Water states on its website:

> *"Most Sydney properties receive water pressure of between 15 metres (m) and 65 m head. The current overall average pressure across Sydney Water's area of operations is 52 m".*

(This is subject to the elevation change from the local water tank, e.g., waterfront properties can be much higher.)

A key first task for designers and contractors of domestic systems is to not only measure the current supply pressure to the location but also to try and find out if any changes in supply pressure are planned. This might be particularly important across urban areas where supply pressures may

It is important that designers and contractors of domestic systems not only measure the current supply pressure to the location but also to try and find out if any changes in supply pressure are planned.

change as property densities change and more houses are connected to the supply.

Another issue beyond the control of the designer might be the installation of pressure regulation devices by plumbers. Pressure regulation devices at the water meter to protect domestic devices such as washing machines and tap fittings are designed not to be operated above a certain pressure, commonly 50 m in Sydney. The friction loss though these devices can also affect the hydraulics of an existing irrigation system.

Sprinkler choice can be complicated

Sprinkler manufacturers have modified their products to improve their performance and increase their functionality. Fitting pressure regulation and check valves in sprinkler bodies are two examples.

In the United States, where many sprinklers sold in Australia are manufactured, the WaterSense program recommends sprinklers with pressure regulation be installed in new systems to ensure efficient sprinkler performance. While such features are useful when water pressure is too high, they can reduce sprinkler efficiency if pressure is too low or is reduced after the irrigation system is installed.

Professional designers and contractors know that site topography will have an important impact on system design. In some urban settings there can be elevation changes of more than 5 m, which will have a significant impact on the hydraulics of any system. Big elevation differences across the system can also lead to some laterals draining if check valves are not fitted. Making the issue more complicated is the fact that sprinklers manufactured by different companies can have different characteristics for factors such as sealing pressure, e.g., sprinkler spring resistance, and reported sealing pressure.

One way of managing some of the effects of elevation changes is by installing check valves in sprinklers, which offer the benefits of reduced pipe fill time, thus decreasing runtime and, on some slopes, reduced water loss due to leakage.

Another way is to specify sprinklers with inbuilt pressure regulation units. Mostly they are set to regulate pressure at 210 or 310 kPa. Before using pressure regulated sprinklers the designer or contractor needs to consider the following:

- submain pipe burst material (e.g., LDPE rated to 300 kPa). In some cases, retrofitting pressure-regulated sprinkler bodies can result in back pressure above pipe burst pressure
- optimising sprinkler spacing for nozzle best performance uniformity at the regulated pressure
- elevation change (e.g., Sydney), where sprinklers are at lower elevations, pressure regulation is an option to prevent nozzle "misting" (higher pressure).

Refurbishing old systems

Refurbishing old domestic irrigation systems can also present different challenges. It is not unusual to find systems with submains of different materials such as copper, PVC, MDPE, rural and LDPE. Each material has its own hydraulic characteristics in relation to burst pressure and friction loss. Knowing which material has been installed is critical to choosing emitters that can operate within the hydraulic specifications of the system. Situations have been found where the burst pressure of the submain has been lower than the optimum operating pressure of the sprinkler (e.g., LDPE).

The bottom line

Professional irrigation designers and maintenance personnel know that part of the challenge in operating an irrigation system effectively is matching available pressure or flow to the number of sprinklers required to provide uniform coverage.

For domestic systems that are on mains supply, pressures are decided by the water supply authority and it is important that designers and managers do their homework so that, as much as possible, the system operates efficiently within this constraint.

David McKechnie and Jeremy Cape

Soil and substrate mapping for water management in the USA and Australia

SNAPSHOT

- Managed aquifer recharge is used in urban situations in Australia and other countries to 'bank' water in times of high rainfall for use when it is dry
- This option is typically not available to irrigators or water supply authorities in Australia, in part because water use legislation and management of groundwater prevent it
- Developments in soil mapping technology using EM surveying and multi-depth imaging equipment are opening the potential for irrigators to assess at depth the seepage pathways beneath earthen storages, and telemetered monitoring can quantify that water contribution to aquifers beneath from where it can be re-extracted when needed for irrigation

Optimising both groundwater storage and soil moisture use can benefit from the same substrate mapping and monitoring. Both strongly depend on soil and substrate variation, which is often far more complex than the average engineer is trained to recognise. Opportunities to precisely improve both surface water use efficiency and groundwater management typically require the same mapping and monitoring technology. When managing deep drainage and aquifer recharge, the same mapping and monitoring is relevant.

As soil mapping and monitoring technology is rapidly improving, and complex irrigation automation is becoming more affordable, the combination is going to create some great opportunities for more appropriate water use. David Allen explains how in this article.

AQUIFER RECHARGE

In the USA at present there is much talk, and action, of pouring water into the ground to recharge aquifers, i.e., MAR (managed aquifer recharge) or water banking. It includes the following examples:

- installing weirs in rivers as had been done extensively in Australia until about the 1960s so that now we have freshwater plumes beneath most of our weir pools
- installing seeping 'leaky' upland dams and contour banks to force more seepage into aquifers from where it is gradually extracted
- surface spreading where water is flood irrigated to seep into the soil, often for more than just growing a crop, e.g., deep drainage to recharge aquifers
- surface reservoirs that capture water, which is then fed as quickly as possible into infiltration galleries (gravel filled trenches) or recharge bores.

The popularity of MAR in the USA is at odds with what has been largely happening in Australian agriculture, where the focus over the last decade has been on making surface water savings, generally at the expense of groundwater recharge. Such a strategy has had some benefits. It has made savings by reducing evaporation of water and it has alleviated some waterlogging and soil salinity problems. It has also changed, but not necessarily improved, groundwater resources where infiltrating water has mixed with salts in the ground to create saline or brackish groundwater.

In Australia we have also focused on optimising soil moisture flow into and through the root zone, controlling available moisture, drainage of salt build-up in soil, and oxygen availability to roots.

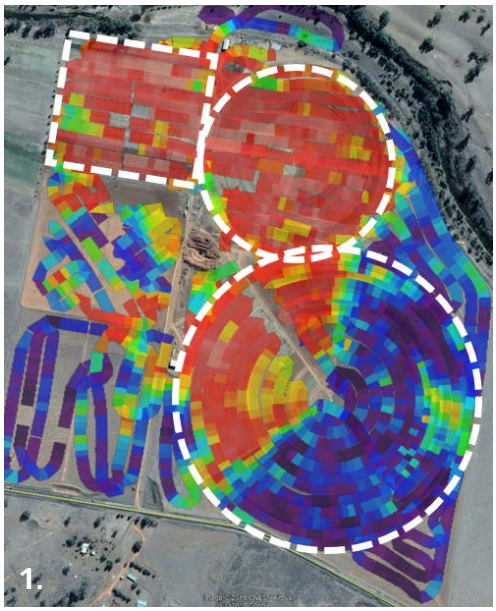
HISTORY AND LEGAL FRAMEWORKS THE KEY TO DIFFERENCES

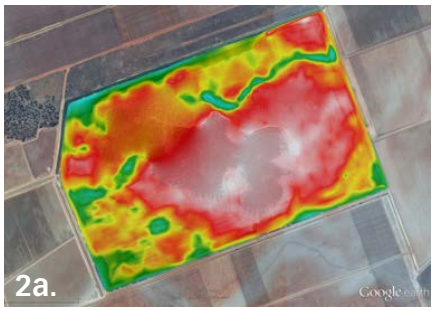
Why is the focus different in these two countries? It is to do with history and legal structure. In the USA, farmers "sort of" own their groundwater while in Australia, governments own the groundwater and licence a little bit of it back to farmers.

In the USA, there are perverse outcomes in that competition to pump the last drop of useable groundwater before the neighbour gets it has led to significant problems, including:

- declining water levels
- ground subsidence
- pointlessly huge pumping heads
- ingress of saline groundwater.

The practice in the USA has, however, led to one good outcome, and that is that they have space in aquifers now to





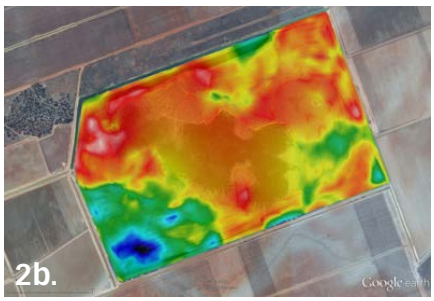


Image 1: Electrical resistivity mapped at 4 m deep clearly outlines where irrigation has occurred with two centre pivots and a rectangular paddock covered with sprayers. Note how only a sector of one pivot has been operating. Red indicates high EC (moist and/or greater salinity), and irrigation infrastructure is outlined in white dashed lines. The blue, almost circular area indicates where the pivot has not been operating.Images of deeper layers beyond the impact of irrigation reveal aquifers suitable for re-extraction of the seepage water.
Image 2a: Imaging at a depth of 1 m. Shallow resistivity images can show where soil texture differences allow seepage into the soil. In this image clay is red and slightly lighter soil grades to aqua.
Image 2b: Imaging at a depth of 12 m. Deeper resistivity images can show where there is an opportunity to enhance and manage recharge into deeper aquifers. The blue feature is suggested as a recharge pathway.

recharge more water when it arrives in floods. This means they have a long-term water storage solution free from evaporation loss.

In contrast, in Australia, government focuses on keeping the aquifers full, allowing extraction of only less than the estimated recharge. Such an approach precludes the opportunity to practice MAR as adding more water will only cause waterlogging problems. As well, in much of Australia, a farmer or water distribution authority recharging an aquifer loses title to their water and must then buy it a second time as part of a groundwater licence and then only if that is permitted.

There is a zone of ambiguity above the regional water table where water ownership is not clear, and this includes water seeping from canals and reservoirs and water within the root zone. Because of this lack of clarity around ownership and potential for litigation, Australian farmers do not generally try to manage and recover this water nor use it as part of a water storage option (with rare exceptions including the lower Burdekin).

In contrast, town councils in Australia are starting to practice MAR as they have first rights to groundwater recharged and have an obligation to manage stormwater. CSIRO has also recently announced a project to involve irrigators in trialling its potential (see the Spring 2021 edition of Irrigation Australia Journal, page 44.

ROLE OF MAPPING AND MONITORING

Despite how groundwater may be managed legally, the best option is to balance and optimise the impact of waterlogging, salinisation of root zones and aquifer recharge. Surface water infrastructure and irrigation application can be optimised with the same continued soil moisture mapping and monitoring required to also manage aquifer recharge.

Monitoring is typically done at isolated sites using capacitance probes or other sensors but is most useful in combination with mapping. Soil moisture is hard to map directly, apart from right at the surface, but timelapse mapping of electrical resistivity, resolved into layers within the soil, can be used to map soil moisture and salinity change in the soil. Separating the impact of salinity change from saturation change is difficult, if not impossible, using resistivity mapping alone. Very deep imaging can penetrate right into and resolve deep preferred recharge pathways and aquifers beneath.

The opposite of electrical resistivity is electrical conductivity so mapping of either is actually the same thing. Historically, a lot of EM mapping has occurred in Australia for soil mapping. Until recently, no attempt had been made to resolve resistivity of precise layers in the soil so if moisture was at the focal depth of an EM instrument it decreased mapped resistivity but if it was at a different depth, it had less effect. More modern processing techniques, used with multi-depth imaging equipment, can resolve layers.

It is only with this approach and timelapse surveying that changes in soil moisture can be practically mapped. For viability, however, the technology needs to go on a farm vector, such as a tractor (or irrigator), that regularly passes over a site. Calibration using soil moisture probes is also necessary.

There is no short cut, as nearly all the benefits only come as the whole mapping procedure becomes more rigorous. Without rigour there is no point in making multiple maps at different dates across a paddock and there no way to map changes in soil moisture nor the depth distribution of that moisture.

POTENTIAL FOR MAR IN AGRICULTURE

With government incentives suggested, but not yet legislated, to meter floodplain harvesting, installing a lot of the monitoring needed to quantify recharge from irrigation infrastructure may be soon mandated, at least in New South Wales. Wouldn't it be good if farmers could map the soil of their earthen structures and access and enhance such metering, at reasonable cost, so they can quantify, enhance where appropriate, and get credit for their managed aquifer recharge.

INFORMATION

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David Allen, Groundwater Imaging, Dubbo

Irrigation monitoring in potatoes: a case study

KEY FINDINGS

- Crop water requirement changed rapidly as the crop developed, in this case a fourfold increase in crop water needs. Daily crop water was less than 2 mm/day during the sprouting and emergence stage. Over two weeks, daily water use increased from 2 mm/day to over 8 mm/day – a fourfold increase. This means it is important to bring soil back to field capacity before the rapid vegetative crop growth stage.
- After row closure, changes in the weather became the major driver in daily crop water use. Hot, dry, north-west winds pushed crop daily water use to over 11 mm/day, with cooler changes and showers dropping it to 6 mm/day. With peak crop water demand pushing the limits of most irrigation systems, short periods of lower crop water demand associated with cool changes can be used to catch up and refill the soil.
- A common trap for growers is to delay restarting irrigation after rainfall. After 20 mm of rain in mid-January, irrigation was not restarted for seven days, resulting in the crop going into water stress during the critical bulking up stage. This drove soil moisture to its lowest level during the sensitive tuber bulking up stage. Estimated yield losses of 10 per cent resulted from the delayed restart of irrigation after the rain. Across the half pivot, the yield losses could have been between $12,600 and $17,900.
- IrriSAT provided a useful tool for monitoring crop growth and water use. IrriSAT is easy to use and provided useful information on crop growth, 7-day forecasts of crop water use to help with planning and can also be used to check for variability across the paddock. A major strength is the coverage of the whole paddock using the satellite information.
- Soil moisture sensors provide a good spot check on soil moisture conditions. As with all soil moisture monitoring, it is important to choose the right location in the paddock at appropriate soil depths and correctly install the sensors.

This case study explains how the irrigation tool, IrriSAT, combined with soil moisture monitoring, provided important information to a potato grower about crop water requirements and actual soil moisture levels. This enabled him to manage his irrigation to maximise yield and quality.

