App alert

Viticulture apps – identification and assessment

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App name	App Icon	Subject	updated	platform	Cost	Link
BOM		Weather + short-term forecast	Real-time	Android & iPhone	Free	http://www.bom.gov.au/app/
CliMate		Historical data, analysis, trends and forecasting	Real-time	iPhone & iPad	Free	http://www.australianclimate.net.au/
AWRI Dog book		Registered chemicals for vineyard use	regularly	Android, iPhone, iPad & iPod touch	Free	https://goo.gl/pzOfCn
MyPest-Guide Grapes		Pest identification and control options	regularly	Android, iPhone & iPad	Free	https://goo.gl/cc7PUk
PestGenie		Farm safety, chemicals and spray records	regularly	Android, iPhone, iPad & iPod touch	Subscription	https://goo.gl/zNy5WM
PMapp		Assesses powdery mildew infection levels	Last update Dec 2015	Android, iPhone, iPad & iPod touch	Free	https://www.adelaide.edu.au/news/news82342.html
Viticanopy		Vine balance assessment	Last update Oct 2015	Android under development iPhone, iPad & iPod touch	Free	https://www.adelaide.edu.au/news/news81346.html
Fit Vine		Assess vine planting material	Last update Oct 2014	iPhone, iPad & iPod touch	Free	https://itunes.apple.com/us/app/fit-vine/id928430666

Vineyard apps – current apps and their evaluation

It would seem there is an app[lication] for everything these days, and vineyards are not exempt.

Viticultural apps have been emerging over the past few years to assist growers in their daily management operations. Apps allow growers to have the convenience of being able to make vineyard management decisions or collect data using a smart phone device. Data is then in a ready-to-export format for sharing, and record keeping is easier and more accessible. The instant availability from online sources, especially specialised apps, allows growers to make decisions quickly, based on accurate and up-to-date information. Many of the best apps are available for free and others are at a low cost considering their benefits. I have road tested a few currently available apps and discuss their benefits below.

The advent of apps has made many vineyard management decisions easier through having immediate access to information and the ability to store and analyse data. The convenience is only matched by the cost of many of these apps many of which are free. I encourage you to at least trial these apps, which will not leave you out of pocket and can actually increase your bottom line. All apps evaluated can easily be downloaded at either the **Google play store** (https://goo.gl/bkNIOG) or **iTunes** (https://goo.gl/2wdv0A).

Bureau of Meterology (BOM) Weather

This new, free app is guaranteed to be a favourite of many Australian vineyards. The app has all the benefits of the old, trusty website, which was an essential planning tool for vineyard activities when trying to work around the weather. The app has allowed the information previously available on the BOM website to be even more close at hand on mobile devices. The app prompts the user to make available their current location and then provides current weather data, a six day forecast and immediate link to radar information on climate, especially impending rainfall. The app allows the user to enter multiple sites from around Australia for links to weather information by simply tapping a star icon.

CliMATE

This free app is a valuable tool for evaluating climate information historical records. It allows the user to pinpoint their geographic location and then access both historical and predictive weather information for that location. The most relevant weather parameters are available for analysis as well as seasonal trends, which is a great tool for making weather reliant management decisions, particularly regarding irrigation decisions or evaluating pest and disease pressure. The app allows the user to be an expert on local weather, which will definitely help with timing management decisions and allocating resources. With water acquisition, security, cost and availability constantly changing in relation to growing climate variability and extreme fluctuations, this app is a very useful tool for water budgeting.

Dog book

The Australian Wine Research Institute (AWRI) guide of *Registered Agrochemicals for use in Viticulture* is available as a free app. This replaces the need for the printed version released each year that advises winegrape growers of agrochemicals available for use in viticulture and their withholding periods. The app has made it easier to navigate the guide on a mobile device, which provides fast and convenient access to the information. It is important to use the update prompt to check for changes and additions to the guide during the season. The benefit of this app is that growers have the information in the palm of their hand when spraying to avoid any potential issues associated with chemical usage compliance.

MyPestGuide Grapes 1.1.

This free app is a useful tool for identifying common pest and diseases of vineyards. Although developed by the Department of Agriculture and Food, Western Australia (DAFWA), the identification component of the app is relevant to other Australian winegrape growing regions. It is user friendly, which has easy to follow prompts to identify an unknown pest or disease in vineyards. This is done by firstly identifying the damage caused to the vine or fruit and then narrowing it down to a number of pests or diseases that could be the cause. Detailed information is then available for each of the potential pests and diseases including a description, life cycle, damage, and control options. The app allows the user a greater degree of confidence in identifying a pest or disease issue for assessing economic thresholds and implementing targeted control measures, both of which will help to maximise fruit yield and quality.

