

A new season

Inspiring digital transformation on Australian farms



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Introduction



➔ Australian farmers stand to reap massive benefits from digital transformation.

You're a farmer – resilient, resourceful and invariably up before dawn. Each day, you make decisions with one eye on the weather and the other on the markets. Yet, increasingly, your most valuable commodity is cold, hard, objective data.

Farmers who tend livestock or crops on the basis of data reduce the uncertainty caused by fluctuating commodity prices or environmental conditions. They also free themselves to run their operations from afar with the click of a button. Another bonus is they can accept cues from in-field intelligence collected by sensors and robots, which are transmitted direct to their smartphones.

This high-tech vision of the future once seemed fanciful. Yet, in a world where everything is digitally connected, data-driven

precision farming offers massive opportunities. As the world's population soars from 7 billion in 2017 to a projected 9.6 billion by 2050, the fastest-growing export markets are in our backyard. Rising incomes and an expanding Asian middle class means that demand is growing for high-value foods. This includes everything from organic milk to Wagyu beef.

By making the right technology investments today, Australian farmers can optimise yields and deliver products that will continue to meet changing consumer tastes. They can also streamline business processes, empower employees and engage with customers who seek to trace the origin of their food from the paddock to the plate.

Microsoft has long been a trusted partner of Australia's agriculture sector. Our trusted cloud

infrastructure and analytics product suite – supported by exciting capabilities in machine learning and artificial intelligence – are now inspiring the development of solutions that make Australia a global leader in digital farming technology. In this e-book, we profile some of these success stories. We also offer the latest advice from our experts and partners to help local farms transition into thriving digital businesses.

"Australia is the best living lab to develop digital farming technology. We already have highly innovative farmers – now we need to build an ag-tech industry to exploit that advantage."

Mike Briers, CEO, Food Agility

1 BUILDING the intelligent farm

➔ New sensing technologies are helping farmers extract key business insights and make better decisions.

The promise of digital transformation is simple – equipping farmers with the insights they need to maximise the productivity of every hectare. Already, food and dairy producers are deploying precision farming techniques in rural and regional areas, as well as in controlled vertical environments close to cities to towns. Rapidly improving broadband connections make it possible to digitise virtually any object. For example, Internet of Things devices such as sensors can be deployed in fields to measure conditions such as temperature, humidity, UV, wind, and soil moisture and nutrient levels. This helps farmers determine the exact amount of water, fertiliser or chemicals they require – eliminating waste and reducing associated electricity and fuel costs.

The first step in building the intelligent farm is to connect key nodes – potentially using a combination of static sensors, satellite imagery, and robots and drones (see Figure 1). Next, enterprise-grade cloud platforms such as Microsoft Azure collect, store and aggregate field information. Advanced analytics and machine learning tools such as the Cortana Intelligence Suite look for patterns and insights from this data. These are then dispatched to a farmer's mobile device in the form of an alert – perhaps notifying them that a particular row of crops is ready for harvest or a cow is ready for artificial insemination.

Sensors can be fitted to livestock, enabling farmers to track grazing patterns. They can also be attached

to products, right down to individual milk vats, lettuce stalks or rare cuts of meat. This allows farmers to track deliveries and obtain crucial insights all the way to the supermarket. For example, if sensors are attached

“What we do is build use cases where hyper-localised sensing technology measures conditions in the paddock and transmits that information to the cloud. This transforms into an algorithm that ends up in an app on the farmer's phone, supporting their decision.”

Mike Briers, CEO, Food Agility

to cows, abattoirs can identify which animals offer the highest-grade meat and communicate this information back through the supply chain. Farmers can then determine how to replicate these results; for example, through genetic manipulation or feeding regimes. Having 'anytime, anywhere' access to the latest decision support tools offers farmers great benefits. They can manage their enterprise remotely and enjoy a single point of view across multiple properties. As noted by Peter Schmidt, Microsoft Business Solutions Specialist, farmers can also better quantify and manage risks such as unforeseen weather events. “In our conversations with banks, they say that having this capability would allow them to be more lenient in terms of premiums for drought insurance or the interest rates they offer farmers for loans,” he says.

FIGURE 1:

Three ways to connect the farm



1. **Static sensors:** These can be used to measure typical weather and soil indicators. Placement can be challenging. For example, it is much easier to lay sensors around a permanent crop than in an environment where produce, such as carrots and beans, are dug up constantly. However, devices are becoming more robust, as well as more energy-efficient due to greater reliance on solar power.



2. **Aerial satellite images:** Increasingly granular and accurate to the square metre, these can be sorted using cloud analytics and data visualisation tools such as Microsoft Power BI to identify trends such as disease incidence across a broadacre wheat crop. This helps farmers pinpoint trouble spots that need to be treated.