The 1000 ha farm farm is located near Cowra, New South Wales, on loam and sandy loam soils. It has been producing processing potatoes for the past ten years and the grower was interested in trying some new tools to manage his irrigation.

MONITORING AND SCHEDULING TOOLS

Researchers Marc Hinderager and Dr Kelvin Montagu from AHR's Soil Wealth team investigated how the satellite-based irrigation scheduling app, IrriSAT, which estimates the daily crop water needs, could be combined with tools that measure soil moisture directly in the root zone of the crop. For this case study, they used the Wildeye system, which uses TDR (time domain reflectometry) to measure soil moisture at two depths and uploads the data to a website for access. (This choice does not imply endorsement of this product over other systems.)

The crop was planted on the 27 October 2019 on half an irrigation pivot (13 ha). Two soil moisture sensors were installed in the half pivot 44 days after planting and were monitored until the crop was harvested the 15 February 2020. The IrriSAT app was used on the same area from planting to harvest.

This demonstration followed usual pivot irrigation practice for a large potato operation on variable sandy loam to loam soils. The grower was given useful information about irrigation requirements for this crop based on IrriSAT and soil moisture monitoring, with the aim to keep within the allowable depletion amounts and field capacity range of 6596 to 8596 soil moisture. All decisions were made by the grower.

HOW IRRISAT WORKS

IrriSAT uses satellite images of a crop to monitor growth stages and calculate a crop factor (Kc). The crop factor is then used to adjust daily reference evapotranspiration (ETo) data from the Bureau of Meteorology to estimate daily crop water use (mm/day). Importantly, IrriSAT will also predict crop water use for the next seven days, based on weather forecasts.

It also keeps track of rainfall and irrigation and combines this with crop water use to produce a soil water budget. This can help guide irrigation frequency and show when the soil may be drying to below the refill point.

Figure 1A shows examples of the IrriSAT satellite images of the potato half-pivot at Cowra from November 2019 to February 2020. It also produces an actual crop

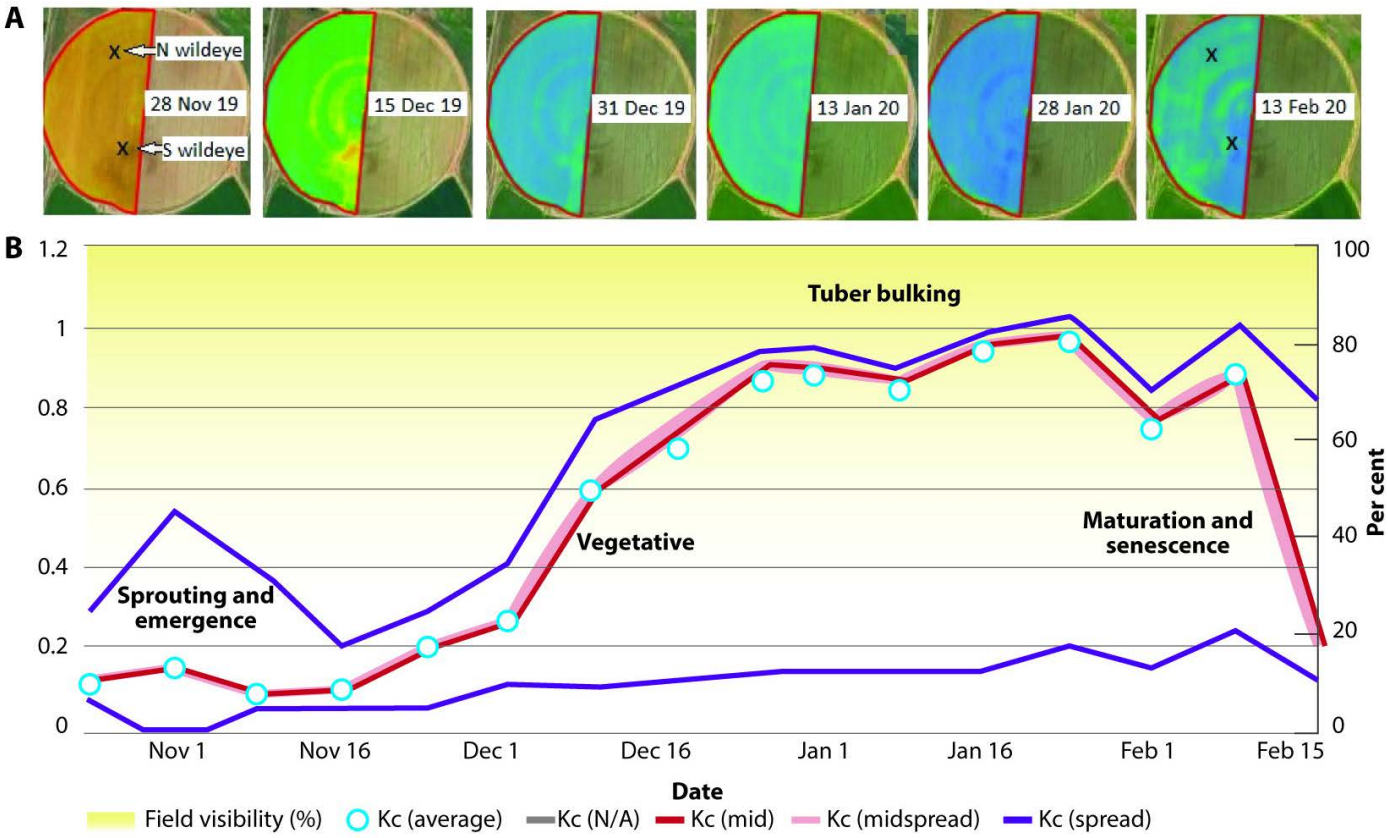

Figure 1. IrriSAT fortnightly time-series of crop factors produced from satellite data (A), and crop factor over time with potato growth phases added (B). In A, x indicates location of soil moisture sensor (N = northern; S = southern). Legend for time-lapse of IrriSAT images: Kc = 0.2 (brown, bare soil); Kc = 1.2 (blue, maximum ground cover).

growth curve for a crop based on the crop factor, which is calculated from NDVI (Figure 1B). The crop factor is used to adjust reference evapotranspiration into crop water use.

IrriSAT also keeps track of rainfall and irrigation and combines this with crop water use to produce a soil water budget (red). This can help guide irrigation frequency and show when the soil may be drying to below the refill point.

SOIL MOISTURE SENSORS AND SOME KEY RESULTS

Two soil moisture sensors were installed in the root zone of the crop at 20 and 50 cm depths. They tracked soil moisture in real time and showed from where in the soil profile the water was being taken up. Users can see how deep irrigations and rainfall events are penetrating the soil, which helps them understand how long it is necessary to irrigate for to refill the soil profile (see Figure 3).

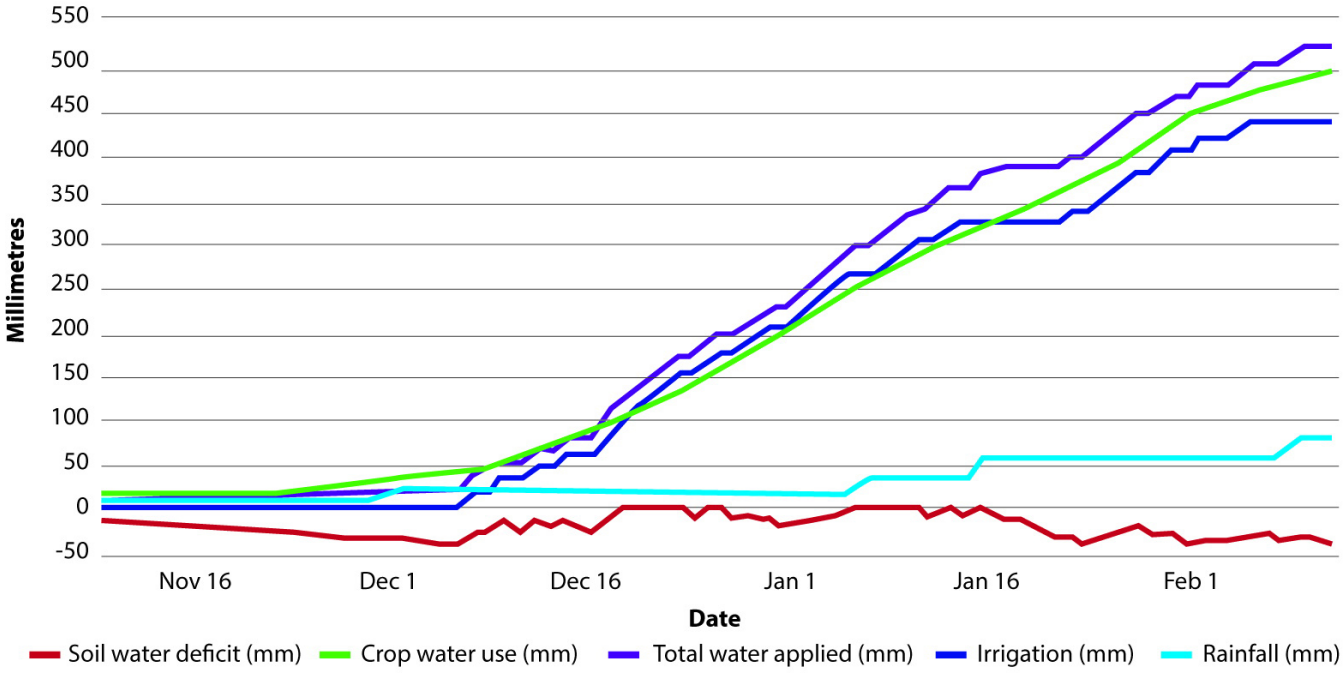

Figure 2. IrriSAT cumulative daily water balance from planting (1 November 2019) through to harvest (19 February 2020).

The soil moisture sensors can also indicate what time of day roots are using soil moisture. Zooming into the daily water use on hot summer days shows that most water uptake occurs from early morning through to noon, after which plants began to physiologically shut down due to the heat (Figure 4).

WHAT HAPPENED DURING THE 2019-20 SUMMER SEASON IN COWRA?

The description below outlines what happened during the four main phases of the crop and how these stages relate to crop water use calculated by IrriSAT (Figure 5):

- sprouting and emergence
- vegetative
- tuber bulking
- maturation and vine senescence.

Sprouting and emergence – disease management a priority. During the first 30 days - sprouting and emergence - the soil needs to be kept dry to prevent diseases like *Rhizoctonia* developing. Early crop growth relies on water stored in the seed piece and roots growing into new soil for moisture, with no irrigation applied. But irrigation needs to be started early enough to bring the soil back up to field capacity before crop growth really takes off during the vegetative stage.

Getting this balance right is hard and, in this case, was further complicated by 9 mm of rain near the end of the emergence stage. A common trap for growers is to delay starting irrigation after rainfall.

Vegetative stage – crop growth driving water use. The potato crop entered the vegetative stage with a soil moisture deficit of more than 40 mm. This was the result of a delay in starting irrigation, probably because of the 9 mm of rain, potentially slowing early growth and costing yield.

During the vegetative stage daily crop water use increased in two weeks from less than 2 mm/day to more than 8 mm/day (Figure 2). This was largely driven by crop growth rather than changes in weather, which highlights the benefits of IrriSAT's satellite monitoring producing the crop growth curve through the development of the crop factor (Kc; Figure 1).

To overcome the soil moisture deficit, the grower had to run the pivot hard to refill the soil and keep up with the rapidly increasing crop water use. During the three weeks of the vegetative stage, the grower applied 180 mm of irrigation. This got the crop back on track and set it up well for the critical tuber bulking stage during a hot January.

Tuber bulking – changes in weather driving water use. Once the canopy had closed over, the weather became the major driver in daily crop water use. Hot, dry, north-west winds pushed crop daily water use to over 11 mm/day, with cooler changes and showers dropping crop water use to 6 mm/day.

Irrigation during this stage was about keeping up with peak crop demand, with any water stress reducing tuber growth and causing tuber malformations, diseases and hollow heart. With peak crop water demand pushing the limits of most irrigation systems, short periods of lower crop water demand associated with cool changes needed to be used to catch up and refill the soil.

The grower did a good job of keeping the water up to the crop through early January with both IrriSAT and soil moisture sensors showing irrigation meeting crop water demands.

In mid-January, 20 mm of rain fell, increasing soil moisture to above field capacity (Figure 3). After the rain, the grower did not restart irrigation for seven days during which time the daily maximum temperature was over 35ºC and the crop needed 43 mm of water. This drove the soil moisture to its lowest levels.

