

# Plug in to improve efficiency, productivity

GRAEME JENNINGS

Effective use of digital technology can improve farm efficiency and productivity, according to Ian Ware.

In fact, the potential of this technology is so great that whether or not a grower is using it well could determine whether or not a farm business is profitable, he said.

“Digital technology improves the efficiency and accuracy of record keeping because the grower or operator can use an iPad or similar to enter information directly into the computer. You can fill in spray sheets in the paddock while the tank is filling, for example.

“A good communication and data transmission network also enables more, and easier, interaction between growers and their agronomists, opening the way for agronomists to be directly involved in in-paddock decision making.”

Ian, principal of APA Sound, an electronics engineering company that has been at the forefront of applying digital tools in agriculture for 35 years, believes good use of digital communication technology can also give growers an advantage when selling grain or livestock because current information about prices is critical to maintaining a strong position in the market place and maximising returns for their produce.

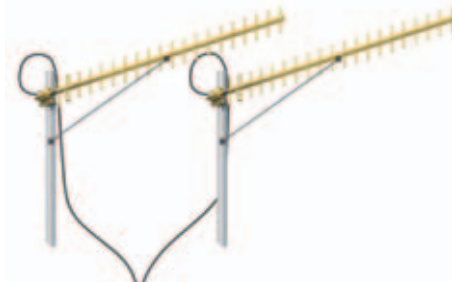
“The potential for application of digital technology in agriculture is almost



IAN WARE SEES HUGE POTENTIAL FOR DIGITAL TECHNOLOGY IN AGRICULTURE.



THE PARABOLIC 4G ANTENNAE ABOVE LOOK QUITE DIFFERENT FROM THE 3G ANTENNAE [LOWER RIGHT] AND HAVE VERY DIFFERENT PERFORMANCE CHARACTERISTICS. ABOVE RIGHT IS AN NBN ANTENNA WITH A MODEM PLACED ON IT.



limitless provided the relevant practical issues are addressed, with the coverage and capacity of the communication network a key issue,” he said.

“The key is good connectivity. You can have all the latest apps, the most powerful computer and the best agronomist, but all that is meaningless unless you can access the apps and computer and exchange data with the agronomist when you need to.

“To do that requires a digital communications network that covers the whole farm, so data can be sent and received from the farm office and from phones and iPads anywhere on the property.

“Good connectivity is essential and the foundation for that is a reliable Wi-Fi (wireless) network that enables data transmission and access to information whenever it is needed.

“The base requirement is a good internet system service to a central hub, usually the farm office in the house or a centrally-located shed, and a reliable communication network tuned to data transmission covering all the property.

“Where total coverage isn’t possible the system needs to be set up so data loaded onto devices while they are out of reach of the network is automatically transmitted to its destination when the device is reconnected to the network.”

The connection between the property and the outside world will of necessity involve a telco but growers can set up property-wide networks independent of a telco using reliable, affordable, off-the-shelf electronic components, many of which can be set up without any specialised technical knowledge, Ian said.

“I believe the simplest option is to set up with an iPhone, iPad and a PC at the house or office, all linked into the ‘cloud’, which is actually a large off-site computer server.

“A grower who can’t access or prefers not to use the ‘cloud’ can establish his own ‘cloud’ system by setting up an external hard drive accessed through the home system’s router that serves the same function.

“A well set-up ‘cloud’ system allows documents like spray record sheets, for example, to be worked on by several people simultaneously, so two or three operators can be filling out the same spray record sheet while the agronomist has the same document open and can check what chemical is being applied where, at what rate and in what conditions.

“A farm business will typically have 40 to 50 documents that will be used at least once a year and ‘pro forma’ versions of these, and files of those documents from previous years, can be sitting ‘in the cloud’ ready to be used whenever they are needed.

## GOOD INTERNET, WIFI 'NON-NEGOTIABLES' FOR FARM DATA

A good internet connection to the farm office and a robust wifi system that enables internet access and data transmission to and from the office from anywhere on the property are non-negotiables for growers wanting to capitalise on the power of digital technology, said Ian Ware.

