SMART FARMING USING SIMPLE TECH

Not all technology is complicated or expensive. One of the best things to emerge from the digital revolution is the accessibility and mobility of technology. With vastly improved user interfaces, compact devices, and simplified apps, technology can be used almost anywhere, anytime, by anyone in thousands of applications. This includes agriculture, writes Ryan Hall.

KEY POINTS

- A range of easy-to-use tools is available to growers to help with scouting and keeping track of crops
- Drones do not need to break the bank to be useful; simple applications can yield large savings of time and money
- A variety of smartphone applications are available to help potato growers
- Applications using satellite imagery can be used to optimise irrigation, monitor growth, and provide a historical record of an area

Figure 1. A drone being used to scout a potato crop in NSW

DRONES/REMOTE SENSING

That small drone that has been sitting in the shed since it was unwrapped last Christmas could save you significant time and money, and could be an excellent tool for monitoring and assessment.

Drones have varying levels of use. Drones with multispectral cameras and other capabilities can provide significant information to a grower about how well a crop is growing, or help to quantify areas where growth is below expectations. However even a smaller drone with a decent camera (20-megapixel) can be useful to keep an eye on things.

Back in January of 2021, John Coulombe of Drone Training Solutions conducted a webinar with the Soil Wealth Integrated Crop Protection team. In his seminar, John outlined the various considerations and uses of drones on agricultural properties.

One of the major benefits of drones is that they are not limited by wet soil. Looking at your crop, or spotting trouble spots in the irrigation system, without trudging through miles of mud, is one great advantage. Drones are also fast. What might take an hour to walk through will only take 5 minutes with a drone.

"A great example of this is monitoring irrigation. It's super easy to turn the irrigation on and send up your drone to make sure it's all working properly," John said.

"Need to check the levels on your dams? Send the drone out and have a look. Saves you fuel and time, and it can be a bit of fun at the same time."

So, what are some of the important things to know about drones?

John noted that there are some restrictions on use, including laws on where, when, and how you can fly.

"Insurance is also another thing to consider; check to see if your liability insurance covers things in the air. Most don't. It's important to be covered in the event something goes wrong and someone is hurt", John said.

As John points out, costs can be variable.

"A good drone with a 20-megapixel camera is a fantastic starting point. These can cost around $2000. This is an investment that will soon pay for itself given the potential savings from identifying a problem early."

Drones are part of a set of management tools, best used in combination with satellite maps, soil maps, electromagnetic (EM) surveys, and historical knowledge.

It is also important to be aware of the rules and regulations of flying

Figure 2. Image captured by a drone highlighting a problem area and its extent. It still requires ground truthing to determine the cause of the problem

drones on your property. In most cases licenses are not required for small drones , but it is important to be across the rules and regulations. Find the most up-to-date information on the Civil Aviation Safety Authority (CASA) website.

The importance of 'ground truthing'

Ground truthing, a term favoured by the ABC's Dr Karl, involves checking conditions with your own eyes and ears. In this context, it means going to a site identified by the drone to check the situation. The drone can identify potential issues quickly and easily, but will not necessarily reveal the exact problem.

What about bigger drones?

There are several issues to consider before upgrading to a more serious drone. Drone restrictions are related to weight classes, which determine cost, function and importantly, licenses. The drones used for spraying are massive, with their 30 L tanks making them very heavy. As a result, extra training and licensing is required to operate them. While useful, these drones are expensive, costing upwards of $20,000.

Further information on this is available on the CASA website (https://www.casa.gov.au).

So why not a satellite?

The use of drones and satellites is not mutually exclusive. Satellites have their own advantages and disadvantages. One of the main limitations is cloud cover. If a satellite passes on a cloudy day no information can be captured. Depending on the frequency of passes this can mean days or even weeks until the next pass, which may be cloudy again. Drones mitigate this by flying low.

IrriSAT, which has been discussed previously by PotatoLink, is a free, satellite-based irrigation scheduling app that combines satellite images with weather data to estimate crop water use. With weekly satellite image updates and weather reports, crop water requirements can be predicted up to seven days in advance, helping to manage irrigation.

As with drone monitoring, ground truthing is also important when using satellite tools. Combining soil moisture probe data with IrriSAT facilitates ground truthing of estimated crop requirements against actual soil moisture levels. With this information about the water budget, when to irrigate and by how much, can be calculated.

While an important part of the tool, there is more to IrriSAT than water budgeting. The normalised difference vegetation index (a measure of different wavelengths of light) or NDVI can be used to identify areas of problem growth.

Interpreting satellites requires some practice but tools like IrriSAT are a great help. For more information, see the PotatoLink website for a webinar and case study on IrriSAT. You can read about IrriSAT in the first edition of PotatoLink magazine, also available on the PotatoLink website.

APPS

Ironically, most of us barely use our smartphone as a phone. Apps are what we want and there seems to be one for everything, including for the agricultural sector. While some are specific to potato crops, others are for broader use.

Two apps that caught our attention are DiagPOT and xarvio™ SCOUTING.