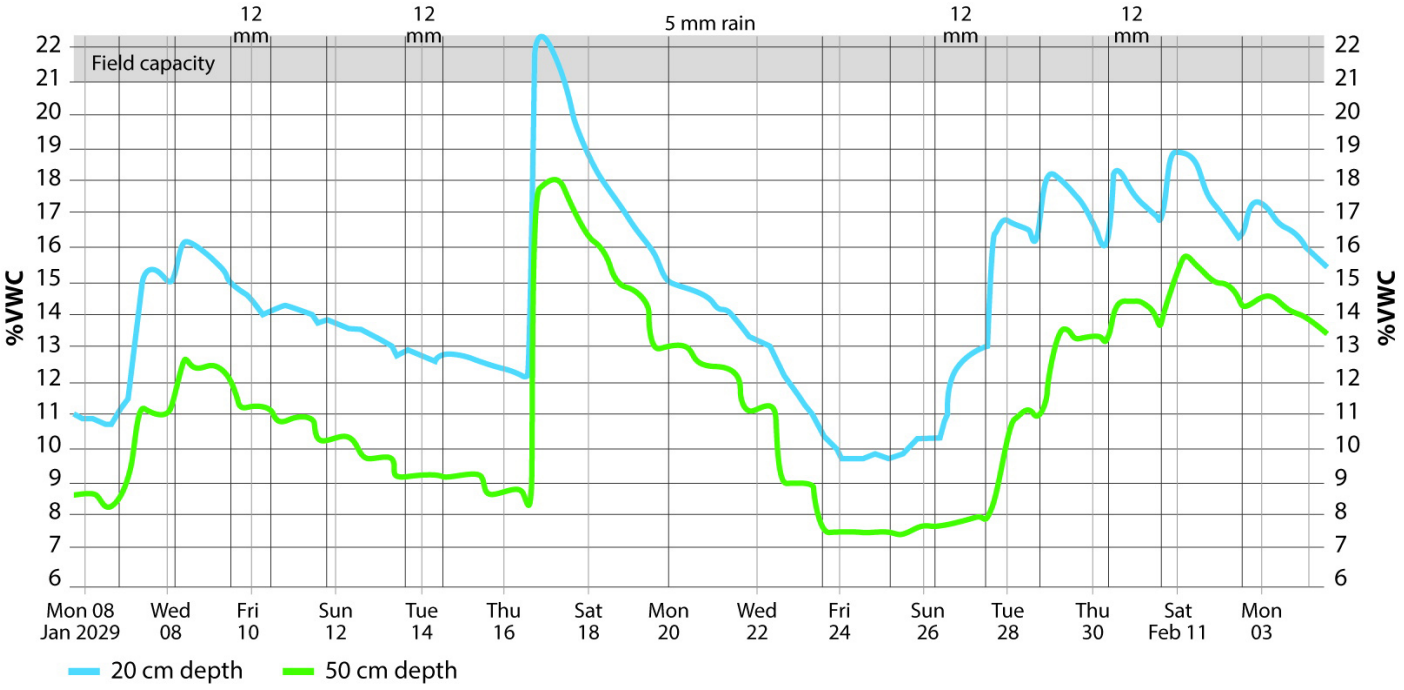

Figure 3. Soil moisture data in the potato pivot at Cowra, January to February 2020. The blue line is 20 cm depth and the green line 50 cm depth. Irrigation and rainfall are added as vertical lines.

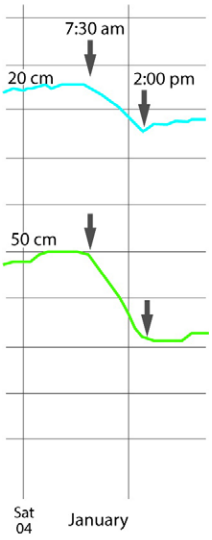

Figure 4. Changes in soil moisture during the day for 4 January 2020. Max temperature = 44.6 °C.

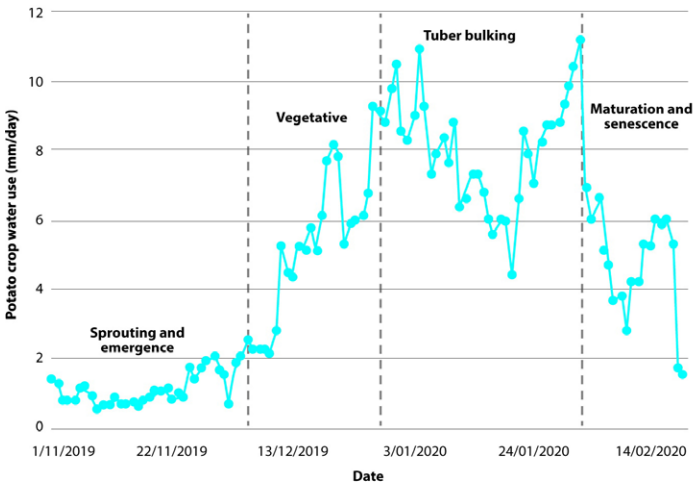

Figure 5. Potato daily crop water (mm/day) estimated by IrriSAT using crop factor and reference evapotranspiration (ETo) from weather data.

The low soil moisture levels during the sensitive tuber bulking up stage would have reduced overall yield, estimated by the researchers to be 10 per cent resulting from the delayed restart of irrigation after the rain. Across the half pivot the yield losses could have been between $12,600 and $17,900.

Maturation and vine senescence. The crop had recovered from the water stress by the 28 January 2020 (Figure 1), but the water balance remained in deficit until harvest (15 February) because of the earlier water stress period described above (Figure 5). Tuber quality was excellent across all areas of the paddock. Yields were lower than expected, probably due to the water stress. No disease issues and no hollow heart was detected.

THE OUTCOME

This case study showed how the IrriSAT app used with soil moisture sensors can provide growers and irrigation managers with essential information about irrigation needs and actual crop water use. The irrigation was managed well for most of the season, with one underwatering issue after a rainfall event mid-January 2020. This caused the crop to go into water stress during the critical tuber bulking stage, which was likely to have caused premature vine die off in marginal areas of the pivot and reduced overall yield.

Acknowledgment. This article was reproduced from the Soil Wealth and Integrated Crop Protection project, which is funded by Hort Innovation using the vegetable research and development levy and funds from the Australian Government. For further information see: https://www.soilwealth.com.au/

Variable rate irrigation and centre pivots: challenges and successes

SNAPSHOT

- We spoke to James Curran from Pinion Advisory about the use of variable rate irrigation technology with centre pivots, and describe a case study looking at the use of VRI on a dairy farm
- Using VRI technology with centre pivots can allow more precise control of water application in different areas of the field
- This technology can help farmers save water and boost productivity, but it can be complex to use and maintain and is not beneficial in all situations
- A dairy farm case study found that using VRI technology with a centre pivot resulted in 30 per cent water savings, increased pasture production, reduced power use and reduced problems like bogging
- A model showed that on this farm the payback period for the investment could be less than three years

Centre pivot irrigation has been used since the 1960s, but it was only about ten years ago that digital technology started allowing more precise control of water application. Using soil maps, variable rate irrigation (VRI) technology lets farmers customise water application within a field by controlling the amount of water coming out of individual sprinklers. In some situations, this technology can have big benefits; in others, simpler solutions may be better. We spoke to James Curran from Pinion Advisory about the advantages and challenges of using VRI with centre pivots, and describe a case study in which VRI technology has been a great success.

Centre pivots are designed to achieve an even application, with larger nozzles towards the outside of the circle to cover the larger area at the perimeter. In practice, however, once the water hits the ground, it doesn't necessarily infiltrate uniformly; infiltration depends on soil characteristics, slope, vegetation cover and other variables.

James Curran explains that VRI technology aims to overcome these problems, "VRI attempts to ensure that the right amount of water ends up in the right place. In theory, VRI gives the farmer the ability to manage where the water is applied within the circle.

"A standard centre pivot has a basic control panel that can let farmers adjust speed, depth of water applied at different degrees of the circle, and how much water is applied within each 'wedge' of the circle. The idea of VRI technology is that it can allow more precise control of water application using electric actuated valves at each sprinkler or block of sprinklers. This allows the sprinklers to be pulsed on and off to control the depth of application."

THE CHALLENGES

James says that the main challenges with VRI technology on centre pivots are to do with maintenance and application, "When you take a simple, robust machine and add wiring and tubing to it, which will be exposed to the elements, you are adding more parts that can go wrong – for example, the solenoid valves can corrode, parrots can chew wires, et cetera.

"When it comes to application, you set up a system based on a field map that shows where the water is applied, and different zones get different percentages of water, often based on soil type and the predicted lateral movement of water within the field. Unfortunately, the application mapping is not an exact science, and often farmers discover that the map needs modifying to more accurately reflect the true conditions. This can be something of an ongoing process, and generating

Centre pivots are designed to achieve an even application but in practice, once the water hits the ground, it doesn't necessarily infiltrate uniformly.

Using VRI technology on centre pivots on Rob Bradley's dairy farm resulted in lower water and energy use and increased productivity.

maps is complex and expensive – up until very recently this has not been something that farmers can do themselves."

For this reason, when growers come to James asking about VRI for their centre pivots, the first thing he asks is: Why do they want it? What's the problem that they are trying to solve? James finds that often people are trying to manage lateral movement of water on the ground, and he advises them to try the simpler solutions first: sometimes installing a new sprinkler package to control the intensity of application and get it as low as possible will fix the problem.

James says there some situations where the use of VRI with centre pivots can be beneficial:

- in areas where water is expensive, farmers can see direct cost savings from using less water - this is not the case in all parts of Australia though
- to improve yield and agronomic productivity, for example, by reducing overwatering in potato crops to prevent rot
- on some undulating land to customise application for wetter and drier areas
- in dairies it can be useful to manage water around water troughs, farm entrances and laneways to prevent bogging and improve animal health

BETTER PASTURE PRODUCTION

A recent case study in Tasmania clearly shows the benefits of VRI technology with centre pivots on a dairy farm.

The three-year project by the Tasmanian Institute of Agriculture found that the use of VRI with centre pivots can significantly increase pasture production in dairy farms while reducing water use by around 30 per cent compared with flat rate application.

Before the introduction of VRI technology, dairy farmer Rob Bradley, at Cressy, relied on what he calls the 'spade-based' method of irrigation scheduling – periodically visiting the paddocks under the pivot to turn the soil with a spade to determine the moisture content, and irrigating accordingly.

His farm's irrigated area is an undulating 177 ha pasture with wetter and drier areas. Even with significant water inputs (over 6 ML/ha) with flat rate irrigation, the pasture showed poor growth rates.

Rob estimated that improving growth rates by 20 kg/ha/day from an average of 40 to 60 kg/ha/day would increase pasture production by over 200 t under his 117 ha pivot. If achieved, this result would lead to less grain being bought and a saving of $200/t on feed costs, worth more than $40,000 over a three-month period.

A VRI system was installed on the existing 569 m centre pivot. The ability to control individual sprinklers makes it possible to improve scheduling by reducing application to wetter areas, particularly in early spring. This gives these areas a chance to dry out and produce pasture instead of remaining waterlogged. Less waterlogging also means less bogging – a problem that can sometimes prevent the pivot from being run when required.

This site also has 3 ha of laneways and open irrigation channels, which do not require water. VRI has allowed Rob to avoid these areas, minimising runoff and water wastage and better maintain the laneways under the pivots. It also makes it easier to manage events such as silage making, and other practices that require water manipulation, without impacting irrigation of other areas.

In the first and second years of using VRI, through adjustments in irrigation scheduling, Rob achieved more than the target 20 kg/ha/day improvement in production. He summed up the impact of the project: "We're putting the water where it needs to go, we're using less power to do it, and we're growing more grass".

A model was used to assess the return on investment for VRI technology. It showed that if pasture production were to increase by 1 t DM/ha/season, the payback period for the investment would be less than three years. The results at Rob's farm suggest that an increase of 1 t DM/ha is achievable, as VRI technology enabled the pivot to continually operate with optimum scheduling (preventing issues with pivot ruts or paddocks drying out when stopping the pivot from management interventions, such as cutting silage).

NOT A SILVER BULLET BUT TECHNOLOGY IMPROVING

James Curran emphasises that VRI should not be considered a silver bullet and is not the best or cheapest solution for all situations: simpler solutions should always be considered first.

Over the years, however, he has seen VRI technology undergo a lot of changes, with manufacturers coming up with designs and then taking them back to the drawing board to redesign and refine: "Issues are being ironed out as we go along. It's still not perfect but it's better than it was, and there are some areas, like dairies, where there can be clear benefits".

Eve White, Irrigation Australia

AUSTRALIAN AND CALIFORNIAN WATER LAWS – CAN WE LEARN FROM ONE ANOTHER?

SNAPSHOT

- Australia and California are experiencing the impacts of aridity and drought but their legal frameworks around water rights are different
- In Australia, water plans limit allocations to levels proportionate to the available water, which helps us respond to over-extraction and sustainability issues
- In California, when less water is available, junior right holders give up their water right so senior users can continue business as usual
- Australian water markets operate together with water plans to incentivise the highest and best use of water. California's water trading system is a fraction of the value of Australia's and lacks a central trading forum
- California could benefit from a system like Australia's Basin Plan to manage the inter-jurisdictional catchments that feed into the system
- California has seen many cases of water rights litigation, and with the effects of climate change, Australia is likely to see more in the future

In most jurisdictions, water rights are the backbone of the framework that regulates the use and development of water resources. The role of water rights is especially important in areas of water scarcity. Australia and California are already experiencing the economic and ecological impacts of increased aridity and drought, with 90 per cent of California experiencing 'extreme drought' in 2021 and Australia having the distinction of the driest inhabited continent and the most variable rainfall.

This article by Joseph Monaghan and Christopher Watt describes the legal systems of Australia and California, and the impact their different approaches might have on litigation in the future.

Despite both Australia and California being similar in that they are being affected by increasing aridity, each has approached water rights using a different legal framework. One of the key differences is the existence of water plans in Australia, which are a feature of our legal framework that limit allocations to levels proportionate to available water and account for the effects of climate change. California lacks this element of the regulatory framework, raising the question of whether California is appropriately prepared to face the challenges of climate change.

We also predict increased litigation over Australian water resources, in light of the Californian experience.

Water law background

Over time, the common law in both Australia and the United States has developed to manage the impact of human activities and development on the hydrological cycle. The first feature of water management under the common law is an understanding that water is a vital resource that cannot be 'owned' in a traditional sense and should be available to all. The second feature is private rights of access to water.

Riparian rights. The riparian doctrine developed in England and was then adopted around the common law world, including in Australia. Riparian rights provide an incidental right of owning land to access and use the water that touches that land. This means a riparian water right cannot travel and is tied to the owner of the relevant land. This system of riparian rights was not necessarily well suited to Australia, nor the arid Western United States. Justice Windeyer of the High Court of Australia noted the foreignness of our inherited laws in Gartner v Kidman (1961–62) 108 CLR 12, saying "the conditions of settlement, of climate and of geography in which this body of customary law developed are very different from those prevailing in many parts of Australia."

Prior appropriation rights. In California the riparian doctrine has been mostly replaced by another common law water right unique to the United States, namely, prior appropriation rights. The right to access water applies a 'first in time, first in right' ranking system, with the right to access water based on the quantity and use of the initial take. This means when less water is available, junior right holders are expected to give up their water right so senior water users can continue business as usual. This is subject to some limitations – for example, on the condition that the public trust is not violated through adverse impacts to lakes and rivers, and that any use must be both 'reasonable' and 'beneficial'.

