Unmanned aerial vehicles (drones) and viticulture

DRONES look really fun to operate, but once you get past 'that looks really cool' and 'I want one', you need to answer the far more important question: 'What can I do with them to add value to my business?'

Drones (or UAVs) come in a wide range of shapes and sizes. In a consumer context they range from small 'toys' designed to be flown in your living room, through to large petrol driven units that can carry substantial payloads. In viticulture, the largest units can be used for pesticide application, but the most common applications centre on vineyard monitoring. Flight times also vary – most battery-powered rotory-wing UAVs (Figure 1) have a flight time of 15-30 minutes, while fixed-wing UAVs can fly for up to two hours.

HOW CAN DRONES BE USED IN VITICULTURE?

UAVs normally fly closer to the ground than conventional light aircraft and are configured to take a series of photos at predetermined points or time intervals across a vineyard. These photos are then 'stitched' together to make a single very high resolution image. The detailed image can then be used to assess missing vines or frost damage (Figure 2). While the images are impressive, if assessments are only needed occasionally it may be easier and less expensive to conduct them manually on the ground.

Plant cell density 'vigour maps' have traditionally been collected using light aircraft (or possibly satellites) operated by consulting companies; however UAVs can also be used to take these images. The cameras mounted in light aircraft acquire images at very precise wavelengths and high resolution. Miniature versions are available and operators can also modify normal compact or action cameras to take similar images. However, even when miniature or modified cameras are used, more than one camera may be needed to collect the wavelengths required for a 'vigour map'. Depending on the capacity of the UAV, this can require the vineyard to be 'flown' twice (once with each camera) in order to collect sufficient information. Operators would also need to be able to process the data collected into a usable map, which is not straightforward. At this stage, both the costs involved and the complexities of data processing may mean that it is more effective to use a service operated by consultants for vigour mapping rather than trying to go it alone with a UAV.

Figure 1. Flight path for a rotor UAV being programmed in the vineyard using a mobile phone.

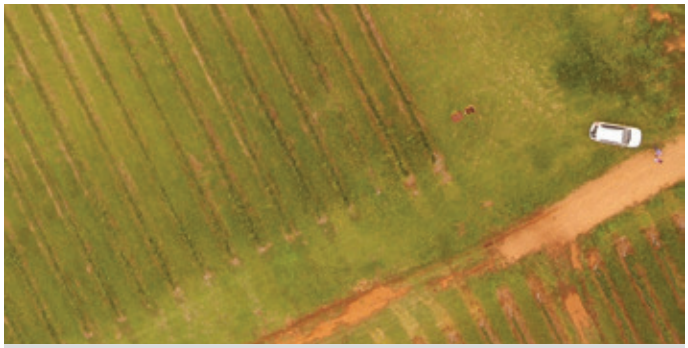

Figure 2. High resolution vineyard image; note the missing vines at the start of the third row of the block on the left.

The most promising potential application for UAVs is for the assessment of water stress. This is normally done using a thermal camera and while the techniques are still being refined, generally the hotter the vine the more stressed it is. Traditionally thermal cameras were large and bulky, but more refined models continue to be developed. Regular, weekly flights to assess water stress or highlight sections of the vineyard that need to be checked lend themselves to using a UAV (compared to a light aircraft). An ideal UAV system would be permanently installed at a vineyard and then fly to collect imagery from different sections of the site during optimal conditions. Images would be uploaded and processed automatically giving the vineyard manager a fresh set of maps on their smart phone at 7am the next day. There are a number of companies currently working to develop this type of automated solution.

CAN I FLY A UAV IN MY VINEYARD NOW?

The Australian Civil Aviation Safety Authority (CASA) requires anyone operating a UAV for commercial purposes (which includes use of UAVs in a vineyard operation) to have an 'operator's certificate'. Changes to these regulations have been proposed which are likely to allow small UAVs (less than 2kg) to be flown commercially without a licence. There are other regulations governing flying during daylight hours, maintaining a line of sight to the UAV and altitude limits, as well as restrictions on using UAVs near airports, crowds and in built-up areas.

SO WHAT IS THE 'SHORT ANSWER'?

In the short term UAVs are most likely to be used by researchers; or consultants who can provide processed maps as a service to vineyard managers. They offer flexibility for small areas and opportunities for regular monitoring that are difficult to achieve with light aircraft. As the technology matures 'turn-key' solutions are likely to be developed that are more attractive for direct purchase by vineyard managers.

The AWRI thanks the University of New England for contributing the images and other content to this article.

For more information on the use of UAVs in viticulture, please contact the AWRI helpdesk

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