PestGenie

PestGenie has been around for some time and is now available as a mobile app via subscription. It provides a database of 7 million chemicals including their labels and safety data sheets (SDS). The benefit of this is that all compliance documents for vineyard chemical users can be found in one concise site. Additional features include a crop protection expert facility to select the most appropriate disease control method, spray diary and chemical inventory.

PMapp Version 1.0.4.

This free app is designed to help collect and assess data on powdery mildew (PM) infection. It is emphasised in the app background information that it is not a decision support tool. Developed as a collaboration between the University of Adelaide and Industry and Wine Australia, the app has provided a field data collection template that replaces the need for the old-fashioned manual version. Whilst the app has the disclaimer to not be a decision support tool, it is by design a tool to assess PM incidence and severity. This app is very relevant due to the disease's widespread incidence in vineyards, and the winery thresholds for low levels of infection. Powdery mildew remains a major risk in many Australian vineyards and this app is a particularly useful tool to assess your PM prevention strategies or the incidence and severity of a PM infection. Therefore, this app will help growers to be more confident in their understanding of levels of PM damage, provide an accurate infection assessment tool for negotiating potential downgrades, and protect wineries from taking compromised fruit from the vineyard.

Viticanopy

This free app allows the user to assess vineyard balance by measuring parameters that are associated with vine balance. Vine balance has been shown to have a direct correlation to wine quality. Growers can now easily assess the parameters of vine balance, vine leaf area index, canopy porosity and canopy architecture in the field using a handheld device. This has replaced the previous assessment tools that were expensive, destructive and relied on a high degree of expertise. Now anyone can assess their vine balance information to help make decisions to about adjustments during the season to maximise fruit quality. The concept of vine balance has been based on some quantitative and some qualitative measures that require a certain level of expertise to interpret. This app allows the user to easily obtain an assessment of canopy density and quantifies the information so measured responses can be applied for ongoing assessment. This can only benefit attaining maximum fruit and wine yield and quality.

Fit Vine

The National Wine and Grape Industry Centre has developed this free app as a tool to identify and assess vine planting material. The app is a useful tool to give growers the confidence to self-assess vine planting material quality to help ensure that industry standards are observed. This not only benefits the grower but also the Australian wine industry on the whole. There is renewed enthusiasm for planting and replanting vineyards in Australia. The release of this app is well timed and should avert any potential issues with planting material quality for growers.

The Fit Vine app

A field tool for assessing grapevine planting material

Helen Waite

The last thing I expected to do when I embarked on my PhD research was to develop an app, but that is exactly what came to pass. A PhD is a voyage of discovery into the unknown that can turn up unexpected results and take some unexpected twists and turns. It was one of those unexpected turns that led ultimately to developing an app designed to help nurseries and viticulturists assess the health and fitness of grapevine planting material.

It all began in 2012 when I was invited to give two master classes in the WineSkills program in England. There had been significant issues with poor establishment and planting material failing that had seriously affected the fledgling English wine industry, and it was felt that my expertise could be of benefit to UK viticulturists. The master classes took the form of introductory talks and discussions, followed by practical workshops where the participants dissected sample vines and completed a guided evaluation of all aspects of vine quality. On both occasions, the participants commented on how much they had learned and how enjoyable helpful the master classes had been.

Back in Australia I also knew that although nurseries and viticulturists are very aware of how graft transmitted viruses affect the health of planting material, awareness of other equally important aspects of vine health and quality is low. This is most likely because young vines can appear strong and healthy at first glance. However, serious trunk diseases can also be transmitted in apparently symptomless planting material. These diseases severely debilitate young vines causing vine failure and poor establishment resulting in increased costs, delayed cropping and unproductive vineyards. Trunk diseases transmitted in infected planting material are also the main cause of the syndrome known as 'young vine decline' in the vines that survive. Other defects such as poorly-healed graft unions and weak root systems can also significantly affect the establishment and survival of young vines, increase their susceptibility to stress and reduce grape yield and quality.

Clearly it is better to not plant compromised vines, but the lack of data detailing the affects from poor vine establishment and performance on vineyard productivity has meant that many people do not regard vine quality as important.

How then to raise awareness of the importance of quality planting material and the attributes that differentiate good and poor material?

I knew that master class workshops would not reach most of the people who would find them useful. The information needed to be presented in a format that could be used without support, was readily accessible and easy to use in the field.