Water law reforms

The key water law reform in Australia occurred under the National Water Initiative. The National Water Initiative is a federal and state government blueprint that was agreed to by the Council of Australian Governments in 2004 with two

key pillars: water markets and water resource planning. Together these features seek to provide for increased water use efficiency and environmental sustainability.

Water plans seek to ensure the allocation of water rights is consistent with available water. They provide environmental regulation by specifying requirements for water trading and catchment management strategies. The Murray–Darling Basin Plan is an example of a water plan, albeit on a grand scale, with the catchment being the entire Murray–Darling Basin. Basin states are then responsible for preparing water plans for catchments within the Murray–Darling Basin. The combined effect of these various instruments is to manage water resources in a sustainable way.

Water markets operate in conjunction with these instruments to incentivise water's highest and best use. In 2019–20, water market turnover in Australia was A$7 billion, driven by record entitlement and allocation prices due to low water availability and high demand.

Australia and California are both affected by increasing aridity, but each has approached water rights using a different legal framework (top: Colorado Rover, California; above: Lewiston, South Australia). *Photos by Christopher Watt and Scancode Productions on Unsplash.*

Australia has seen few water rights cases compared to California, but we expect the trend towards increased litigation to continue as the consumptive pool of available water diminishes. *Photo by Zac Edmonds on Unsplash.*

California's approach to water management law is very different. Its State Water Resources Control Board has been managing appropriation rights since 1914 and still broadly follows the common law prior appropriation model. California has a system to trade water rights, but the state's annual turnover from water trading is just a fraction of Australia's water market turnover, at US$295 million, with no central trading forum. Like Australian rivers, Californian rivers experience over-extraction and over-allocation. Among 27 major rivers in California, 16 had allocation levels greater than 100 per cent of natural supplies.

Climate change

Climate change is a multiplier of existing social, economic and environmental challenges, so any existing challenges in managing water in arid jurisdictions like Australia and California are likely to be magnified as regions grow hotter, drier and experience increasingly severe droughts. Australia has already experienced an increase in heat extremes and droughts. Similarly, in California temperatures and extreme high temperatures are virtually certain to continue to increase under all emissions scenarios.

The Australian legal framework based on water plans places us in a superior position to continue to reform and tackle over-extraction and sustainability issues. California may do well to borrow from this aspect of the Australian system. The catchment for California's water resources does not follow that state's borders. Therefore, there is a strong case for federal intervention under a water plan, like the Basin Plan, to manage the interstate and international catchments that incorporate California.

Water rights litigation

While California could learn from Australia, there also are lessons we could learn from the Californian experience.

Perhaps the most important is the Californian experience of water litigation. In recent years there has been a large increase in water-related litigation, with the Climate Case Database recording over 100 water-related cases in the past five years alone in the United States, with a significant number in Californian courts and all dealing with issues related to disputes between competing users of a scarce resource.

Australia naturally shares this in common with California, and disputes will be more likely as water resources become scarcer due to climate change. We can therefore expect more litigation in Australia between, for example, irrigators and other irrigators, irrigators and government environmental water holders, towns and cities, as well as between states, and between the states and the Commonwealth. Australia has seen few water rights cases compared to California, but we expect the trend towards increased litigation to continue as the consumptive pool of available water diminishes.

Lessons for both jurisdictions

Despite its shortcomings, the Australian system of water rights and regulation provides some important lessons for California with respect to its system of water rights. In particular, California might benefit from an instrument like the Murray–Darling Basin Plan to provide for cross-jurisdictional management and water allocations that are proportionate to availability. Australia, in turn, needs to be prepared for more water rights litigation, which we predict will increase in the context of climate change.

Information

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Dr Joseph Monaghan and Christopher Watt, Holding Redlich

UP CLOSE

In this edition of Up Close we talk with Des Horton, former Irrigation Australia Limited board director, current member of the Melbourne regional committee and a long-time supporter of the association. In recognition of his longstanding contribution to the organisation, Des was also awarded life membership of the IAL in 2012. This year he clocked up 27 years continuous membership of the regional committee.

Currently, he is taking some long service leave from his role with strategic business partnerships with Greater Western Water, but he says that doesn't apply to the regional committee, whose meetings and activities he is still involved in. We talk with Des about his perspectives on how IAL and the industry has changed over the last 45 years.

IA. How long have you worked with Greater Western Water (and predecessors) and what have your roles been?

Des. I started at the Melbourne and Metropolitan Board of Works 1975 and since then have had a largely accidental career through transitions of that organisation to Melbourne Water, which in 1995 was 'disaggregated' with the creation of City West Water and others in Melbourne. City West Water was then merged with Western Water to create Greater Western, in July 2021.

I have had a range of roles since I started at the Board of Works, including being involved in the development of what is now the Water Efficiency Labelling and Standards (WELS) Scheme for domestic appliances, and the Smart Approved WaterMark for outdoor products and services, the expert panel of which I have been a member of since 2007. I was also a member of the Victorian Water Industry Association Urban Water Efficiency Task Group from 2004 to 2012 and I had a few years as a judge of both the Green Plumbers and savewater! awards.

During the Millennium Drought, I was coordinator for Melbourne Stakeholder Liaison, and Exemptions and Compliance group. These roles allowed me to communicate information from the IAL to the Melbourne water businesses working groups and the Drought Response Committee.

IA. One of the biggest changes in urban water management was the corporatising of Melbourne's urban water authorities in the 1980s. What other significant changes have you seen to how water is managed in Melbourne and to how consumer attitudes have changed?

Des. A significant development was the construction of the desalination plant and introduction of desalinated water to the Melbourne supply.

It is also interesting to see the evolution of the Melbourne 'retail' water businesses, City West water, South East Water and Yarra Valley Water, which were created in 1995 as corporatised operations with the Victorian Government as shareholders. More recently, they have been returned to a status of authorities.

IA. You were a member of the IAL (and IAA) board as a director from 2002 to until 2010, which included a stint as treasurer. Thinking about when you were on the board, what do you think are the most significant changes that the association has made?

Des. While many changes for the better happened during that time, I think the two key things were the merger with ANCID and subsequent transition to Irrigation Australia (Limited) and the foundation work done to establish irrigation-based competencies in the National Curriculum Framework. This is still delivering benefits and possibilities and will do so further into the future.

IA. Getting your crystal ball out, do you think there will be major changes to the way irrigation is managed in the urban environment and how important do you think changes in planning perspectives will be on how irrigation is managed?

Des. A key outcome of work done at the time of the review of the Millenium Drought was the change in attitude of the water supply organisations about community open space, something that the IAL contributed to. I was able to take information and advice from the irrigation industry to the review and this was supplemented by submissions from other interested groups. As a result of raising awareness about the value of open space to the community, there were significant changes to the of water restriction conditions now in place.

Irrigation is now talked about seriously in helping to mitigate the heat island effect in major cities, and in future even being applied in specific areas to provide focussed, short-term cooling to assist people in the community use open spaces during hot spells.

We are already seeing that the designers of open spaces, buildings and infrastructure are incorporating green aspects for aesthetics, cooling, and supporting the wellbeing of users of these spaces. I hope this trend will become even more common and valued in the future.

IA. With a bit of spare time on your hands for the next few months while you are on long service leave, are there any projects you want to pick up or places you want to travel?

Des. While I will be on long service leave, with four grandchildren I won't actually be on holiday. While the two older ones (boys) will be at school in 2022, the two younger ones (girls) will be looking after me some days of the week.

I also plan to continue to support the Melbourne Region Committee throughout 2022, continue with my involvement in the Smart WaterMark Expert Panel, and I have been a Union Delegate at work for 20+ years and an employee support officer, so I will be continuing to offer support to those who seek it.

Maryellen and I will get away a few times here and there; we already have several short trips in Victoria booked for weddings, significant birthdays and the like, but we'll also have the chance to simply take off around the state for short trips until we have time to plan for bigger ones down the track.

And there are, of course, all those half-finished or not started jobs around the home that I am getting to (with some encouragement) now. Hopefully there'll be some time for golf (my game cannot get any worse) and some music events now that things are opening up again.

FIND AN IRRIGATION SPECIALIST

If you are looking for an irrigation specialist, then the Irrigation Australia website is your one-stop-shop. Just type in a postcode and irrigation professionals listed in the area will be shown, along with their contact details.

REGIONAL ROUNDUP

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

Queensland. The committee hosted a successful member event on 15 September at the Azalea Grove Nursery in Redland Bay. This is a multi-use family-owned nursery with three separate companies working on the same site. The nursery, which has been operating for 50 years, is known for the quality, diversity and innovative nature of its products.

The topics of discussion included:

- the Lowara Hydrovar pump set
- pump upgrades for recycling dams
- drainage and water harvesting upgrades when there is no town water available onsite
- Azalea Grove Nursery's new production facility
- Nelson Irrigation R2000 sprinklers
- heat pump technology for the propagation house
- trials between drip and mini sprinklers for in-ground stock

Western Australia. The committee is not resting on its laurels after organising a very successful waterwise irrigation expo in August. It has a busy end to the year on the books with a number of events and activities planned, including:

- the Regional Annual Meeting, which saw 22 nominations from WA members to volunteer their support of the various subcommittees that make up the WA region
- Waterwise activities, including participation in rolling out the smart controller rebate program
- a member walk and talk event at Fruitico Farms, a table grape grower located in Riverdale and Hamel - just south of Perth, Western Australia.

The August expo also kicked off the Waterwise Irrigation Training Program, a three-year joint initiative supported by the Department of Water and Environmental Regulation and Water Corporation. This program provides fully subsidised training in irrigation efficiency to parks and gardens teams of participating councils in the Waterwise Councils Program.

Students were required to put into practice designing, operating and maintaining an efficient irrigation system over a four-day training course. All students were assessed as competent and received statements of attainment for: AHCIRG338 – Troubleshoot irrigation systems; AHCIRG337 – Measure irrigation delivery system performance and AHCIRG346 – Operate pressurised irrigation systems.

The second training course will be held in March 2022 and the final course for the 2021–22 year will be held in May 2022. Councils will be approached in May 2022 to apply for the second year uptake of fully subsidised training.

Victoria. The Melbourne regional committee met in July and members were provided the opportunity to give input into a letter to the Department of Environment, Land, Water and Planning, Victorian Building Authority, Western Water, and Yarra Valley Water highlighting concerns about incorrect irrigation installations, particularly to do with recycled water and providing solutions. IAL is waiting for a response.

The committee has been engaged by Greater Western Water and Yarra Valley Water to present a three-hour best practice workshop on municipal irrigation covering sites such as sporting complexes, and public open space gardens. The program and marketing for the event has been finalised and is ready to go when a date is set when COVID-19 restrictions permit.

The committee reminds members in Melbourne to find out about the 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, involve a self-study process with online exams. Underpinning the programs are best practice standards for irrigation system specifications, installation and design.

To learn how your business can become a Waterwise Professional, contact Irrigation Australia on (08) 6263 7774 or visit the Waterwise website.

South Australia. The committee has recruited new members to volunteer their time to support the region. They met on 1 November to identify future activities and develop a strategic plan. The committee will review suggested events for 2022 such as: a tour of the desal plant, a visit to a super school, a tour of the North Adelaide Golf Course and a soil moisture monitoring field day featuring satellite/aerial drone photography. If you have any suggestions for the committee to consider, please call Tracy Martin on 08 6263 7774 or email tracy.martin@irrigation.org.au.

2021 WATERWISE IRRIGATION EXPO DRAWS A CROWD

Feedback from exhibitors and attendees at the expo, organised by the Western Australia Regional Committee in August at Crown Perth Convention Centre, has been overwhelmingly positive.

Thirty companies exhibited at the expo and more than 200 delegates attended. School grounds staff were targeted this year and the response from this sector was impressive with more than 50 schools registering to attend.

The feedback from this sector is that they really require training in water efficiency, and the regional committee is having discussions with government agencies about how this can be delivered.

BOARD DIRECTORS RE-ELECTED

Four directors were reappointed to the Irrigation Australia Limited Board at the 2021 Annual General Meeting. All four existing directors renominated and were subsequently re-elected for a further two-year term.

At the board meeting following the AGM, Andrew Ogden, one of the reappointed four members, was re-elected as Chair of Irrigation Australia, a position he has held since 2014. In thanking directors for their vote of confidence, Andrew said that he places a high priority on achieving increased recognition of the irrigation industry and our members as valuable contributors to the effective management and use of Australia's most precious resources – water. He believes continuing the growth in training and knowledge of industry members is key to supporting that effort.

Andrew specially thanked the other nominee Brett Peel, who although missed out this time has offered his services to Irrigation Australia and its Board in whatever capacity required.

The other directors reappointed were:

Simon Treptow. Simon was first appointed in 2017 and was re-elected in 2019 and in 2021. He was appointed Deputy Chair in 2021 and is the Chair of the Audit and Risk Management Committee. Simon is General Manager of Irrigear, consisting of over 80 independent businesses and this, he says, provides him with direct insight to current policy making in the water industry, providing industry guidance and feedback from all over Australia.

Peter Brueck. Peter was first appointed in 2015. He is Principal Consultant of Water Wise Consulting providing water infrastructure consultancy. He was Deputy Chair until 2021 and serves on the Governance Committee and the Certification Board. Peter specialises in the design of irrigation and water management systems for the landscape and sports turf industries in the public, private, domestic and golf sectors.

Momir Vranes. Momir was first appointed in 2015 and re-elected in 2017, 2019 and 2021. He is also Chair of the International Commission on Irrigation and Drainage Australian Committee (IACID), which plays an integral part in the development of the program and organisation of the ICID Congress to Australia in 2022 aligning with Irrigation Australia's national conference to be held in Adelaide in 2022.

Irrigation Australia chatted with Simon Treptow about what he sees as important issues for the irrigation industry and what he'll be focussing on in his position as director.

"My primary focus, given that I represent a group of water retail specialists around the country, is establishing industry credentials. Currently, we have limited licensing and qualification requirements in the irrigation industry."

Simon believes there is potential to develop a broader certification process and more formalised training, "I think there's opportunity for much more to happen in this area and for professional players in the market to differentiate themselves through their qualifications and benefit from having those qualifications recognised."

