Vineyard
AgTech

Digital viticulture in the Canberra District

Digital maps as a foundation for AgTech adoption – part 1

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The Viticulture Society of the Canberra District (VSCD) has completed an AgriFutures Australia Producer Technology Uptake Project (PTUP) to trial 'Digital Viticulture in the Canberra District'. This is a summary of key findings.

The VSCD AgriFutures project was a journey of discovery through adoption of drone mapping and its progression to understand the need for precision viticulture – and that this is an enabler to generate data assets for year-on-year understanding of change in vineyard productivity.

The trial involved eight growers within the Canberra District who tested a range of technologies on their vineyard sites over the 2023 and 2024 vintages.

Case studies showcased include:

- Drone mapping vineyard block boundaries and optimal flight times for vegetative mapping during the season.
- Processing map imaging through open source software and creating block features and areas of interest.
- Side on imaging using RGB/NDVI

sensors for bud, bunch, canopy, plant counts and health.

- Bringing it all together, storing and managing data, and
- AgTech options for vineyard monitoring and management.

Hans Loder, digital viticulture expert, director of viticultural consultancy Vitifelix Pty Ltd and part of the Wine Australia 'Collabriculture' project, facilitated the workshops for the grower group participants, aligned with critical phenological stages in the vineyard *(see Figure 1 for workshops overview)*.
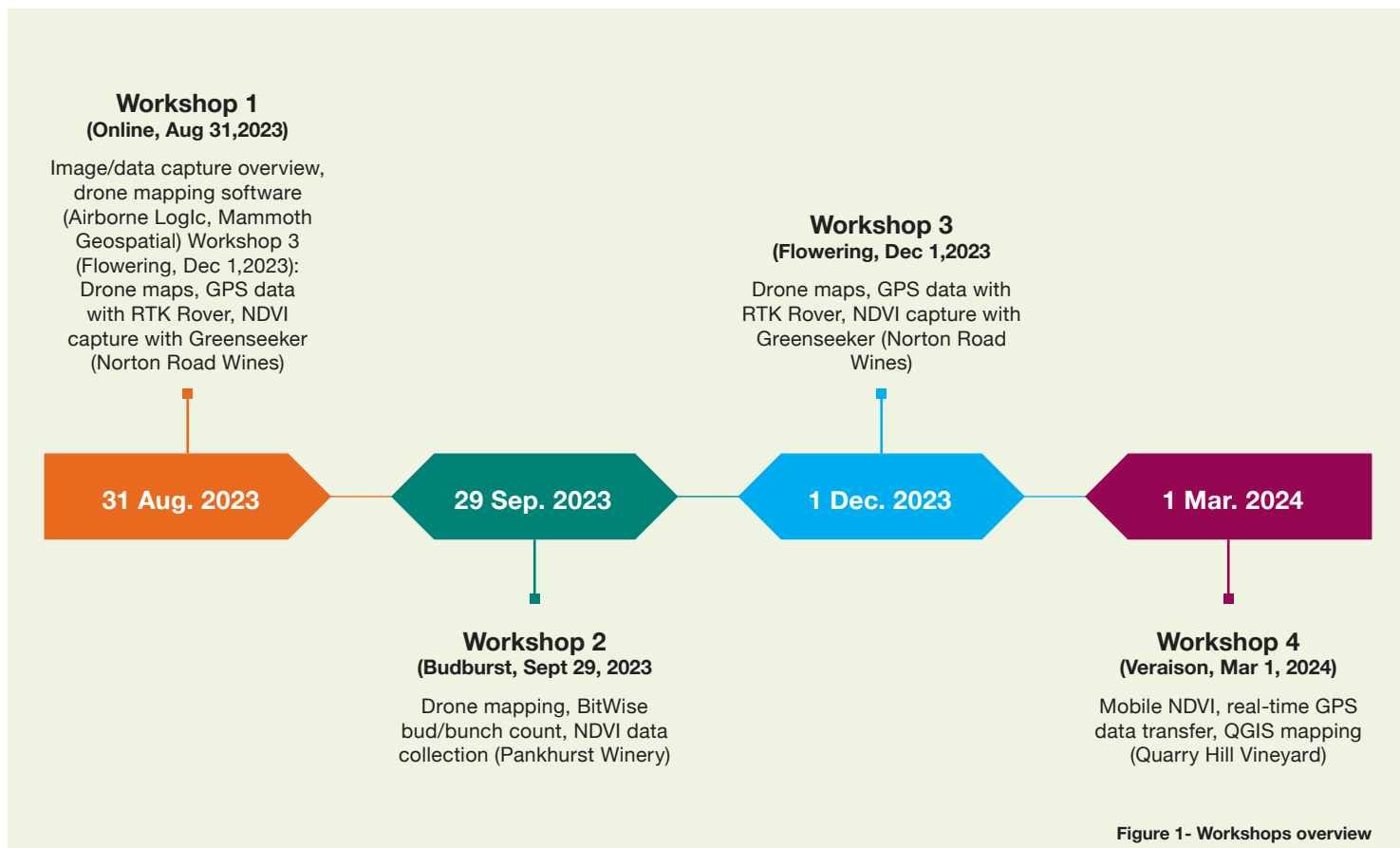