With the help of Ken Appleby who very generously donated his IT expertise to the project, I used the check list I had developed for the master classes in England as the starting point to construct a vine quality calculator in Excel spread sheet format. The calculator assesses all aspects of vine quality including internal and external features of young vines and accompanying documentation. It also included descriptions and explanations of the characteristics of good and poor vines. We christened the spread sheet Fit Vine because it calculates the fitness of planting material as a means of gauging vine quality and thus their capacity to establish and create healthy, productive and long lived vineyards.

We sent the Fit Vine spreadsheet to a variety of people who tested it and gave us feedback that helped us refine it and improve its functionality and accuracy. Once we were satisfied that it was the best we could make it, we made it available as a free download from the NWGIC web site. Nevertheless, it was a relatively unsophisticated tool and was not well suited to use in the field.

To make it a more useful and user friendly tool, Fit Vine needed to be in a more sophisticated format and easily accessed for use in the field when vines are delivered just before planting. This was where the app concept came in. Almost everybody owns a mobile phone or iPad and although reception in rural areas can be erratic, I felt that if Fit Vine could be turned into an app for mobile devices, it would be much more accessible and useful.

The next challenge was how to fund the app's development. After trying the usual sources open to researchers without success, Professor Alain Deloire, the (former) director of the National Wine and Grape Industry Centre at Charles Sturt University, Wagga Wagga, very generously agreed to fund its development.

Thus began my relationship with an app production company. Think mature aged scientist and young gun app developer. It could have been a recipe for disaster, but was a very happy and productive working relationship, that, after a modicum of hard work and a lot of fun, resulted in the publication of the Fit Vine app.

Because it was designed to be used in the field, we had to make the app self explanatory. That meant presenting the vine assessment as a series of illustrated weighted yes/no questions and providing directions for the sequential dissection of sample vines. At the suggestion of Brandon the app developer, we decided to make a short one minute video showing the sequence of steps in vine dissection. That meant writing the script and filming it on my iPhone so that it could be turned into the animation that is part of the app. I also had to find photographs to illustrate the assessment criteria. I had a reasonably good collection that covered most of the defects seen in young vines and only had to take a few more.

Finally the app was ready. Brandon sent me a test copy that I used to assess a real batch of vines, and once we had ironed out a few minor issues it was ready to go live to industry around the world via the Apple store. There are versions for iPhones and iPads and it is free to download. Industry feedback so far has been positive, but as with all new concepts, if the resources became available, there are some minor changes I would make to improve the function of the app, such as having a separate evaluation for vines on own-roots. There is also a facility for feedback from users under the section 'How to use this app'.

Developing the app was a lot of fun. I learned some new IT skills and Brandon learned something about grapevines.

Smartphone app to assess berry and bunch characteristics

Dr Suzy Rogiers, Principal Research Scientist, NSW DPI Wagga Wagga

Grape growers are facing challenges in optimising yield and harvest dates due to hotter, drier seasons compressing harvests. Having real-time access to data on the following characteristics will help growers and winemakers to make better decisions during harvest:

- berry volume
- berry dehydration (yield loss)
- bunch and vineyard variability
- white grape berry skin colour.

A team at Charles Sturt University's National Wine and Grape Industry Centre (NWGIC) led by Professor Alain Deloire is developing an android, smartphone-based, real-time imaging tool to help growers make decisions related to harvest.

Figure 2: Prototype app running on android phone. After an image is taken in the vineyard, the app calculates berry volume and provides information on the number of berries per size category.