Simon says that IAL is moving in this direction, "We are progressing along this path. I think a model for the sort of thing that we could do basically revolves around the Certified Meter Installer work that IAL is doing on behalf of various state governments. IAL provides the training for certified meter installers, recognises and registers and renews their certification every two years provided they meet the criteria for professional development points in that period. This important certification, among eleven other certifications Irrigation Australia offers, is increasingly recognised by government and is a model we should roll out on a broader basis in the industry.

"We've already shown that we can do it with certified meter installers. I think the next 12 months will be a progression along the way towards establishing that sort of structure across the industry."

Directors of Irrigation Australia are elected to a two-year term commencing from the Annual General Meeting.

The other members of the Board are: Peter Durand (Netafim Australia), Ron Nadebaum (Rain Bird Australia), Greig Graham (Rivulis Australia), Colin Bendall (Sunwater), Carl Walters (GBCMA) and John Pivac (Vinidex).

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.

IAL BOARD DIRECTORS

NEW EDITOR FOR THE JOURNAL

A changing of the guard is underway at *Irrigation Australia Journal,* with current editor Anne Currey deciding that after 25 years it's time to hang up the red pen and investigate the world and what it has to offer beyond things watery. Anne will be introducing new editor Eve White to the journal over the next two editions. We get up close to Eve and find out a bit about her.

Eve, tell us about you and your background

Eve. I grew up in southern Tasmania, which is where I live currently with my husband and two young children. Before that I lived in Northern NSW for a couple of years and in Brisbane for eight. Outside of work, I love growing our own vegetables (particularly tomatoes in summer), bushwalking with my family, and ocean swimming.

And your professional background and how you became an editor?

Eve. I originally studied science, majoring in ecology. Then I did a PhD, and after that I continued to work in research for a few years in the areas of weed ecology and agricultural science. Unlike many scientists, I always enjoyed the communication part of science more than the science part of science. I completed a Graduate Certificate in Communication and started freelance editing and writing in 2010. My editing and communication work has been largely in the areas of science and technology. It's a perfect fit for me.

What are your impressions so far about the journal and the irrigation industry?

Eve. I've learnt a lot already about the scope of the irrigation industry: that it encompasses science, technology, an understanding of the land and the weather, hands-on practical skills, business skills, politics, marketing and more – and that irrigation is important in urban as well as rural settings.

Something I like about the journal (although I imagine this might also be challenging as an editor at times) is that it covers all aspects of irrigation – from policy through to pipe fittings and the latest research on smart technology.

What are you looking forward to in being editor?

Eve. I love learning about new things simply for the sake of learning, and I know that I will have that opportunity every single day in this job. I'm looking forward to speaking to people in the industry, hearing their stories and helping to tell those stories. I'm looking forward to communicating information that will be useful or interesting to others and will help support and connect irrigation professionals.

What is the last book you read and where will your next holiday be?

Eve. The last book I read was a Secret Seven book, to my kids. Before that I read One Village at a Time, a true story by an amazing Tasmanian woman, Catherine Wheatley, who raises money to build wells in Ethiopia. Our next family holiday will be to the South Island of New Zealand as soon as borders reopen. Until then, we'll be doing weekend bushwalks and beach adventures within Tasmania.

IRRIGATION AUSTRALIA INTERNATIONAL CONFERENCE & EXHIBITION

5TH OCT TO 7TH OCT 2022

A BIG EVENT COVERING THE LATEST IN IRRIGATION CHALLENGES, INNOVATIONS AND OPPORTUNITIES

After being postponed for two years, the biggest irrigation event in the southern hemisphere will be back next year. Don't miss **Irrigation Australia International Conference and Exhibition.** Everything about this year's Irrigation Australia International Conference and Exhibition will be BIG.

- ✔ Being held in Adelaide's Convention Centre, on the doorstep of irrigation regions featuring agricultural and horticultural irrigation using a range of water sources including recycled, stored and river supply
- ✔ 1500+ conference delegates and 2000+ exhibition visitors expected
- ✔ Being held in conjunction with the 73rd IEC Meeting and 24th ICID Congress (3 to 10 October 2022)
- ✔ Exhibitors from Australia and around the world
- ✔ Retailers, distributors, resellers, contractors, government, installers, specifiers, designers, irrigation managers and the latest technology and innovations in irrigation, all under one BIG roof.
- ✔ A 3-day conference program with the theme, Irrigation for the Future – Challenges Innovations and Opportunities
- ✔ Social program with plenty of time to meet up with colleagues and friends
- ✔ Technical tours
- ✔ Irrigation technology on show from around the world
- ✔ Full day workshop on enhancing the performance of canals, reservoirs and dams with geosynthetics
- ✔ Our supporting partner is Brown Brothers, and sponsors include Rain Bird, Hunter, Goldtec, HR Products, QIS and the Lucas Group

REGISTRATIONS NOW OPEN

Get in early and register for the conference through the conference website, www.icid2022.com.au.

A BIG PROGRAM OF ACTIVITIES

As well as a jam-packed conference program and exhibition, the event features workshops, study tours, and opportunities for socialising. This big program showcases the best and the latest that the irrigation industry has to offer.

Abstracts open

Invitations are open for speakers to submit abstracts for either the international congress or the Irrigation Australia conference. Go to the conference website, www.icid2022.com.au for information.

Jeff Camkin, Adjunct Professor, University of Western Australia, talks about the conference.

Workshops

Learn about the latest innovations in irrigation technology at the conference workshops.

We're excited about our full-day workshop in geosynthetics, 'Enhancing the performance of canals, reservoirs and dams with geosynthetics'.

Geosynthetics have been used in construction for decades. They offer cost-effective and durable solutions for many applications in geotechnical engineering. Sealing products are used in dams, reservoirs and canals to control seepage, avoid erosion, stabilise banks, or to ensure structural integrity. Additional benefits include reduced construction carbon footprint and lower long-term maintenance costs.

This workshop offered by the Technical Committee on Hydraulics (TC-H) of the International Geosynthetics Society (IGS) will focus on how geosynthetics reduce water losses in irrigation and agriculture-related applications, canals, water reservoirs, and dams.

Technical tours

Hop on a bus to see what's happening in irrigation near Adelaide in both urban and rural settings. There'll also be tours further afield, including Western Australia and New South Wales. Here's a taster:

Water, Wine and Wetlands – Langhorne Creek. Visit vineyards that use natural flooding on the floodplain, see migratory and local birds on a Ramsar wetland and see the heritage irrigation structure at Bleasdale Winery, where we'll enjoy lunch and a glass or two of the local wines.

Where the Murray meets the sea – Goolwa. At the river port of Goolwa you will see the system of barrages separating the lakes from the sea, ride on a paddle steamer and enjoy a tour across the barrier islands at the Murray mouth. Being in a Ramsar wetlands area there is abundant birdlife and an opportunity to see birds that have migrated from the northern hemisphere.

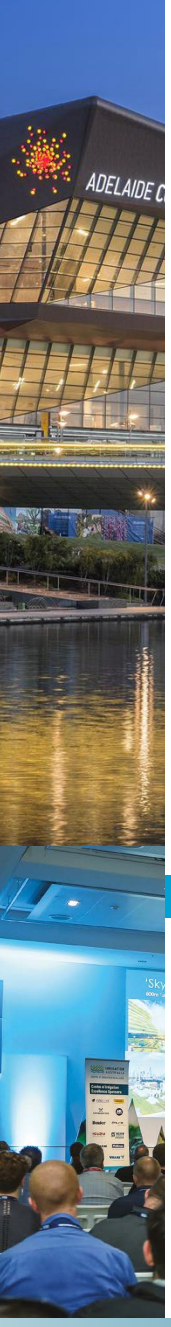
Regional New South Wales, incorporating Murrumbidgee and Colleambally Irrigation. Visit broadacre cropping areas where cotton, rice, maize and other crops are grown on a large scale. Water management is achieved using a wide range of metered irrigation technologies ranging from simple flooding to highly sophisticated remotely controlled digital moisture sensing and water release mechanisms.

Dairies, orchards, truffles and vineyards – Western Australia. Take a scenic tour of the South West region of Western Australia and learn about irrigation systems in dairy and citrus farms. You'll visit local growers, including a truffle farm, and enjoy a beautiful winery lunch and vineyard tour to learn about irrigation practices in the Margaret River wine region. This trip includes overnight stops in Pemberton and Bunbury. Return transport will be provided from Perth, and participants will be required to arrange their own flights to Perth from Adelaide.

Social opportunities

The organisers haven't forgotten how important it is for people to be able to catch up with old and new friends and colleagues. The social program includes a welcome reception and happy hour drinks on the exhibition floor.

And don't forget the ever-popular conference dinner, which is always a sellout.



24th ICID INTERNATIONAL CONGRESS 73rd IEC MEETING

3RD OCT - 10TH OCT 2022
ADELAIDE | SOUTH AUSTRALIA

IRRIGATION AUSTRALIA
INTERNATIONAL CONFERENCE & EXHIBITION | 5TH OCT TO 7TH OCT 2022

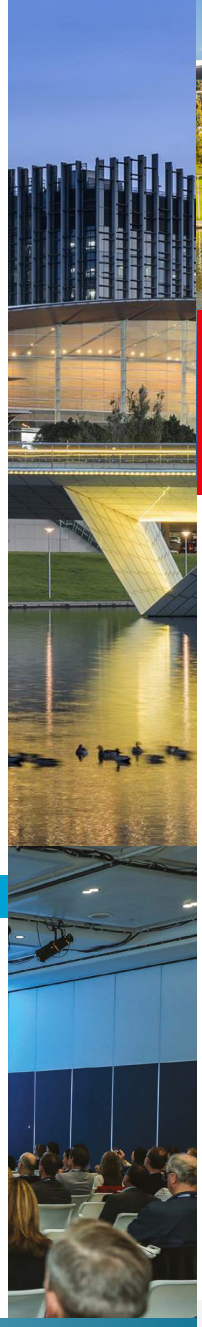
Event Supporter

Adelaide Convention Bureau

ADELAIDE CONVENTION CENTRE

ADELAIDE SOUTH AUSTRALIA

Government of South Australia



Irrigation Australia is proud to join with the International Commission on Irrigation & Drainage (ICID) for their 24th International Congress & 73rd IEC Meeting and we look forward to welcoming delegates from around the world to Australia in 2022 for this international conference on irrigation and drainage.

Why attend?

- Visit the exhibition and meet with the industry leading suppliers of irrigation & water management technologies.
- Hear from the leading researchers and experts in the field of irrigated agriculture and drainage.
- Build strong relationships with industry suppliers and professionals.

Why exhibit?

The combined 2022 Irrigation Australia and International Commission on Irrigation & Drainage (ICID) conference and exhibition will bring people from up to 78 countries representing 90% of all irrigated land, to Adelaide in 2022 – can you afford not to be there?

Meet People From

ICID Conference Theme

Innovative Research in Agriculture Water Management to Achieve Sustainable Development Goals

Irrigation Australia Conference Theme

Irrigation for the Future – Challenges, Innovations and Opportunities

- The Conference Organisers now invite speakers to submit an abstract for consideration at either the International Congress or the Irrigation Australia Conference. Visit the event website at **www.icid2022.com.au** for further information.

Expected Participation

1500+ Conference Delegates

2000+ Exhibition Visitors

FOR MORE INFORMATION
www.icid2022.com.au

General enquiries please contact:

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P +61 8 9389 1488
E events@encanta.com.au

Irrigation Australia:
P 1300 949 891
E info@irrigation.org.au

IRRIGATION AUSTRALIA

SNAPSHOT

- Geoff Harvey updates us on irrigation training plans and progress with training
- Ross Cope from Greensill Farming has just completed his Certificate III in Irrigation Technology
- Peter Smith provides the latest on meter policy and certification
- Irrigation Australia training courses

IRRIGATION AUSTRALIA TRAINING

ARE YOU ELIGIBLE FOR FUNDED OR SUBSIDISED TRAINING?

Irrigation Australia is approved to deliver subsidised training in South Australia, Tasmania, New South Wales and Western Australia. Eligibility requirements vary between states. You can find out more by contacting your local apprenticeship network provider or group training organisation, such as MEGT, or get in touch with us and we will direct you to the right person in your state.

As we approach the end of 2021, now is a good time to start planning your professional development for 2022. Read on to find out about our upcoming courses.

TRAINING COURSES COMING UP

Meter Validation and Installation Online Course (certification as a CMI (DQP)) 7 to 10 December 2021 and 15 to 18 February 2022. This course is for people who will be responsible for installing and validating rural water meters. This is a virtual course and you will need be able to complete a meter installation in your workplace.

Certificate III in Irrigation Technology (AHC32419), trade level, block 1 commences 14 December 2021. This qualification reflects the skills and knowledge required to become an irrigation installer, operator, retailer or technician for residential, commercial or agriculture industries. This in-depth irrigation training program 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.

Certificate III in Irrigation (AHC32419), upgrade course. Students who have obtained the Certificate III in Irrigation AHC32416 or equivalent may be eligible to upgrade to the new qualification.

Certificate IV in Irrigation Management (AHC4119) (new course), block 1 commences 27 January 2022. 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.

Urban Irrigation Design Course, 8 to 11 February 2022. Delivered virtually over four half days this course is an entry-level domestic irrigation design program suited to participants that work in irrigation and landscape sales. It also suits installers and irrigation system operators and managers interested in the basics of irrigation systems design.

Commercial Irrigation Design Course, 22 to 25 February 2022. Delivered virtually over four half days this course is suited to urban domestic irrigation system designers or technicians looking to take the next step in irrigation system design processes.

Irrigation Pumps and Systems, 15 to 17 March 2022. Participants will gain the knowledge and skills to operate and maintain irrigation pumping systems and install, test and maintain pumping systems to a national standard.

Irrigation Efficiency (WA), 29 March to 1 April 2022. This program will consist of three days face-to-face training. Candidates will gain the knowledge and ability to become an irrigation efficiency professional. Candidates will be required to put into practice designing, operating and maintaining an irrigation efficient system in their own workplace.

FUNDED TRAINEESHIPS IN WESTERN AUSTRALIA

If you're in Western Australia and are a school student, school leaver of 2021 or unemployed, you may be eligible for a funded traineeship.