Depending on factors including mobile phone reception in the area, the internet service available, distances and topography, establishing a property-wide wifi network capable of handling the necessary communication and data transmission could require the use of devices to improve signal strength and coverage, he said.

And farm vehicles, from the ute to the tractor and header, need to be set up to accommodate 'smart phones' and other digital devices such as iPads.

Ian, principal of electronics engineering company APA Sound, advocates using iPhones and iPads because of their capabilities, and Telstra's wifi 4G 782S modem because, for growers who don't have access to his preferred options of an ADSL or WiMax fixed wireless internet connection, 4G mobile broadband offers a faster service and larger monthly data allowances than a satellite broadband service.

The 4G service can be made to work provided the signal strength is sufficient to register one bar on the signal indicator on a mobile phone, he said.

"Using an internal antenna on the modem will improve signal strength but the performance of 4G mobile broadband is affected by weather conditions, distance from the nearest transmission tower and the number of users on the network at any time."

He recommends that growers in areas where signal strength is suspect use two external antennae to maximise signal quality and increase the rate at which data can be sent and received on the 4G network.

Antenna choice is important because different antennae are designed to handle different signal frequencies, with 1800 mega hertz (Mhz) the frequency needed to maximise speed of data transmission on the 4G network. The antennae specifications for 3G are different.

The 782S modem, which comes with 10 wifi connections, is a portable unit powered by a rechargeable battery. Use of a suitable cradle or 'docking station' for the modem can maximise its mobility and improve its performance, he said.

"Netgear offers a docking station for the 782S modem that will charge the battery while the modem is in the station and comes with connection points for two external antennae that are linked into the modem. The docking station also has a plug-in 'ethernet' port that allows connection of a router to increase the number of wifi connections or other 'wired' devices."

When choosing a mobile phone it is important to make sure it is recommended for use in rural areas, Ian said.

"Phones designed for use in country areas usually have a superior antenna system that improves signal strength and quality. Phone performance in vehicles can be further improved by using a phone cradle and an appropriate external antenna."

When choosing a cradle it is important to make sure it is designed for the model of handset being used and that it has a connection for an external antenna, he said.

"Phone cradles use an integrated patch antenna and to maximise reception it is important to match the cradle to the specific handset model to ensure the phone's internal antenna is as close as possible to the patch antenna in the cradle.

"When choosing an external antenna for a vehicle it is important to consider the type of terrain in which it will be used. In flat country a high-gain 9dBi antenna can be used but for hilly areas a 5-7dBi antenna is better because it has a wider angle of transmission."

The right phone antenna choice will maximise the quality and stability of voice transmission but will have little impact on data transmission because mobile phones are designed primarily for voice transmission and the frequencies for voice and data are different, he cautions.

However, antenna selection can have a significant impact on the data capability of a farm wifi network and it is important to choose antennae that are designed to send and receive data at the correct frequency for the device of service being used.

Issues to consider when selecting an antenna for wifi data transmission include:

- Whether or not it needs to be a dual band antenna. Most wifi equipment is dual band and requires a dual-band antenna.
- Frequency. The antenna needs to suit the frequency of the devices being used in the network and the transmission of data.
- The level of gain achievable. In general terms, the higher the gain the better the data signal and the greater the transmission distance.
- The form of communication. Point-to-point communication requires directional antennae. Omni-directional antennae are better for general wide-area coverage.

When it comes to internet, line connection is best and Ian advocates that growers routinely check the progress of the National Broadband Network (NBN) in their local area with the aim of gaining connection to the network as soon as access is possible.

"NBN fibre is fast, stable and reliable," he said. "If NBN access is not available, 3G/4G mobile broadband is the next fastest option for internet connectivity, with satellite broadband the fall-back, and most limited, option."

“One of the biggest efficiency gains with this technology is in record keeping, because being able to use an iPad or similar to enter data from the paddock direct into the computer saves time and means more accurate records because it eliminates the need to make notes and transcribe them later back in the office, or to rely on memory. And the system can be set up so all data entries are automatically time stamped, which clearly identifies when each entry was made.”

With a good property-wide network it is relatively easy to have machinery cabs set up so the driver is linked into the Wi-Fi network for communication and record-keeping and can undertake other management tasks while in the cab sowing, spraying or harvesting.”

