Grower Tour of Agriculture Victoria's Tatura SmartFarm

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In late September, as part of their AgriFutures Techology grant distribution, the Victorian Strawberry Growers Association arranged a tour for berry growers to Agriculture Victoria's SmartFarm in Tatura, Victoria. The research that is conducted at the Tatura SmartFarm is funded by a combination of external grants from Hort Innovation and other government initiatives and Agriculture Victoria.

The SmartFarm in Tatura was founded in the 1930s with the purpose of being a test site and agricultural research location for orchard crops in the Tatura region. It consists of 100 hectares dedicated to the study of optimum conditions and new technologies in orchard horticulture, focusing on developments for apples, pears, and almonds. It is one of Australia's leading horticultural research facilities. Berry growers met there to see the latest in technological innovations and discuss how those innovations could be applied to our particular industry.

Dr. Ian Goodwin and Maddy Peavey led growers on a tour of the facilities. During the trip, growers encountered new innovations in protected cropping, received an overview of the various horticultural practices being tested on-farm, and watched a demonstration and presentation of the new technologies that Tatura is experimenting with.

Tatura is first and foremost an orchard research facility, and most of their experiments relate to the growing and care of those tree crops. Growers were given an overview of Tatura's world-first Sundial Orchard, where researchers are studying the best row orientation to grow nectarines and apples. The different orientations provide different light environments, and researchers are intently studying the effects of those orientations on yield, fruit quality, and sunburn. Layered into this experiment is another on pruning techniques and trellis training, so that researchers are getting valuable information on multiple fronts to provide the best growing technology possible.

Conversations with berry growers prompted reflection on their own field orientations and led to a discussion about whether conducting a similar experiment would be valuable for berries, particularly blueberries. A similar experiment with Rubus trellis configurations was also mentioned as being of interest.

Many berry growers expressed an interest in having a dedicated program developed for berries that was devoted to examining growing techniques.

Growers were given an overview of the irrigation technology they use at Tatura. Researchers currently use a Goldtech TALGIL irrigation controller to monitor and water their crops. Sensors from all over the farm transmit information about soil moisture levels, tree water stress and weather conditions via radio waves to the central irrigation control hub, where the controller receives and records the data, which is presented in a simple graph on a mobile phone or desktop computer. The controller can react to certain thresholds by automatically engaging irrigation; however, staff at the site prefer to use the data as feedback to the irrigation schedule.

Figure 1. Dr. Ian Goodwin shows growers an installed sensor. Photo credit: Sandy Shaw

Figure 2. The agrivoltaics experiment at Tatura. Photo credit: Sandy Shaw

Figure 3. Growers tour the Sundial Orchard and view the irrigation setup. Photo credit: Sandy Shaw

Figure 4. The autonomous Burro collaborative robot. Photo credit: Sandy Shaw

Dr. Goodwin also explained the installation of an AQUAFLEX soil moisture sensor – a simple but effective moisture monitoring setup. Instead of a probe, the AQUAFLEX consists of a three-metre-long strip which is buried within the ground at a predetermined depth (e.g., 30 cm depth in the middle of the rootzone) and assesses moisture over a length of three metres, resulting in a more reliable "average" soil moisture measurement.

Tatura's Agrivoltaic setup is potentially applicable to berry growers. Agrivoltaics is the term used for combining solar setups with agricultural production. The goal is to produce a synergistic system – the solar power helps alleviate the electricity costs on the farm and provides cover from heat and hail for the crops. Meanwhile, the crop cover creates a cooling effect underneath the solar panels which helps the panels absorb energy more effectively. Agrivoltaic systems are being trialled around the world, including in all types of berry production.

The Tatura experiment examined the effect of an agrivoltaic setup on blush pears, paying attention to all aspects of production. They use standard rigid solar panels that feed power to two storage batteries to drive the irrigation pump for the orchard block. Excess power is fed into the electricity grid. The agrivoltaic setup at Tatura produces more than enough energy to run their irrigation pump, creating a neat farming feedback loop.

Researchers say initial findings are that the panels create a more even tree temperature distribution underneath, providing a moderate cooling effect of a few degrees in summer and inversely creating a warming effect of a few degrees in spring and autumn (as the plants don't lose radiant heat as quickly).

They found that the panels reduce tree transpiration (water loss through evaporation) and lower fruit temperature, while also increasing chill accumulation in flower buds. Their initial results in pear found that the panels provided some protection from hail and there was no sunburned fruit under the panels; however, moderate reductions in pear fruit size and blush colour were observed. Researchers suggest there is too much shade for the pear trees — the panels intercept approximately 50 % of the sunlight. More recent solar panel technology may be better for pears.

For example, photo-selective panels that allow the wavelengths of light most useful to the pear trees to pass through the solar setup and go on to allow the plant to photosynthesize, while the rest is harvested by the solar panels and used to fuel farm activities.

Alternatively, integrating solar cells into rain or netting covers would be ideal. As berry crops also have sensitivity to shade requirements under certain conditions, they may also benefit from research involving photo-selective panels. Agrivoltaic setup requirements vary widely depending on the crop, and more research is needed to determine exactly how to make it work for berries.

Agriculture Victoria Research recently joined forces with Melbourne and La Trobe Universities and will run a workshop on 28 – 29 November 2024 to examine what a research project might look like for the berry industries.

After lunch, growers were treated to a demonstration of the various Agtech innovations that were being tested and utilised on the SmartFarm. They saw a demonstration of the Burro collaborative robot – an all-terrain autonomous self-driving cart equipped with GPS and AI learning technology that allows it to move independently around the farm. It can carry up to 225 kg (the larger Burro Grande version has a load capacity of 450 kg). The SmartFarm uses it to transport fruit from its orchard to the grading station, which it can do without needing any oversight. The Burro can also be equipped with a tow bar allowing it to tow additional weight, or even an autonomous sprayer.

Also viewed was a Green Atlas Cartographer, which uses LiDAR and cameras to enable AI to forecast and assess potential yield, fruit size and colour, and tree size. Growers also got an in-depth look at the equipment researchers use to help them take their measurements and viewed their dynamic controlled atmosphere storage experimental setup.

Overall, it was a stimulating day which brought together researchers and growers to engage in discussions about what the future holds.

Thank you to everyone at Tatura and all the growers who participated.