3. **Connected roving devices:** Robots, drones and tractors can roll up to a crop and record footage, immediately informing the farmer about current volumes and conditions, and helping them decide when to harvest.

➔ Taming the Queensland fruit fly: a case study

The Queensland fruit fly is a pest that has caused some farmers to lose more than half their crops. Advance Computing has developed an app to capture knowledge about how fruit flies move and spread infestations, as well as their susceptibility to traps. Everyone in the community can record the number of pests caught in their own trap. Farmers can track the GPS waypoint of traps and begin heat mapping the data. By centralising and digitising records of infestations, sophisticated analytics can be used to understand how fruit flies migrate between farms, depending on the season and time of day.

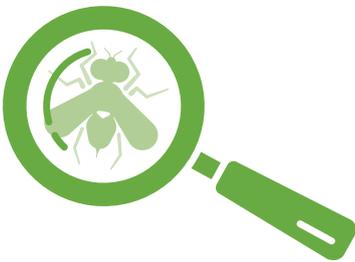


"I'm caretaker of Greenwood Orchards – fourth-generation here. The fruit flies hit our apples. They seem to really like our Pink Lady and Fuji apples late in season. It's put a lot of pressure on our willingness to invest and keep developing, so we are at a bit of a standstill as we get our systems in place."

Lynton Greenwood, apple farmer

"It took us understanding the community's needs and data requirements and then using Microsoft tools to make that happen quickly. It's really a community-driven effort to start getting some data so that some better planning and mitigation might occur."

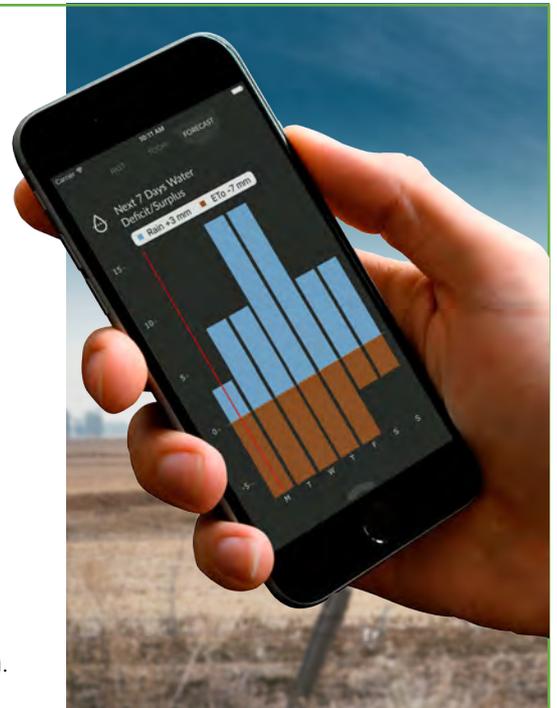
Chris Motton, Advance Computing



➔ A better climate for crops



Sudden weather changes are a major challenge for farmers, potentially costing millions of dollars each year. Using sensing technologies and the Microsoft Azure cloud, Australian company The Yield has developed an app that gathers hyper localised weather data on farms at the field, row and plant level. The data is then converted into insights that help farmers decide when to plant, feed, irrigate and harvest crops. The solution is being used by Australian lettuce grower Houston's Farm to reduce damage to crops caused by water-related issues. It is also helping the Tasmanian oyster industry calculate contamination risks to oysters after rain.



