TRICKLE-DOWN effect

As water conservation becomes increasingly important in modern winemaking, *Simone Madden-Grey* investigates how wineries are cutting back in an attempt to farm in a more sustainable manner

AS DROUGHT, water scarcity and increasing global temperatures dominate headlines, water conservation has become an integral part of the wine industry's response to these climatic shifts, and the issue has leapt to the top of wineries' priority lists. Now more than ever, innovation around ways to save water during the wine-production process is imperative, and the challenge has thrown up a slew of intriguing strategies. From irrigation algorithms to planting new varietals and using worms to filter water, companies are finding ways of using water wisely.

Labelling wine bottles with water-conservation logos has yet to take hold, but producers are working hard to highlight their efforts through websites, media coverage and annual sustainability reports. Part of the discussion revolves around the fundamental importance of sharing information gleaned by individual wine estates with the wider wine community. The likes of Jackson Family Wines have been particularly vocal in championing this spirit of sharing, choosing to reveal its strategies through a series of detailed webinars this year, as part of its wider Rooted for Good initiative, a 10-year road map to tackling the climate crisis. Other organisations such as Tasting Climate Change,

spearheaded by Canadian Michelle Bouffard, and Fladgate's The Porto Protocol Foundation have all staged virtual talks, inviting leading experts to share their water-management strategies.

One such expert is Dr. Roger Boulton, professor of enology and chemical engineering at UC Davis, California, who has stressed the importance of using water that is "fit for purpose". The focus must be, he says, on a dual water system, which "separates and uses water intelligently". The way in which our urban infrastructure is designed means we tend to use the same high-quality water for drinking as we do to flush our toilets, which undermines this approach. To successfully reduce water usage, we must actively change the way we use it – in the world of wine and outside of it.

Using the same water multiple times is standard procedure at Bragato Research Institute where a Clean in Place system operates

COLLECTING RAINWATER

Boulton is well placed to advise on water conservation after decades of working with the wine industry, including being heavily involved in the design and establishment of the Jess S. Jackson Sustainable Winery Building at UC Davis. Fundamental to the building's design is the capturing of pure rainwater, which is collected during winter and stored in large tanks, before being filtered daily for winery use.

At New Zealand's Bragato Research Institute (BRI) winery, research manager Dr Tanya Rutan says Boulton's insights were helpful in designing the Marlborough facility. Water reduction is achieved in a number of ways, including the onsite capture and storage of rainwater for analysis and UV filtration, before being used throughout the building, including for drinking. At Wakefield Wines in Australia's Clare Valley, an impressive series of specialised rainwater tanks have also eliminated the need to bring in clean water for winery use.

On-site reservoirs are another effective way to collect and store rainwater, and are being used by the likes of Montes wine estate in Chile, where lined canals maximise rainwater capture by channelling it towards the winery's reservoir. At this wine estate in the Colchagua Valley, the vines are mostly dry farmed (without irrigation), except for in extreme drought when the stored water is used for irrigation. Similarly, ponds are used at Château Tanunda in the Barossa Valley, Australia, where cascading reed beds capture and filter estate and winery wastewater before the water is used to irrigate the vineyards and estate grounds.

Looking beyond the vineyard to local ecosystems is part of the work at Bodegas Cerrón, where the arid conditions of Jumilla, Spain regularly place wildlife under stress. A rain pond has been established here for frogs and snakes in the area and open vessels dotted around the estate provide rainwater for bees, insects and other wildlife.

EFFICIENT BARREL CLEANING

Tank and barrel washing is another area where water usage is being reduced or eliminated in wineries. In Argentina, Zuccardi, which has six bodegas under its wing, uses high-pressure water for cleaning its barrels. In Jumilla, Bodegas Luzón uses steam to clean its barrels and winery equipment. Flow-reduction attachments are fitted to all taps, and adjustable hose nozzles are also used at Luzón to keep water to a minimum.

Ultraviolet-light-sanitation technology is used to eliminate water during the final stage of cleaning tanks at Jackson Family Wines' La Crema and Freemark Abbey estates, which saves more than 1,000 litres of fresh water per tank. The same technology is also used for barrel cleaning at Kendall Jackson Wines in Sonoma.