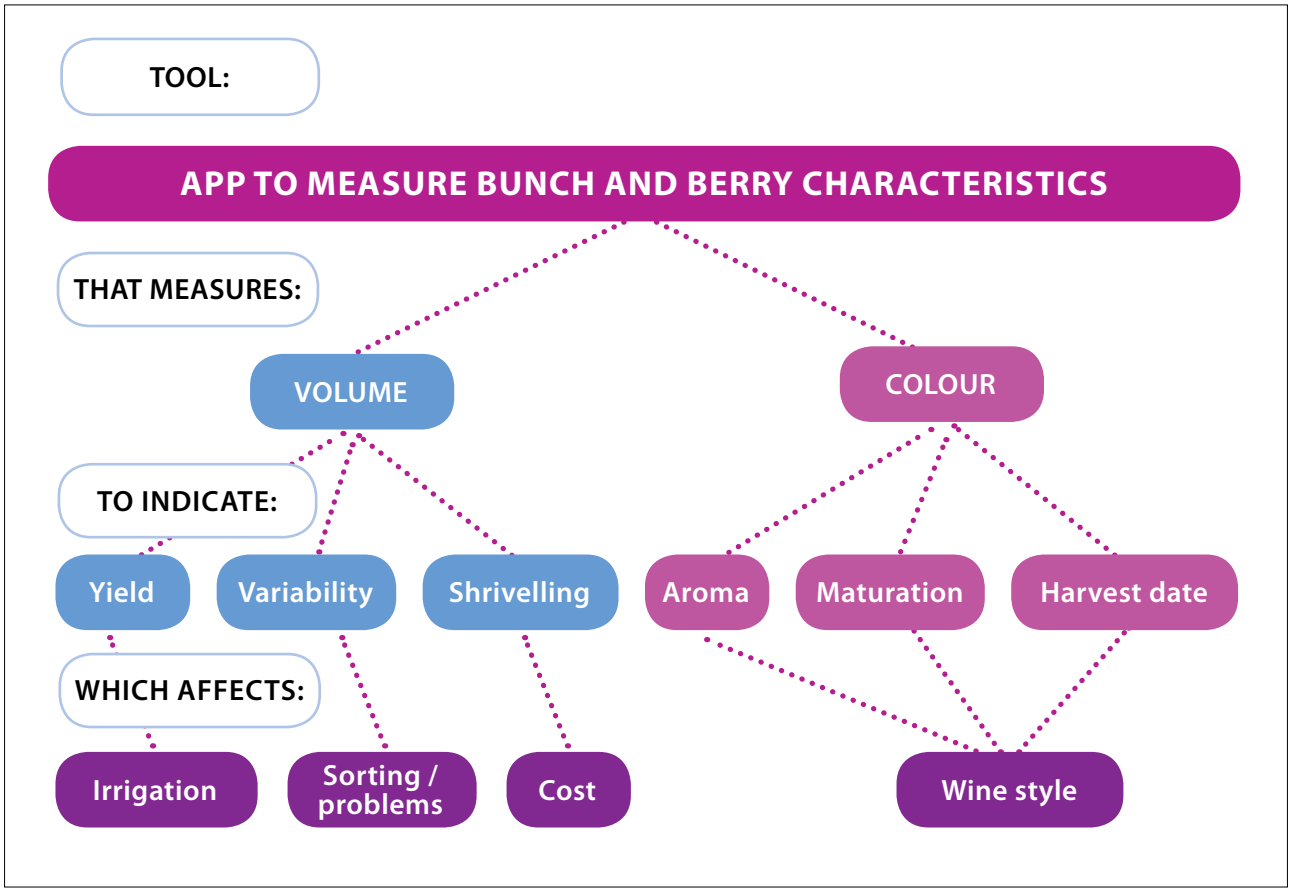

Figure 1: Overview of the app's functions and relevance to the wine industry

App alert

To use the app, a grower or winemaker takes a photo of grape bunches in the vineyard. The app will then calculate berry size and assess berry colour against a standard. Information will be provided on potential yield, the range of berry volume classes on any particular date and the extent of variability within a bunch and across the vineyard. The app will also provide information on the onset and extent of berry shrivel within the block. Together with other indicators, the information can be used to make decisions on irrigation, cultural practices when appropriate (e.g. canopy manipulation), the requirement for sorting in the winery and the optimal time to harvest particular wine styles.

Berry colour is a new and important indicator, notably for white variety ripening, because a relationship exists between berry skin colour and the berry's aromatic potential, mainly pyrazines versus thiols. In conjunction with other indicators, berry colour has the potential to be very useful for profiling berry maturation and selecting the most appropriate harvest dates for specific white cultivars.

Industry involvement

Professor Lisa Given at Charles Sturt has been leading user-focused trials of the initial app prototype (Version 1). Focus group discussions have been held with grape growers and winemakers in NSW and ACT to explore the app's functionality and visual design. This research is part of a Linkage Grant funded by the Australian Research Council with 11 wine industry partners, including Wine Australia and the Australian Wine Research Institute.

Future work (January to April 2017)

- Calibration in the vineyard of the V1 prototype app in collaboration with selected or volunteer wine industry partners
- Improvement of V1 according to user needs and practical interest
- Testing of users' experiences with the system, to ensure simple and robust operation.

The app is scheduled for release in 2018.

Acknowledgments

The project brings together expertise from Charles Sturt University's Intelligent Analytics & Sensing (IAS) Research Group and CM3, a research unit in Machine Learning and Machine Vision.

This project is funded by Wine Australia, NWGIC, CM3 and an ARC Linkage Grant on Information Seeking & Research Adoption in the Wine Industry

Further reading

Deloire A. 2012. New method to determine optimal ripeness for different white wine styles. *Practical Winery and Vineyard Journal*. Fall 2012, pp. 2–5.

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