Workshop 1
(Online, Aug 31,2023)

Image/data capture overview, drone mapping software (Airborne LogIc, Mammoth Geospatial) Workshop 3 (Flowering, Dec 1,2023): Drone maps, GPS data with RTK Rover, NDVI capture with Greenseeker (Norton Road Wines)

Workshop 3
(Flowering, Dec 1,2023

Drone maps, GPS data with RTK Rover, NDVI capture with Greenseeker (Norton Road Wines)

| 31 Aug. 2023 | 29 Sep. 2023 | 1 Dec. 2023 | 1 Mar. 2024 |

Workshop 2
(Budburst, Sept 29, 2023

Drone mapping, BitWise bud/bunch count, NDVI data collection (Pankhurst Winery)

Workshop 4
(Veraison, Mar 1, 2024)

Mobile NDVI, real-time GPS data transfer, QGIS mapping (Quarry Hill Vineyard)

Figure 1- Workshops overview

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[1] Dave Gerner from Wine Australia said at the Expert Panel session: "A digital twin of a vineyard is mostly data driven– a series of data that represents what's going on in your vineyard that you can use to monitor that and compare that over time and understand where you are today and in a year or five years and 10 years."

[2] 'Here come the Robots, but what do we do with the data?', available at: www.nuffield.com.au/post/here-come-the-robots-but-what-do-we-do-with-the-data

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A number of AgTech consultants were engaged during the course of this project in both the provision of technologies and demonstration of how they can be used.

As example, Case study 1 outlines the creation of vegetation maps through the use of a drone fitted with a NDVI camera. Key outcomes were learning how to operate the drone, fly effective missions, timing of flights and reducing costs through use of a 'buddy system' for data collection throughout the season. Case study 2 then outlines the steps to processing images and interpreting them to deliver insights.

As the project progressed the workshops engaged vendors to gain an understanding of how to process digital maps through open source software such as QGIS and MyEfficientVineyard. This demonstrated that many of the processes involved in mapping could be outsourced to these vendors if necessary – and the efficiencies that could be had through doing so.

In contrast, the trial discovered some easily accessible and low-cost technologies deliver near equivalent results to more expensive vendor options, such as the side on NDVI Greenseeker unit that generated GIS data that could be uploaded and presented into QGIS.

There can be cost savings from a 'do it yourself' and collaborative approach if you have access to some advanced digital literacy in your grower group! Case Studies 2, 3 and 4 point to these alternatives in the report.

A key learning from the project was that creating an accurate digital representation of the vineyard is the foundation asset for mapping/tracking and the first step to digital twinning[1]. Steps include progression from all of property contouring, identification of zones and then the ability to identify and track individual outliers.

The ability to store and manage data based on a common platform and set of data protocols is key to enabling vineyard monitoring, management and decision-making. As Loder (2024) observed the organisation of data is critical before insights can be deduced.[2]

Using a structured database for the storage of vineyard mapping data or AgTech devices data feeds can include data on biosecurity, weather stations, frost, irrigation, variable rate applications, targeting sampling (i.e. soil), etc.