REUSING WATER

Using the same water multiple times is standard procedure at Bragato Research Institute (BRI), where a Clean in Place (CiP) system operates. The system has a separate tank for each cleaning product and the water is returned to the corresponding tank for reuse. Regular monitoring ensures maximum reuse of water before colour and pH indicate that replacement is required.

Having started out with just a sketch and an innovative engineer, the BRI CiP design has been tweaked over the past

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Feature findings

- Producers are working hard to highlight their efforts in water conservation through websites, media coverage and annual sustainability reports.
- Wineries are using rainwater capture and filtration, and on-site reservoirs as a way of collecting water for use in grape growing.
- The three Rs – reducing, reusing and recycling water – are vital practices in many wineries.
- Some vineyards have been planting cover crops between the vines, because of their water-retaining capabilities, and others irrigate at night to reduce evaporation.
- Since introducing dry farming to all Montes's estates in Chile, there has been a 65% reduction in annual water usage.

Familia Torres has found significant benefits from wastewater-treatment stations

Dry run: Mac Forbes

two years of operation. Essentially, Rutan says, it works like a large dishwasher. Rutan is designing a bespoke tray to facilitate washing the winery's tank fittings and kegs using the same CiP process. Significant water conservation has been documented through the use of this system at BRI, as has been the experience at Zuccardi, where an automatic CiP system is used for cleaning cross-flow filters.

ADDING ON-SITE TREATMENT PLANTS

These can help capture, filter, sterilise and repurpose water. Familia Torres, for example, has implemented wastewater-treatment stations in its global portfolio.

According to the company the benefits have been significant, not only through using water fit for purpose but by increasing water value through multiple uses.

In Mendoza, Argentina, the water-treatment plant at Domaine Bousquet started out with a pilot model before

On-site water-treatment plants can help capture, filter, sterilise and repurpose water. Familia Torres has implemented wastewater-treatment stations in its portfolio

Brand Updates

Angove Family Winemakers

"A highlight of this year was winning Organic Exporter of the Year at the 2021 Australian Organic Annual Industry Awards. It's a reflection of the green footprint we are creating across the globe," says Mark Ramm, regional export manager. "The conservation of water across the whole production process is one of the critical points we're looking at. The conversion of all our vineyards to drip irrigation has resulted in 25% less water consumption per hectare. We also capture and store rainwater for future use as process water within the winery, reducing our reliance on ever-dwindling river flows. In the winery we have installed a 200kW solar system, which will cover 50% of peak-time power use. The recently purchased Angels Rise vineyard in McLaren Vale has started the three-year conversion over to fully certified organic, after which Angove will farm over 285 hectares of certified organic vineyards."

Cono Sur

"An important achievement in 2021 is having achieved B-Corp certification, which assesses the organisation for its governance, economic, environmental and social aspects," says Antonia Ferres, senior brand manager, Europe. "Another exciting innovation has been installing five photovoltaic plants in our vineyards to support the irrigation systems. We have also improved the efficiency of the irrigation systems of our Santa Elisa State by 35% and of our Campo Lindo State by 26% through installing frequency inverters. Furthermore, we have replaced 100% of our luminaires in the wine cellar for LED lights and minimised the use of electricity in the refrigeration process. In 2022 we are adding a 600 kW photovoltaic plant on the roof of the wine cellar, which will cover 20% of the electricity required by oenology. "

Fetzer Vineyards

"A huge accomplishment in 2021 was achieving Regenerative Organic Certification for our winery and 100% of our estate vineyards in Mendocino County, California," says Rachel Newman, vice-president, marketing. "In doing so we became the world's largest ROC-certified winegrower, obtaining this rigorous credential for regenerative farming and social responsibility. Also in 2021, two of our brands, Bonterra Organic Vineyards and Fetzer, became Climate Neutral Certified. We continue to look at enhancing our water stewardship through smart water meters, natural wastewater treatment using worms and microbes to return wastewater to beneficial use, and precision irrigation, which continue to deliver strong results."

Brand Updates

Accolade Wines
"We're immensely proud that our Europe portfolio, which includes Hardys, Mudhouse, Jam Shed, Banrock Station, Echo Falls and Kumala, has been certified carbon neutral," says Caroline Thompson-Hill, managing director. "We continue to prioritise shipping wine in bulk and we now ship wine in 26,000-litre bags in the same sized container as previous 24,000l bags, reducing CO_2e emissions. In 2021, Accolade Wines became the first wine supplier to join a reusable-packaging partnership from Tesco and Loop, with shoppers able to purchase, return bottles and repeat. The bottles are suitable for at least 10 reuses. We also introduced flat wine bottles for some brands – these are 87% lighter and made from recycled PET."