The AHC32419 Certificate III in Irrigation Technology is a nationally recognised qualification; you will learn how to design, operate and maintain irrigation systems in a range of professional environments, such as local government, landscaping, irrigation retail outlets and irrigation contractors.

Applications for our current course have just closed, but we'll be running more in 2022. Email us at training@irrigation.org.au to register your interest.

Irrigation Australia is also keen to find irrigation-related businesses to support and employ these students, particularly school students, for at least one day per week.

Interested in any of these courses? Register here or email training@irrigation.org.au with any questions.

ROSS COPE ACHIEVES CERT III IN IRRIGATION TECHNOLOGY

Ross Cope recently completed the Certificate III in Irrigation Technology AHC32419 through Irrigation Australia.

Ross works as irrigation project coordinator for Greensill Farming, a Queensland enterprise that produces sweet potatoes, sugarcane and broadacre crops. We spoke with Ross about what he learnt from the course and how he found the combined online and in-person training.

IA. What is your role at Greensill farm?

Ross. As irrigation project coordinator, I am responsible for designing, arranging approvals, ordering all material and supervising construction of approved designs of new irrigation pump stations and sheds.

IA. Why did you decide to enrol for the course?

Ross. I was working in irrigation and I thought this would be a good opportunity to learn more about something that I practice every day, and to discover new and improved techniques.

IA. Have you done similar training before?

Ross. I previously completed a Diploma in Engineering and focused mainly on water and wastewater reticulation system design, which gave me a better understanding of pipe fittings and standards for both internal and external design and construction.

IA. It was a mixture of online and face-to-face coursework. How did you find this?

Ross. I found the mixture of online and face-to-face coursework enjoyable, and the trainers were friendly and approachable. I didn't have any challenges with using Zoom and am grateful that we used the technology available, so that the course could continue and I could reach my goal of completing the Certificate III in Irrigation Technology.

IA. What's the main thing that you've learnt in the course that you'll apply in your day-to-day work?

Ross. The main thing that I have valued and will have in the back of my mind when assessing an irrigation design will be understanding the soil types and the depth of water required to reach the plants' effective root zone to achieve the optimum moisture for growth and yield, while minimising water wastage and long-term costs.

IA. What advice would you give to someone who was thinking about doing this course?

Ross. If you have just joined the irrigation industry or have been in the industry for some time and are interested in understanding how the system you operate or own works, or just have interest and would like to build you knowledge base in irrigation, this is a good course to do. You'll gain practical knowledge and get a better understanding of how important irrigation is to farming, commercial and domestic industries.

TRAINING DIARY

DATE	COURSE	LOCATION
1 to 3 December	Irrigation Pumps & Systems (3 half days online)	Virtual classroom
7 to 10 December	Meter Validation & Installation, includes Certification as a CMI (DQP) (4 days online)	Virtual classroom
14 and 15 December	Certificate III in Irrigation Technology – Block 1 December 2021 intake (2 days online)	Virtual classroom
18 and 19 January	Certificate III in Irrigation Technology – Block 1 December 2021 intake (2 days online)	Virtual classroom
27 and 28 January	Certificate IV in Irrigation Management AHC41119 – Block 1 of 2 – August 2021 intake (2 days online)	Virtual classroom
31 January and 1 February	Certificate IV in Irrigation Management AHC41119 – Block 1 of 2 – August 2021 intake (2 days online)	Virtual classroom
8 to 11 February	Urban Irrigation Design (4 half days online)	Virtual classroom
15 to 18 February	Meter Validation & Installation, includes Certification as a CMI (DQP) (4 days online)	Virtual classroom
22 to 25 February	Commercial Irrigation Design (4 half days online)	Virtual classroom

PETER TALKS METERS

Interest in accurate metering and pattern approved water meters is increasing across Australia; New South Wales is steaming towards the next roll-out date of 1 December while Queensland Department of Regional Development, Manufacturing and Water has released version 3 of its interim standard.

Supply of meters and local intelligence devices (LIDs) has improved recently. Delays are more likely to be due to CMI/DQP availability, so keep encouraging your clients to get started as soon as possible.

Audits of a sample of meter validation certificates from different jurisdictions indicates there is room for improvement by CMIs/DQPs. Most anomalies were simple errors of recording or misunderstandings of what is required. CMIs have been very responsive to constructive feedback. Below is a summary of the main issues from the most recent audits. Careful completion of the validation certificates for each jurisdiction is essential.

NSW – 10 validation certificates. The main deficiencies were no meter reading at installation, no LID information, flow rate of the works not recorded and insufficient tamper-evident seals.

Queensland – 10 validation certificates. The main deficiencies were inadequate details of site works, inadequate or no details of the water source, flow rate of works not recorded or inaccurate, and no or insufficient tamper-evident seals.

South Australia – 12 validation certificates. The main deficiencies were insufficient tamper-evident seals, inadequate or no details of the water source, no meter reading at installation, inadequate upstream or downstream pipe lengths.

No additions to the list of pattern approved meters were made in the last few months but it is important that CMIs/DQPs check the PA certificate and ensure that the parameters and requirements are complied with. CMIs are reminded to always download and check the relevant pattern approval certificate before undertaking an installation or validation. These are available at the Irrigation Australia website.

Information

For any information about metering or if you have any metering issues or have questions, contact Peter Smith at email LINK metergovernance@irrigation.org.au, or phone 0455 973 780.

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Peter Smith, Metering Governance Officer, Irrigation Australia

METERING FORUM

Have you checked out the new Metering Forum on the Irrigation Australia website? The forum contains a lot of information on metering, including for floodplain harvesting. Access is open to all and subscription is free.

Subscribers can also ask a question and we will find you the answer. If you subscribe you will also be notified when a new post is made. This site is recommended for all CMIs and CSVs (DQPs).

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

CENTRE OF IRRIGATION EXCELLENCE SPONSORS

The goal of the Centre of Irrigation Excellence (COIE) is to increase the range and standard of irrigation skills in Australia. Regardless of whether you are a grower, student or irrigation professional, the COIE aims to provide you with information and tools to help expand your irrigation knowledge. As we move towards a new year, it is a good time to tell you a bit about the COIE sponsors whose support makes our work possible.

Advanced Industrial Products

Advanced Industrial Products is an Australian-owned wholesaler that supplies industrial hoses, valves and fittings to industries including mining, manufacturing, agriculture, civil construction, dewatering, food processing and marine. It is one of Australia's largest stockists of this type and has been in the industry for twenty years.

The company prides itself on fast, reliable service and an innovative, comprehensive range of products and brands, including Powaflex, Powafit, Hi-Miner, Airminer, Hi-Spray, Chemflex, Travelflex, Powaflo, Powavac, Raynbo, Hi-Flo and Tradeflex.

Brown Brothers Engineers

Brown Brothers Engineers Australia has distributed pumps in Australia since 1994. They supply a wide range of pumps for any application, from small domestic pressure systems, irrigation and agricultural booster sets, through to large commercial/industrial pumps and pump systems.

The company distributes some of the world's leading pump brands, like Lowara, Hydrovar, Goulds Water Technology and Flygt. It has three major facilities in Sydney, Melbourne and Brisbane, which all offer warehouse distribution, inhouse engineering and assembly, workshops for custom-design-manufacturing of pump sets and pumping systems.

Brown Brothers staff and engineers work closely with customers to select the best pump and/or pumping system for their requirements.

Hunter Industries

Hunter Industries is a family owned global company that provides water- and energy-efficient solutions for residential, commercial, municipal, and agricultural applications since 1981.

Traditionally, Hunter's core business interest has been producing products that help irrigation systems use as little water and energy as possible. The current Hunter irrigation product line includes pop-up gear-driven rotors, high-efficiency rotary nozzles, spray sprinklers, valves, controllers, central controllers, professional landscape drip, and weather sensors.

More recently the company has also diversified into the landscape lighting and custom moulding industries.

Iplex Pipelines

Iplex Pipelines is the largest Australian owned and operated pipe and fittings manufacturing business in Australia. It has manufacturing and distribution capabilities in all states as well as New Zealand.

The company, which has been around for over 80 years, provides pipeline products and solutions to water authorities, rural and urban agriculture, residential, urban subdivision, civil and mining infrastructure markets across Australia.

Iplex prides itself on its experienced team that actively works and collaborates with customers and the industry to provide safe, secure and innovative water solutions today and into the future.

Isuzu Engines

Isuzu produced Japan's first air-cooled diesel engine in 1936 and has been a manufacturer and innovator of diesel engines ever since. Isuzu now produces more than one million diesel engines annually, as well as being among the world's leading commercial vehicle manufacturers.

For the irrigation industry, the company produces fuel-efficient, low maintenance, reliable Japanese-built blocks, which are engineered in Australia. Isuzu Power Solutions supplies tailorable engines ranging from 10 to 540 hp to suit different applications.

Nelson Australia

Since 1994, Nelson Australia has been the Australian wholesaler of Nelson Irrigation products for agriculture. It is also one of the largest distributors in the world for Hunter Industries' residential and commercial turf irrigation systems.

The company, which has a network of irrigation dealers across Australia, takes pride in its reputation for providing efficient, sustainable and dependable irrigation equipment to the Asia Pacific market, and in its fast and accurate service.

Netafim

Netafim introduced the world's first drip irrigation solutions in 1965 in Israel and it has been providing smart drip and micro-irrigation solutions ever since. Netafim Australia and New Zealand was established in 1993.

Netafim delivers precision irrigation products, digital tools, and services, including agricultural project management. The company has a strong focus on sustainability and efficiency.

Philmac

Philmac, established in South Australia in 1929, designs and manufactures specialist fittings and valves, providing cost-effective solutions for the transfer, control and application of water.

The company, with its team of experienced engineers, has a strong focus on research and development, and it holds many patented world-leading products. Philmac developed the world's first all-plastic compression fitting for polyethylene (PE) pipe in 1968 and its products are now viewed as the international benchmark.

Philmac's products are made in Australia for Australian conditions, but it also exports products to more than 30 countries.

Toro Australia

Toro Australia is a wholly owned subsidiary of The Toro Company. The Toro Company was founded in 1914 to build tractor engines. It has become a leading worldwide provider of turf and landscape maintenance equipment and precision irrigation systems. With its head office based in Minneapolis, USA, Toro now has a global presence that extends to more than 140 countries.

Today Toro is a leading supplier of irrigation products to the landscape, agricultural, turf care and domestic garden markets. This is complemented by an expansive range of mowers and turf care equipment that caters for golf, turf, sports fields and grounds, professional landscape contractor, residential and hire and rental markets.

Valley Irrigation

Valley Manufacturing was established in 1946 in New England, and in the 1960s it became Valmont Industries.

Valmont Irrigation manufactures precision irrigation technology. The Valley brand of centre pivot, linear, and corner equipment provides solutions for conserving water and meeting the growing demand for food. The company also delivers remote control and monitoring products to help farm managers save time and optimise irrigation.

Valmont Irrigation has an extensive network of more than 400 dealers worldwide, including throughout Australia.

Vinidex

Vinidex manufactures and supplies quality PVC, polyethylene (PE), polypropylene (PP), ductile (DICL) and industrial pipe systems to provide premium solutions to individual project needs. Over its 60-year history, the company has grown to become a leader in Australian pipe systems and solutions.

Vinidex is an environmentally conscious company that is passionate about providing sustainable innovative solutions for building, infrastructure, irrigation and rural, mining and industrial, and gas and energy applications.

WATER'S CASE FOR NET ZERO

With COP26 just finishing, the issues of climate change and targets for reducing emissions have been in full view. Many in agriculture accept that adapting through changes in practice and policy are essential. Isaac Jeffrey, Chief Executive Officer with the National Irrigators' Council, recently put the case for Net Zero. He argued that Australia's climate is changing and farmers are at the frontlines, which is why we need net zero by 2050.

Australian agriculture and the irrigation industry are at the frontlines of climate change and are finding ways of adapting to the future. What they are looking for is sound policy to provide them with confidence to invest and make decisions for a Net Zero future.

Our climate is changing. The dry areas of our country are getting drier and we are already experiencing less rain and inflows into our river systems. We are seeing more extreme and frequent weather events brought on by our changing climate. These trends are set to continue, coupled with rising global temperatures on track to potentially exceed two degrees.

To put it into perspective, the last ice age was just five degrees lower than our historical averages and had catastrophic consequences. A two-to-three degree rise will have major impacts on irrigated agriculture, food chains, trade, the environment and local communities as water security deteriorates. In the most extreme case, it will risk global health, food and national security.

All water users will be impacted. It will mean less water for food and fibre production, for First Nations, for local communities and for the environment. There need to be measured and balanced responses to these challenges, and we must confront them together and share the opportunities, risks and burdens.

Australia's farmers continue to be at the forefront of leading adaptation and responses to drought and climate change, but they cannot be left to pay the entire cost alone, especially when much of the change is being brought about by other higher emitting industries.

Government policies to address climate change must recognise agriculture's potential as a mass carbon-sink. Irrigated agriculture can become a large part of the solution. The nation and the world can only reach net zero if the capacity of agriculture to sequester carbon in the soil is intelligently harnessed.

To be part of the solution, agriculture must be able to operate in a stable and practical policy environment. It needs the right policies in place, so it can continue to feed and clothe Australia, while earning export income and sequestering carbon.

Australia must also acknowledge other countries are changing and we risk being left behind. No longer are people willing to stand by and hope the science is wrong. Nations are taking action and launching programs to help their people make the transition and to encourage others into action.

The European Union has already signalled intentions to limit trade with nations not doing their bit. Australian farmers and our economy will suffer, and we may miss out on valuable export opportunities, should other nations adopt similar policies. We also risk an imbalanced playing field and uncompetitive global market if other countries are investing in new technologies to support their industries, while Australia is not.

I'm a realist. I understand the argument that our contribution to global emissions is small compared to other countries. However, if we can do our bit, we can more easily and credibly ask others to do theirs.

Governments and industry need to work together to find the solutions and ease the burdens. We need sensible education programs, funding for research and development, and investment which sustains and create jobs, and assists the transition.