Storage in a database provides security and can facilitate data interoperability or exchange between devices, along with presentation of data in platforms such as Microsoft's Power BI.

There are also risks associated with trialling new hardware, its ongoing software support, and using vendors and their platforms – who themselves are subject to competition, acquisition and business continuity, given the pace of evolution in digital AgTech. Mitigating these risks includes ensuring maps that are generated through the use of compatible software formats and standards – preferably open source.

The Collabriculture project was focussed on establishing open source protocols and standards for the viticulture sector and they provide a foundation for organising data into hierarchies and their storage in relation to digital mapping. This is outlined in Case Study 4.
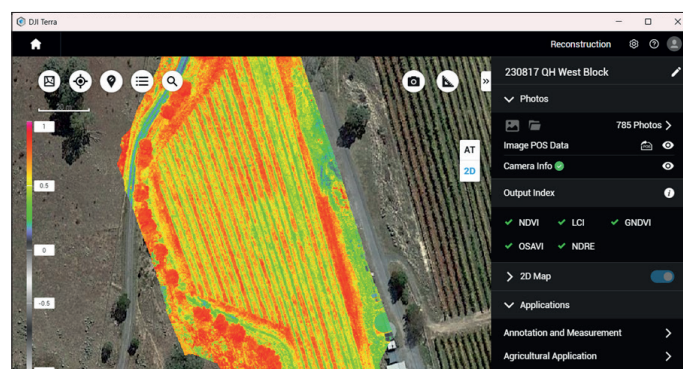
DJI Terra software NDVI map
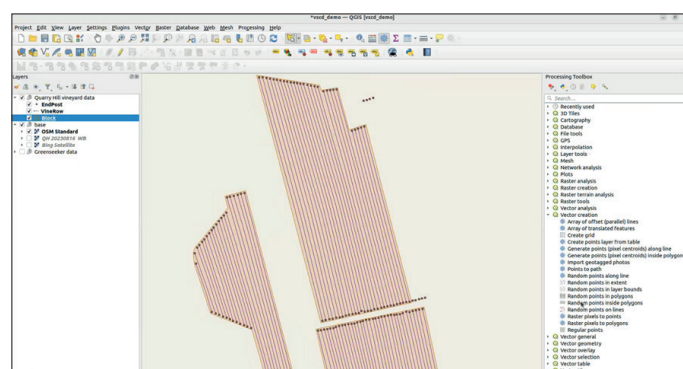
QGIS Map layering images of blocks, rows and individual vines

An AgTech Innovation demonstration event was held by the VSCD funded through the Australian Government's Department of Agriculture, Fisheries and Forestry (DAFF) at the end of October 2024. An expert panel session discussed detailed vineyard mapping and the value propositions and practical approaches to precision viticulture as well as AgTech adoption, to help identify the essential, nice-to-have and emerging AgTech innovations for viticulture, in particular as strategic AgTech adoption as an outcome of vineyard mapping. (See the upcoming article in the January issue for details where vendors demonstrated new technology options that can be integrated with vineyard mapping and monitoring to inform farm management).

Accurate baseline digital maps provide a foundation that creates value and enables basic analysis and benefits straight away that can be built upon. Digital mapping use cases can also guide the selection of AgTech options to address challenges. Challenges are then addressed through targeted, data collection (Agritech adoption!) with devices able to be positioned within the vineyard or blocks in an informed manner for representative data collection.

This project demonstrated the efficacy of collaboration within a small grower group region, where sharing of expertise and future co-investment in equipment enables growers access to apply new technologies at small scale. The project also highlighted the benefits of undertaking some, but not all aspects of digital mapping, where outsourcing to vendors can be more efficient and cost effective at key points.

This is a potential model for small grower collaboration for technology adoption across Australia's wine industry.

The VSCD's 'Digital Viticulture for the Canberra District' Final Report user guides can be found online at canberragrapes.net.au **GW**