Amorim
"In 2021, we were proud to launch bothNaturity and Xpür, the world's greenest and most effective anti-TCA technologies," says Carlos de Jesus, head of marketing and communications. "While Naturity delivers non-detectable TCA performance for our natural cork stoppers without the need for artificial components – we just use water, pressure, temperature and time – the Xpür fluid technology for micro agglomerated corks uses only 25% of the energy traditionally needed to operate similar systems. This new tech gives a 90% reduction in CO2 needed to operate the system. For the past couple of years, Amorim has been actively promoting the upcycling of cork, which is inherently sustainable. More than 700 tons of recycled cork has been incorporated in the production process of cork products and applications that range from construction and flooring to aerospace and fashion. Cork oaks have been thriving in this planet for dozens of millions of years and the trees are never felled, only the cork bark is peeled off without damaging the oaks. In 2022, we will continue to dialogue with our clients to make sure cork's unique sustainability credentials are properly shared with the wine trade."

scaling up the design. Agronomist and sustainability leader Franco Bastias explains that the design uses worms and compost to filter the water, which is then tested before being used for irrigation.

"We have two roles; one is to preserve water and the other is to use water fit for purpose," Bastias says.

In Australia's Clare Valley, Wakefield Wines treats its winery water thanks to specially designed holding ponds. Each pond is constructed to allow for continuous oxygenated pumping over, inoculating the water with natural bacteria chosen specifically for their filtration properties.

While most recycled water is used outdoors, some wineries have adopted technology to filter and sterilise water to the quality needed for use inside the winery. This occurs at a number of Familia Torres estates where treated water is used for bottle washing, refrigeration and cleaning.

Planting cover crops can improve the water-holding capacity of soil through the development of micro-organisms hosted within

PLANTING COVER CROPS

This can improve the water-holding capacity of soil through the development of micro-organisms hosted within. In the extremely arid climate of

Dry slopes: Viña Casa Marín:

Cafayate, Argentina, where El Porvenir winery is based, its viticulturist, Daniel Guillen, says the improved soil structure together with the sun protection the cover crops provide help to retain soil moisture and lower soil temperature.

In the hot, dry Barossa Valley, Michelle Geber, managing director at Château Tanunda, says the strategic use of cover crops is key to managing water competition: "The inter-row crop naturally matures and dries in the warmer months, thereby not competing with other rows for moisture." Geber says the cover crop is left in the vineyard and that these plants break down both above and below the surface, which not only cuts moisture loss during summer but increases the soil's organic matter.

IRRIGATING AT NIGHT

Using water more effectively has been achieved by rescheduling irrigation from day to night at Entrecanales Domecq, Spain. This method has succeeded in reducing plant and soil evapotranspiration, and the sub-surface irrigation used when replanting new

Arid landscape: Bodegas Cerrón, in Jumilla

Many vineyards have been replanted, and targeted irrigation has been a priority

vineyards has further decreased water usage. Almundena Alberca MW, technical director for the winery, says that according to the latest calculations, when irrigation lines are buried below the soil, a 30% reduction in water consumption is achieved. Additionally, drones are used to document soil and vine hydric stress for targeted irrigation.

USING REGULATED DEFICIT IRRIGATION

RDI is another way to conserve water. This is a strategic reduction in water during certain growth phases of the vine without compromising fruit quality. RDI is used at several vineyards owned by Jackson Family Wines, and director of farming Shaun Kajiwara says they are also working with longer, less regular irrigation sets to drive water deeper into the soil, encourage root growth downwards and minimise water loss.