DiagPOT is a free smartphone application available on both IOS and Android platforms. The app was developed from the *Practical guide on diseases, pests and disorders of*

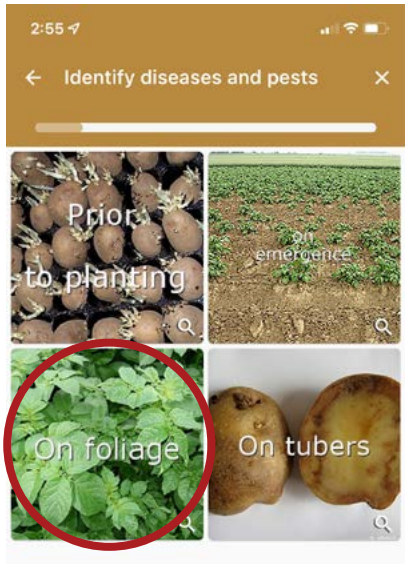

Figure 3. An example of how the app can be used. NOTE the information for late blight in this context is for France. For effective management of diseases and pests please ensure Australian resources are used.

the potato, and created and edited by a range of French organisations including the French Federation of Seed Potato Growers (FN3PT), French Association for Seeds and Seed Potatoes (GNIS), French Technical Institute for Cereals Forage and Potato Crops (ARVALIS-institut du Végétal), and the French Institute for Agricultural Research (INRA).

The application, which has an English language option, boasts a broad range of photos of pests, diseases, and physiological disorders. One of the best uses of the app is as a diagnostic tool, with 400 photos to help identify issues with plants or tubers. The app also includes an index of 150 diseases, pests, and disorders and 94 datasheets that cover causes, symptoms, risk factors and management of diseases, physiological disorders, and nutrient imbalances.

It should be noted that while the app is useful, it has been developed for French conditions; information may be less accurate for an Australian context. Nevertheless, it is a fantastic tool for that first step in recognising or understanding a problem. Consult an agronomist or another relevant professional before making decisions based on the app.

The free app, **xarvio® SCOUTING**, developed by BASF Digital Farming, uses advanced image recognition technology and machine learning to identify more than 400 weed types, as well as damage caused by more than 400 different diseases, pests, and nutrient deficiencies.

In Australia, the focus of the app has been on its application to support the management of broadacre grain crops including canola, barley, and wheat. While it does not currently offer analytical features specifically for potato crops, growers are already finding it useful, with its functionality increasing as more users add to the database.

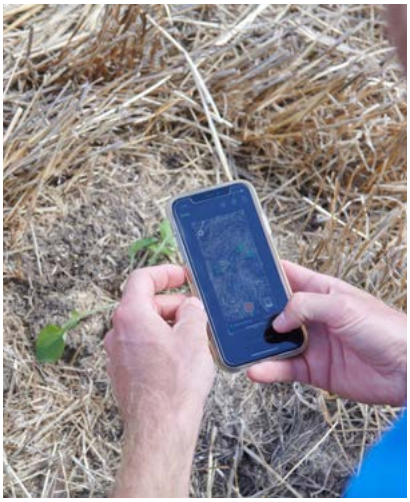

Figure 4. David Brunton using the Xarvio app to identify a weed

To identify weeds, the app compares a photo taken within the apps' camera function with photos already loaded to the app's ever growing image database. If xarvio SCOUTING does not recognise a weed, users can easily record information about that species to enhance the apps' 'knowledge.'

Disease identification works the same way. The more the app is used in Australia, the more accurate it will become.

xarvio SCOUTING also has a feature that documents images and results from local scouting trips. This information creates a local area history that can be reviewed at any time, helping alert users to emerging in-field problems.

Users can decide whether to share the in-field problems identified on their property as part of the anonymous collection of local area data. This information is made available to other local growers and agronomists via the app's unique radar function and in-app notifications. This can help them to take preventative action to protect their crops from a potential risk. This feature could be particularly useful for diseases such as late blight, where a community approach greatly improves overall disease management.

CONCLUSION

Digital agriculture is no longer an idea of the future. It is here and available now, with new technologies and systems emerging every year. While the next 10 years will see major changes to the way potatoes are produced, it is important to remember that not all new technologies are complicated and expensive. Simple digital tools can have a great impact.

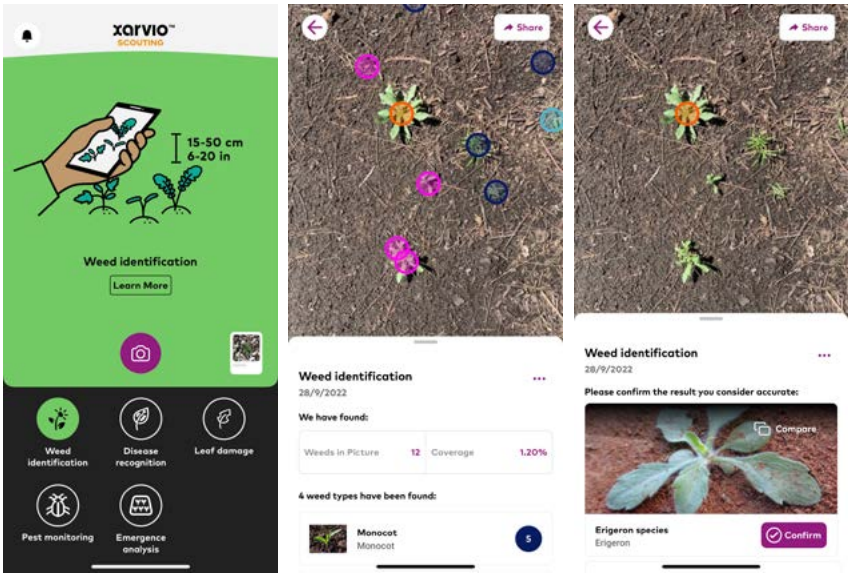

Figure 5. an example of Xarivo SCOUTING app being used to identify weeds