Once a reliable wifi network is in place, the next issue is what software tools to use, he said.

Ian is a fan of Evernote, and advocates that growers considering this program buy the version that allows data to be entered off line then loaded to the central hard drive when the device is back in the network.

“Evernote is not farm-specific but has many links to agronomy-related documents,” he said.

“Google Documents, which enables several people to enter information or edit the same document simultaneously, with all users able to see the changes or additions being made in real time, is also an option.”

Both these programs have a suite of standard documents likely to be of value in a farming business, he said, and allow photographs identified by time and location using GPS co-ordinates to be linked to documents to provide extra information.

“With digital cameras in mobile phones a grower can take photographs linked with GPS co-ordinates so the grower, his agronomist or a researcher knows exactly where the photograph was taken and so, if there is an issue, exactly where the rust hot spot, insect damage or bare patch, for example, is in the crop.”

Digital technology, in combination with a good wifi data transfer network, can also be used to remotely monitor and control farm systems ranging from electric fencing to pumps and tanks, Ian said.

He advocates using the best equipment and systems available and places a high priority on identifying equipment that is

robust and reliable and offers good value.

“Any communication network used for business needs to be reliable and cheap options are seldom good value in the long-term,” he said.

“Some of the equipment we recommend might appear costly but in our opinion good-quality equipment you can depend on offers better value than cheaper alternatives because it is less likely to let you down and often has greater capability or capacity.

“For example, we have recently been checking out a tank monitor used in the Middle East oil industry that has the ability to remotely monitor levels in several thousand tanks and send an SMS advising of the location of any problem it identifies.

“The system is controlled through a simple touch pad, has a life of at least 10 years and in one instance reportedly continued operating after a bomb blast. However, it costs more than \$2,000.

“That might seem to make it unaffordable for a grower, but it has the capacity to monitor levels in 9,000 tanks and information from the monitors can be transmitted over 40 kilometres with the use of a relay station. That means it could be used jointly by multiple growers, which opens up the possibility of setting up a district-wide system or co-operative farmer group to share the cost,” he said.


“This is a well-designed system that allows the operator to turn valves on and off remotely and could be set up so each grower in a group or network could monitor and control only the installations on his own property.”

He also sees potential in using digital cameras and the wifi network to monitor what is happening in paddocks around the property.

“With a good, property-wide wifi system it is possible to set up cameras so they can be controlled from the office or machinery cab to scan paddocks or be set to focus on different areas from time to time.

“Cameras are being increasingly used by producers with livestock, but I believe this technology also has potential in cropping.

“There is considerable talk about using drones for paddock checks and crop monitoring, but at today’s prices you can buy and set up 20 cameras for the same cost as a drone and they require less maintenance, involve less risk and have no licensing or privacy issues.

“With a robust property-wide wifi network it is relatively simple to set up a system to receive digital images and related data from cameras, which means a grower can remotely monitor his paddocks daily if he wants to; as he possibly does if there is a high risk of a rust outbreak or insect attack, for example.” 

## POTENTIAL IN LIVESTOCK MANAGEMENT TOO

Digital technology has significant potential in livestock management, according to Ian Ware.

“It is relatively simple to set up a low-cost system to manage and monitor electric fencing, for example.

“There is equipment available that will monitor the status of electric fencing, indicate if a problem or fault develops and enable the trouble-shooting be done from the farm office or the tractor cab. Using the wifi network the manager can switch sections of fence on and off to identify exactly where the issue is so he can then go straight to the section with the fault, which saves a huge amount of time.

“Monitoring using electronic ear tags is well-established technology that can be used to monitor where and how many sheep or cattle there are in a paddock and reveal movement and grazing patterns.

“There is also potential to set up a network of motion-activated cameras to monitor stock movement. This opens the way for counting how many animals access a water trough or dam, move through a gateway or even just across a camera ‘trigger line’ as they move from one area of a paddock to another,” he said.

“Motion sensor technology can also be set up to trigger an alarm if there is no movement in the target area for a set time, which could indicate a problem of some sort that warrants checking.”