USING ALGORITHMS

The Vitis Agrolab project in Spain is a research collaboration between Familia Torres and IRTA (Institute for Research and Technology in Food and Agriculture, Catalonia). One of its trials involves generating predictive models to provide irrigation guidance. Using an algorithm

RDI is used at several vineyards owned by Jackson Family Wines, and director of farming Shaun Kajiwara says they are also working with longer, less regular irrigation sets to drive water deeper into the soil

Brand Updates

Santa Rita Estates

"In spite of all the Covid related restrictions, we have been able to continue with our work with regards to the social aspect of sustainability," says Elena Carretero, corporate affairs and sustainability director. "We are very proud to have been able to maintain our initiatives within the community throughout 2021, such as with the Don Orione institution for 47 girls and women, and through the Territorial Valorisation Programme (160 students), although we were required to change to a hybrid mode combining digital and face-to-face activities. As part of the improvement process of our Alto Jahuel facilities, we have also implemented a new bottling line with top-of-the-line energy-efficiency technology, in terms of lighting, cooling and heating, as well as changing over 36 fork lifts from gas fuel to electricity. We are working to transition our 53-hectare Los Cerezos Estate over to organic viticulture. In 2022, we will be implementing photovoltaic panels in our vineyards for energy use in the irrigation process, and expanding our waste-recycling programme."

Château Galoupet

"Consisting of 77 hectares of protected woodland and 69ha hectares of vineyards, Château Galoupet plans to pioneer new sustainable viticulture practices and packaging solutions," says managing director Jessica Julmy. "Since August 2020, our vineyard has been in organic conversion and will be fully certified by 2023. Chemical products are forbidden, use of additives is very low in the cellar, and reverse osmosis and de-alcoholization are strictly prohibited. We plan to use 3.5 hectares of our vineyard for testing and learning about biodynamic viticulture. Over the past two years we have explored packaging solutions for our wines, and in May will launch two new formats that we feel are the most sustainable, encouraging consumers to make eco-conscious decisions when it comes to choosing their rosé."

Clean sweep: barrel washing at Jackson

based on data from climate-prediction models, historic climate records, soil analysis and vine hydric stress measurements, an irrigation-volume guide is generated.

The current trial was built around Garnacha, and after two years in development, it was deployed to the field in 2021. The algorithm also takes into account live weather data and which part of the growing season the decision is being made for. Mireia Torres Maczassek, director of innovation and research at Familia Torres, tells me the results were good enough to start work on extending the model to other grape varieties. Additionally, she says work will begin with a third party to develop an app to bring the technology to market.

CONVERTING TO DRY FARMING

At Montes, Danilo Buvinic says that since introducing dry farming to all its estates in Chile, there has been a 65% reduction in annual water usage. In coastal Lo Abarca, Chile, Viña Casa Marín is also working with dry farming. Despite having comparatively less water stress thanks to the coastal location, Maria Luz Marín says water availability remains a serious concern due to the increased frequency of droughts. A small section of the estate is successfully dry farmed, and the plan is to convert as many sections as possible.

Tank squadron: Wakefield in Clare Valley

Mac Forbes, in the Yarra Valley, Australia began switching to dry farming in 2015 as part of his water-management strategy. Although apprehensive about the vineyard's survival, Forbes found inspiration in the vine's ability to adapt and to regulate growth differently. His approach to water conservation is partly informed by conversations with local Wurundjeri elders, the indigenous people of the area where he farms.

This impressed upon him the need to rethink his relationship with the land and the community who come from the land. The focus, Forbes says, is on understanding the responsibility that comes with being on the land, what is valuable and what needs to be preserved.

He says: "In terms of water usage, we are so focused on what is within the fence line that looking at the broader impact of water usage is often overlooked."

Varietals that thrive in hot, dry conditions, such as Fiano, Greco, Mencia and Nero d'Avola, are being used to show another side to Australian wine

PLANTING NEW VARIETALS

In countries where drought and water scarcity have been most intensely felt, some producers are revising which grape varieties are being planted. For wine drinkers, the explosion of alternative varietals being brought to market is a bonus. Australia's Riverland region, once known for its volume production, is now enjoying a renaissance due to clever planting decisions.

Varietals that thrive in hot, dry conditions, such as Fiano, Greco, Mencia and Nero d'Avola, are being used to show another side to Australian wine. It works both ways, however, and at Bodegas Cerrón in Albacete, Spain, where the family vineyards were established with ungrafted vines of Monastrell and Airén, grapes that have long adapted and grown in the scorching temperatures of the Jumilla region, it's a case of "if it 'ain't broke, don't fix it". Understanding that varietals are indispensable to successful water management, the current generation have no plans to change the grapes that flourish here. db