All Australian businesses, including our farmers, need confidence to invest and make decisions, which can only be delivered by sound climate, energy and environmental policies. The time for partisanship and politicking is over, it's now time for Australia to act. It might not be easy, but it is the right thing to do, and it will be vital to ensure Australia can continue to feed and clothe our people and the world.

Source. NIC website

NEW IRRIGATION TOOL FOR DAIRY FARMERS

SNAPSHOT

- IrriPasture is a new, free app that uses data from the Bureau of Meteorology together with irrigation data to make recommendations for irrigation scheduling
- Initial research by the University of Southern Queensland and the Tasmanian Institute of Agriculture showed that for many growers agronomic productivity could be dramatically improved with better irrigation scheduling
- Trials of IrriPasture at 15 sites show that it can help growers to double productivity and save water and energy
- The tool can assist with irrigation scheduling for lucerne, maize, millet and sorghum, as well as pasture

A new, free irrigation tool uses local weather data to help dairy farmers optimise their irrigation scheduling, allowing them to increase crop yields and pasture yields and increase profits.

IrriPasture is a simple app that recommends how much and when to irrigate. Once farm details are set up in Irripasture, it uses weather data from Bureau of Meteorology together with irrigation data, entered by the farmer, to calculate the water budget and provide recommendations for irrigation.

Irripasture was developed by the Centre for Agricultural Engineering at the University of Southern Queensland, the Tasmanian Institute of Agriculture (TIA) and Dairy Australia, in a partnership between the dairy, cotton, horticulture, rice, and grain sectors.

The system was developed following a three-year initial phase during which data about current irrigation practices was collected from farms in Tasmania, Queensland, Western Australia, New South Wales, Victoria and South Australia. This enabled the researchers to pinpoint where improvements in irrigation practices could be made.

"Through that process we recognised farmers were only growing at about half of what they potentially could be achieving," said James Hills, TIA Senior Research Fellow and Centre Leader, Livestock Production.

"With that knowledge, and through that process of investigation, we found one of the biggest issues was the simple scheduling of irrigation. We found that by adjusting scheduling - not necessarily using more irrigation – just adjusting their scheduling, they were able to double their productivity."

In combination, data gleaned from rain gauges, soil moisture probes, weather stations, and weather forecasts help farmers put together a picture that helps them predict optimal water use.

"Soil probes give us a picture of what is happening underground; weather stations allow us to measure evapotranspiration rates, which tells us how much is going out of the system, rain gauges tell us how much is going into the system and simple online scheduling tools bring all the data together," James said.

"This information shows farmers where their water budget is, how much they are using and how much is going into the system, while forecasting tools such as the Bureau of Meteorology, are predicting weather that allows farmers to determine optimal times to irrigate."

Irripasture has been tested at 15 sites in different states. Farmer Brian Chappell, from one test site, found that it helped him make more confident decisions about when and how much to irrigate, "Keeping soil moisture within the Readily Available Water (RAW) zone is really important. When I saw that either the soil probes or IrriPasture graphs were trending downwards towards the refill line, I irrigated to either maintain or increase my soil moisture. The graphs showed me that I had some room to move before hitting the full-point."

Brian said that making sure he started irrigation at the right time after rainfall, and by not over applying, he saved on his water use and energy costs.

In addition to pasture, IrriPasture can help with irrigation scheduling for maize, lucerne, millet, sorghum.

Information. You can find out more about the Smarter Irrigation for Profit (SIP) project on the Dairy Australia website

Researcher James Hills found that by adjusting scheduling, without necessarily using more water, growers could double their productivity. Photo by Chris Crerar.

CHANGES AND OPPORTUNITIES FOR QUEENSLAND IRRIGATION BUSINESS

In December last year, Turf Irrigation Services, in Capalaba, Queensland, was taken over by new owners and re-branded as Hydro Vision. Hydro Vision specialises in the design, construction, and management of irrigation systems for large and small projects across a range of industries.

Irrigation Australia spoke with Tony Kanaris, General Manager of Hydro Vision, about the company's changes, challenges, and the road ahead.

IA. You've recently taken over an established business. What changes have you made, and what industry sectors will you be focusing on?

Tony. Turf Irrigation Services (TIS) was acquired in December 2020 by the new owners. We have since undertaken re-branding as Hydro Vision. The re-branding was undertaken to emphasise the new vision of the company which centres around what we call 'customer-centricity'. This term refers to the customer always being the centre of our focus and any directions or decisions we make as a company always have the customer's best interests in mind.

Tony Kanaris, General Manager of Hydro Vision

Hydro Vision has since moved to a larger modern location in Capalaba, which has increased warehouse capacity and office space to accommodate the growth we are already experiencing. We are also implementing a capital expenditure program with a focus on updating critical machinery and tools, including work vehicles, excavators, bobcats and the latest GPS data systems to ensure our staff have the resources necessary to delivery quality systems on time.

We are continuing to focus on our key sectors: commercial landscape; golf courses; sports turf; public open spaces; pumping and filtration; and storm water harvesting and storage tanks.

Hydro Vision is also expanding into the agricultural market with our new business development manager Peter Ferguson focused on serving the sector. Peter has considerable experience with the agricultural sector and can provide professional advice on centre pivots, lateral movers, pumping, filtration and automated controls.

We have undertaken a restructure of our operational team with new appointments, including an additional project manager, estimating and design manager and operations manager. This restructure will improve the efficiency of Hydro Vision's operations and ensure we meet our goal of customer-centricity.

IA. What do you see as your business challenges in the next 12 months?

Tony. The main challenge over the next 12 months is to ensure we maintain the high standards we have set for ourselves while continuing to grow. Implementation of new procedures always presents challenges and we have developed a review loop process to identify potential issues so we can continually adapt our planning to address these as they arise.

Continuing to establish Hydro Vision as the leader in our field is an ongoing challenge and we understand this can only be achieved with consistent quality outcomes. Hopefully, as we come out of the COVID era, and in the lead up to the Olympic Games in Brisbane, we'll have many opportunities; Hydro Vision is working hard to ensure we are able to deliver quality work for the many major projects to come over the next decade.

IA. Tell us a bit about your staff and their qualifications.

Tony. Currently we have over 35 staff, including casual labourers, installers, site supervisors, estimators, designers, project managers, office managers and administrators.

Hydro Vision's key sectors are commercial landscape, sports turf, public open spaces, pumping and filtration, stormwater harvesting and storage tanks, and golf courses. One of their recent projects was upgrading the irrigation system at Caloundra Gold Club, pictured here.

The new owners at Hydro Vision have a strong focus on training and have since implemented several initiatives, such as the introduction of apprenticeships. We currently have two apprentices, with plans for up to five. This initiative helps ensure we develop quality tradespeople within our organisation and grow our industry knowledge.

Many of our installers and supervisors have a Cert III in Irrigation as well as certifications in a variety of fields including workplace health and safety, plant operations, warehousing, logistics, plumbing, greenkeeping, engineering, civil supervision and horticulture. I also have a Master of Integrated Water Management through the University of Queensland.

Hydro Vision has also implemented an internal quality assurance process where we internally audit our projects during construction to provide feedback to our own staff and ensure a quality outcome for the customer. This has already helped us develop better quality and installation methods and will be an important ongoing internal process.

IA. Is COVID having an impact on projects?

Tony. COVID has obviously impacted every sector of our society and Hydro Vision is no exception. There has been the challenge of ensuring we provide a safe work environment while continuing to work effectively.

We have found that COVID has affected different sectors of our industry in different ways. In certain sectors, such as golf, we have seen significant increases in activity. The additional funding provided by various government bodies has also seen sporting clubs becoming more active. The general commercial market has been less productive but has recently begun to improve.

One of the biggest effects of COVID on our business is the combination of significant price increases in materials and the extended lead times required for major components. That has forced us to modify our processes to minimise the impact, and the challenges continue as the road map out of COVID evolves.

IA. What are your predictions for your business in 2022?

Tony. We are very positive with the prospects of 2022 and hope to reap the rewards of the hard work we've put into implementing all the changes here at Hydro Vision. The combination of coming out of the COVID era and the looming Olympics here in Brisbane provides for a promising year.

We are already receiving positive feedback from existing and new customers with our revised business focus and will continue to implement our policies of development and training of our staff and the customer-centric ethos that underpins everything we do.

STATE ROUNDUP

NEW INDEPENDENT REGULATOR RESPONSIBLE FOR MURRAY-DARLING BASIN WATER MANAGEMENT AND COMPLIANCE

In August this year, the Office of the Inspector-General of Water Compliance, a new independent regulator established by the Australian Government to build greater community confidence in Murray-Darling Basin water management and compliance, took up its duties.

The office is led by Inspector-General of Water Compliance, former NSW Deputy Premier, parliamentarian and long-serving police officer, the Hon. Troy Grant and assumes responsibility for compliance and enforcement of the Murray-Darling Basin Plan, Water Act and other resource plans. New legislation provides the office with the powers to identify water compliance issues and enforce water compliance rules.

The Inspector-General's immediate priorities are undertaking consultative assessments to ensure that all parties are working to plan, and that best practice water management is being delivered. Two assessments are already underway, with the third to commence shortly:

- Commonwealth Environmental Water Office (CEWO). Review the robustness and adequacy of the water management cycle including the delivery, measurement and review the use of water for the environment.
- State/Territory compliance and enforcement. Establish how decisions are made across the jurisdictions relating to water accounting, entitlements, measurement, allocation, governance, and barriers that inhibit the compliance and enforcement functions.
- River Murray and Lower Darling River System water data and accounting processes. Assess the adequacy and robustness of the processes used to measure water at both Basin and individual valley scale in the River Murray and lower Darling River systems.

While state governments will continue to implement the Basin Plan, if laws are not enforced, or stronger action is required, the office has the powers to step in and act to ensure integrity in the system and deliver positive outcomes for Basin communities.

Information. For more information go to Office of the Inspector-General of Water Compliance website

PC DEEMS WATER LIST ADEQUATE

In September 2021, the Productivity Commission released a draft review into foreign ownership of water concluding that reporting of foreign ownership of Australian water is sufficient and that no major changes are needed to the way Australia records foreign ownership of water.

Since 2017, any foreign entity that acquires a water asset has been required to notify the Australian Taxation Office.

Currently, 11 per cent of Australia's water is owned by overseas interests. The highest proportion of foreign-owned water is held in Queensland and Western Australia. Canada holds the most of any overseas owners followed by China, USA and the UK.

Water can be owned in this way due to reforms over the last few decades, which have supported the development of markets for water. Water entitlements are now tradable assets, meaning they can attract capital from both domestic and foreign sources and are susceptible to speculation.

The commission has made three recommendations:

- state and territory governments should link their water registers to the foreign register of water entitlements, and inform foreign entitlement holders to register with the ATO
- future ATO reports should identify farm landholders among water registrants
- the ATO should do more to explain the mandatory need for the foreign register and various terms linked to its use.

The commissioners pointed out that the public perception of foreign ownership of water does not match the views of mining and farming industries, which are responsible for most water ownership.

Non-compliance with the register was found to be "likely inadvertent", with little impact on the register's reporting. Adding more reporting data to the register could breach tax law confidentiality provisions "and may not be geographically consistent", as well as increase administrative costs associated with the register. These costs would not be justified by the benefits.

A final report is due in December.

Information. To download the draft review, go to the Productivity Commission website.

TASSIE IRRIGATION SCHEME GETS GREEN LIGHT

In October, the Northern Midlands Irrigation Scheme in Tasmania has had its business case, totalling almost $150 million, approved – including three pump stations and 157.3 km of pipeline.

When completed completion in October 2024, the scheme will deliver 25,500 ML of high surety water over a 180-day summer irrigation season.

It adds to the 16 new irrigation schemes that have been constructed in Tasmania as part of the Pipeline to Prosperity state-wide irrigation plan that is expected to provide almost 78,000 ML of water and trigger an additional $150 million in on-farm private investment. The plan is a key element in the state's Agri-Food Plan to grow the value of agriculture to $10 billion by 2050.

INDIGENOUS KNOWLEDGE IN URBAN WATER DESIGN

A new project at Monash University in partnership with Melbourne Water Corporation, Museums Victoria, Bayside City Council, City of Port Phillip and Boon Wurrung Foundation is looking at how Indigenous knowledge and practices can be combined with mainstream water management techniques in urban areas.

The project – Repairing Memory & Place: An Indigenous-led approach to urban water design – will be supported by a grant from the Australian Research Council's Linkage Project scheme and focus on the bayside coastal area in Melbourne's south-east, Boon Wurrung Country.

The project, led by Bundjalung, Muruwari and Kamilaroi man Brian Martin, a professor at Monash University, will take an interdisciplinary approach that combines old and new knowledge to help inform industry in terms of best practice.

This work aims to understand Indigenous land use before European settlement and to identify different ways of thinking about and communicating information that's not just a planned map of a city, but also oral information, or sound, or things that we can't see. The project will address the fundamental importance of water to Indigenous people, to Country, and ensure that this is understood and incorporated into broader practices and attitudes towards water.

Source. Water Source website.

IRRIGATORS TO RECEIVE $300 MILLION WORTH OF WATER

Irrigators in northern Victoria are being handed $300 million worth of water, which represents water savings made through irrigation upgrades. It will land in farmers' accounts this month and can be used or sold.

The water savings were a result of irrigation system upgrades as part of the Foodbowl Modernisation Project in 2007, which involved a $1 billion upgrade to old irrigation structure. The water saved from the project has been split three ways between the environment, irrigators and Melbourne Water authorities.

Irrigators will receive 61 GL of high-reliability water and 28 GL of low-reliability water across the Goulburn and Murray irrigation districts. For some it will be worth hundreds of thousands of dollars.

Source. ABC News website.

TOOWOOMBA ENGINEER WINS WATSAVE AWARD

SNAPSHOT

- Dr Alison McCarthy from the University of Southern Queensland is the winner of the Young Professionals category of the 2021 WatSave Awards
- She received the award for her software VARIwise that generates prescription maps for variable rate irrigation with centre pivot and lateral move machines
- Evaluations of VARIwise in cotton crops show that it can result in yield improvements of 4 to 11 per cent and water savings of 12 to 22 per cent
- *Irrigation Australia Journal* spoke to Alison about winning the award and her work in irrigation research

An engineer from Toowoomba has won the Young Professionals category of the international WatSave Awards for her work on irrigation optimisation.

The WatSave Awards, run by ICID, have been presented every year since 1997 to acknowledge exceptional water conservation/saving practices in agriculture. The awards celebrate actual, realised savings – not promising research results, plans or good ideas or intentions to save water.

Dr Alison McCarthy, who was nominated by the ICID Australian committee (IACID), is a Research Fellow (Mechatronic and Irrigation Engineering) at the Centre for Agricultural Engineering, University of Southern Queensland.

She received her award for the software VARIwise that generates prescription maps for variable rate irrigation with centre pivot and lateral move machines.

These machines traditionally apply water uniformly over the field. Often, however, different parts of the field would benefit from different amounts of water, owing to differences in soil properties, elevation, sowing density, planting dates and varieties.

Variable rate irrigation technology uses hardware fitted on each outlet that allows flow rates to vary between outlets. Maps of the field are used to determine individual flow rates. Usually, these maps are generated from soil moisture sensing or a single set of satellite images or from historical soil maps. They do not consider water availability, and do not target seasonal performance objectives (e.g. maximising yield or water productivity). This means they cannot adapt to different weather conditions or limited water situations. Some crops, such as cotton, require stress in early growth stages to produce maximum yield, and simply managing irrigation according to soil moisture deficit does not target optimal yield.

Alison's software, VARIwise, improves on existing technology by using a wider range of factors to optimise site-specific irrigation. In-field cameras are used to automatically detect crop growth rates. This information is combined with online and in-field soil, weather and irrigation management information to determine the best irrigation application

WatSave Award recipient Dr Alison McCarthy is currently working with a potential commercial partner for irrigation optimisation using her software VARIwise.

depth and best day to irrigate to optimise yield and water productivity.

Alison and her team have tested the software on cotton crops and dairy pasture. The benefits include more uniform crop growth and yield, as well as improved water use through reduced over and under watering. The result is yield improvements of up to 4 to 11 per cent and water savings of 12 to 22 per cent in cotton.

Alison took a few minutes out from her research to speak with Irrigation Australia Journal about her work and what it was like to receive the award.

IA. How does it feel to win the award?

Alison. It's an honour to receive this prestigious award! I am excited for the international recognition of my research in irrigation and potential to contribute to the development of future agricultural production systems.

IA. What do you enjoy most about your work?

Alison. Agriculture and irrigation are such multidisciplinary areas, and a range of engineering and science disciplines can help solve industry problems. Irrigation research is an exciting career and every day is different – my daily jobs range from sensor and software development, installing sensors and collecting data on farm trials, speaking with growers and consultants at field days and conferences, project planning and developing new research ideas.

IA. What are the next steps with VARIwise?

Alison. We are currently working with a potential commercial partner for irrigation optimisation using VARIwise. We have continued interest to hear from growers, potential users, and future commercialisation collaborators for these next steps.

IA. How do you think it will make a difference in agriculture?

Alison. Technologies are vital to ensure sustainable, profitable agriculture production. It is exciting to be part of providing these technologies and seeing the impact on farming business in the future.

The awards will be presented at the ICID 5th African Regional Conference in Morocco .

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

Eve White, Irrigation Australia

NATIONAL SHORTAGE OF GROUNDWATER EXPERTS

Australia's future growth is closely tied to good resource management, and water is top of the list. However, we are facing a growing shortage of groundwater scientists and engineers.

The number of students studying hydrogeology is less than half of what it was ten years ago, according to Professor Peter Cook of the National Centre for Groundwater Research and Training (NCGRT). The NCGRT has also seen a recent spike in organisations reporting difficulties in recruiting groundwater scientists and engineers. This skills shortage for hydrogeologists has been identified in the Australian Government's June 2021 Skills Priority List .

The job of a hydrogeologist is to determine how much groundwater is available to support irrigation and town water supplies; to predict and monitor impacts of groundwater pumping on rivers and vegetation; to identify potential sources of groundwater contamination before it is too late; and to locate groundwater supplies for mining developments in remote areas. Tools used by hydrogeologists to predict future changes in water supplies include computer modelling and field data collection.

This knowledge is vital, since Australia's reserves of groundwater contribute an estimated $34 billion per year to our economy by supporting industries including agriculture and mining (2013 Deloitte Access Economics report). As demand increases, the increase in competition for water could threaten economic development unless groundwater supplies are carefully managed.

There is already competition for water between upper and lower catchments, between surface water and groundwater users, competition between urban water needs and agriculture and mining, and competition between people and the environment. The demand is only likely to increase in the future as climate change will mean less surface water available over much of Australia.

People with backgrounds in chemistry, physics, maths, engineering, ecology, biology and geology, as well as traditional groundwater training, are needed to understand and manage our groundwater resources.

Information. For more information, visit the National Centre for Groundwater Research and Training website.

BIG CHANGES AT GRUNDFOS

This year has been a time of transition for Grundfos. The company has been making big structural changes with the aims of improving how its staff respond to customers' needs and delivering products and services tailored to the Australian market.

Four business units

Irrigation Australia Journal spoke to Kevin Stiles, Sales Manager for Grundfos Water, about the changes. "Grundfos has been around for 75 years globally and for 40 years here in Australia," Kevin explains, "Our structure has served us exceptionally well in scaling up our business to where we are today: a global leader with presence in over 50 markets. However, continued growth can be further supported by allowing our organisation to focus even more on the core customer segments".

In January this year, Grundfos was divided into four separate business units:

- Commercial Building Services
- Domestic Building Services
- Industry
- Water Utility, including groundwater and irrigation.

Kevin says that the new structure allows Grundfos to serve the unique needs of their customers: "For example, I manage the water utility unit. All my customers are very similar – they're groundwater and irrigation customers. I've got fewer customers so I can devote more time and resources to them.

"The other benefit is that we now have more money to spend from an R&D perspective, so we have a lot more capacity to invest in R&D based on feedback that comes specifically from Australians."

Relevant to Australia

Also relevant to the Australian market is that the local branch is now reporting to the US instead of Denmark (where the business originated).

"This makes sense because they speak our language from an application perspective," Kevin explains, "The way the Americans do their irrigation is similar to the way we do things here, whereas Denmark is completely different – their climate is different, they're working on a smaller scale and their solar market is different."

The company's more local focus means that they can now drive projects at a local level. "This would have been less straight forward previously," Kevin says. "It would have

required a team of engineers in Denmark sitting down and trying to understand our market. Now we've got the flexibility the scope and the ability to go directly to our market, which we know and understand, and look for innovative solutions at a local level, but funded globally, and using the resources of Grundfos globally as well."

One example of this is Grundfos' R&D in the solar market. "The solar side of our business is growing in importance. It ties into the whole groundwater focus, and the great thing is we, Australians, are absolutely the leaders right now," Kevin says.

What does this mean for customers?

Kevin says that their new approach benefits customers by ensuring they experience:

- a more responsive Grundfos that tailors and aligns decisions across the full value chain to meet their specific needs
- products and services tailored to customers' needs, because of Grundfos' new ability to accelerate innovation
- a simpler Grundfos, which is easier to work with and easier to work in, owing to the streamlined decision-making processes
- staff with deep customer insights who can provide novel solutions to challenges.

"We're already seeing the benefits of these changes," Kevin says. "We're taking customer feedback and are feeding it straight into new designs. Our new structure has cut the chain down massively. And that's the most exciting thing that's happening: we're far more agile than we were before."

NEW CEO FOR THE ALMOND BOARD OF AUSTRALIA

The Almond Board of Australia (ABA) has appointed Tim Jackson as CEO following the retirement of Ross Skinner after a highly regarded career with the almond industry's representative body. Tim has worked as sales and marketing manager for Almondco for ten years and has been involved with the ABA as Director and in other capacities.

Almonds are a major crop in the southern Murray–Darling area and are also produced in Western Australia. They are heavily reliant on water and are Australia's biggest export horticultural crop (worth $545 million in 2020–21). Australia's annual almond production is expected to increase by 50 per cent in the next five years.

CHANGES IN THE PIPELINE AT RODNEY INDUSTRIES

Queensland-based metal and plastic fittings and travelling irrigator supplier Rodney Industries has a new general manager, Clinton Hort. Clinton has recently moved across the country from Perth to take up this position, ending his eight-year role of Chair of IAL's Regional Committee for Western Australia.

Clinton says he's looking forward to his new role, "It's a really solid business with a very good reputation and a good market share. That's what attracted me to the business."

Clinton is taking over from industry stalwart Mike Dorge who was involved with industry training while employed at Vinidex and later Rodney industries.

On taking over from Mike, Clinton says, "It's a bit daunting – Mike's an industry legend; he's been around for a long time. But there's a really good team here and I'm looking forward to building on those solid foundations."

We wish Clinton all the best in his new role and Mike a happy retirement.

COBRAM IRRIGATION IS VALLEY IRRIGATION DEALER OF THE YEAR

Congratulations to Irrigation Australia member Cobram Irrigation, which was recently announced as the Valley Irrigation Australian Dealer of the Year for 2020-21. Cobram Irrigation, a member of the Irrigear group, has been a long-time Valley Master Dealer and the award recognises it having overseen the design, installation and maintenance of hundreds of pivot, linear and universal irrigators in Victoria and New South Wales.

HAS CASH HAD ITS DAY?

Do your customers prefer to pay for goods using cash or are they like most consumers who use a credit or debit card or some other digital payment system?

Many people are now asking the question of whether cash has had its day, to be replaced by credit. A recent article in the NAB *Business View* newsletter looked at whether Australia should be preparing for a cashless society, finding that while cash is no longer king, moving too quickly could have issues, for individuals, businesses and government.

Figures from the Reserve Bank of Australia are a guide to how people are paying for things, and it is obvious that cash is being supplanted by cards and online forms of payment. According to the RBA's 2020 Online Banknotes Survey, in 2007, cash accounted for 69 per cent of total retail payments; by 2019, this figure had fallen to 27 per cent. The pandemic saw it dip even lower still to 23 per cent, with one reason being community concern about transmission of COVID-19 through banknotes.

An interesting aside is that although use of cash for transactions declined during the pandemic, the demand for banknotes grew at the same time, which the RBA attributes to 'precautionary of store-of-wealth motives'. So, there must be a lot of cash under a lot of mattresses around Australia at present!

With the use of digital and other non-cash forms of payment being responsible for more than 75 per cent of retail payments in 2020, the NAB article predicts that most businesses will go cashless within five years, with small business leading the way. Speed of processing transactions and the more costly nature of counting cash, which can be as high as 2 per cent of the value of each transaction, are two major reasons.

The key part of the transition to a cashless society will be to do it carefully and not too quickly. Sweden learned this lesson last year when financial institutions and businesses embraced a near cashless model en masse.

As the article explains, "Communities with limited access to digital technologies or a reluctance to give up cash entirely, in particular the elderly, the disabled and those on low incomes, in rural areas or experiencing domestic violence, were hard hit by the switch". As a result, this year the Swedish Government introduced legislation requiring banks to provide a minimal level of cash services, including access to ATMs.

How about your business: Have you already embraced cashless transactions, or do you still have customers who believe cash is king?

While consumers are increasingly using digital and online systems to pay for goods, cash is not yet dead with it being used for almost a quarter of transactions.

Seven principles of effective tax governance

How well do you understand the principles of tax governance as they apply to your business? The ATO has identified seven principles, described below, for you to assess your business processes, arrangements and systems.

Accountable management and oversight

- Roles and responsibilities are clearly defined and understood in terms of accountability for tax administration and decision-making.
- You understand your tax and super obligations, including registrations, lodgement, reporting, payment and record keeping obligations.
- Where responsibility for tax governance is shared with your tax advisers, ultimately you as the business owner are confident that you understand the tax risks and are meeting your tax and super obligations.

Recognise tax risks

- Appropriate controls and processes are in place to support compliance with tax and super obligations and identify, assess and mitigate commercial and tax risks.
- Tax considerations are included in your decision-making processes, and you're alert to the consequences of decisions made. Material transactions are well documented and subject to appropriate review and sign-off for tax risk purposes. Where commercial and tax risks have been identified, there is a plan to manage the risks and limit the impact on your business.
- A thorough review process considers the ATO's published view and identifies potential differences of opinion that may give rise to a dispute. Risk of dispute with the ATO over a difference in law or factual interpretation is identified early and steps are taken to engage with us.

Seek advice

- Clearly defined arrangements are in place for escalating tax issues and seeking tax advice. Consulting published ATO guidance and advice helps you assess tax outcomes for your business in adopting a particular position. You get advice from tax professionals and advisers, and engage with us early for tailored advice where more certainty is needed.

Integrity in reporting

- Owners or managers can form the view that the financial records of the business, including tax reporting, reflect a true and fair view of that business. Tax positions align with the law. Tax outcomes either reflect economic performance or are understood and can be explained by other factors.
- Systems and controls are in place to ensure accurate reporting, and these controls are reviewed periodically to ensure they remain effective. Good record keeping practices are followed to maintain important documentation for the relevant periods so that it is easily accessible.

Professional and productive working relationship

- You have an open, transparent, respectful and professional working relationship with the ATO.
- Through our engagement with you or your advisers we aim to create a seamless working relationship to resolve any issues and avoid disputes.

Timely lodgements and payments

- Effective tax governance is demonstrated by meeting obligations including lodgement and payment obligations in full and on time. Timeframes are set for tax lodgements and payments.
- Tax liabilities are well managed and paid on time. Efforts are made to engage with us when you're unable to pay on time.

Ethical and responsible behaviour

- Acting ethically and responsibly – with honesty, integrity and in a way consistent with the reasonable expectations of the broader community and the taxpayers' charter.
- Ethical and responsible behaviour involves more than mere technical compliance with the law. Effective tax governance not only ensures accurate reporting, but helps avoid behaviours associated with tax manipulation, avoidance and schemes.

Source. ATO website, accessed 8 November 2021.

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TERMS & CONDITIONS