➔ Connected cows: a case study

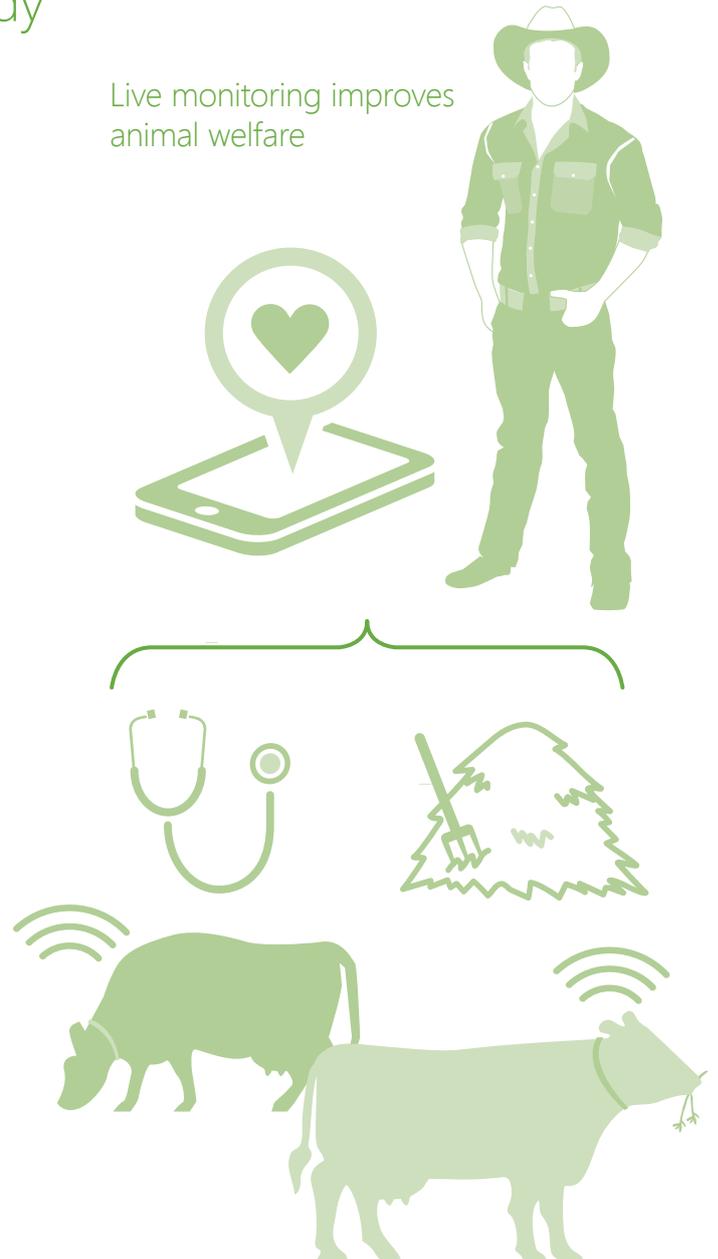
In a landmark use of Internet of Things technologies, German farmers have begun using a new solution that will radically change farming practices. Using Microsoft Azure, the solution from SCR Dairy called 'HealthyCow24' involves attaching necklaces with motion sensors and microphones to cows. The tags monitor activity and rumination levels, helping farmers identify when a cow is ready to become pregnant and alerting them to any health problems.

To identify when a cow was ovulating, farmers needed to spend up to 30 minutes in the stables four to five times a day. Now, HealthyCow24 alerts them on a mobile application – that can run on-premises or in the cloud. This alerts farmers about any relevant behaviour changes, saving them time and enabling greater efficiency. It also helps farmers quickly identify and treat health problems by alerting them, for example, to decreased appetite or a prolonged calving. This ultimately improves animal welfare as well as performance.

"We have alerted farmers of cows having, for example, a prolonged calving, or a difficult labour, in the middle of the night. They were able to go out and save the cow. With this technology, farmers get the information they need to manage the herd more efficiently."

Matteo Ratti, Vice President of SCR's Cow Intelligence Business

Live monitoring improves animal welfare



"Young farmers are looking for technology solutions to make the work more efficient and more profitable, and they would not go into this business if the technology was not there. They need to be able to be away from the farm and still be connected."

Matteo Ratti, Vice President of SCR's Cow Intelligence Business

"We aren't there very often, so we wouldn't see when a cow is in heat. That's what makes this technology so helpful. When a cow is in heat or eats less than anticipated because she starts coming down sick, there is a warning indicator for me. And that's a great thing."

Steffen Hake, dairy farmer

2 CONSOLIDATING business process

➔ Digital transformation enables farmers to streamline their IT and administration, and invest in systems of intelligence.



The possibilities of data-driven farming are spurring many operators to re-architect their IT infrastructure and business processes. The agricultural software market – which is projected to rise in value to US\$4 billion worldwide by 2022 – enables laborious paper-based processes to be migrated online and information moved to hosted cloud providers. Instead of farmers having to wade through silos of information across different IT systems, enterprise resource planning (ERP) solutions help them coordinate key business processes. These could include budgeting and accounting, human resources, livestock mapping, and

management of vendors and customers. Microsoft Dynamics, for example, allows farmers to create a digital record for each farm animal, including information about their health status, grazing patterns and quality of yield.

“You might have information about particular crops, or records of cows and pigs, all held in the one place. Therefore, when you wish to analyse the whole farms performance, you don’t have to pull together data from all these different systems.”

Peter Schmidt, Microsoft Business Solutions Specialist

CASE STUDY

➔ Faster water trading

Access to irrigation water in rural northern Victoria has traditionally been distinct from land ownership. Faced with infrequent rainfall, farmers had to buy specific allocations – either in bulk or as the need arose. Prices were not set in an open and transparent manner. Transactions were conducted on paper and could take weeks. In the meantime, farmers could go bankrupt as their crops wilted while waiting for water to arrive.

In 2014, Australian company Waterpool Co-op, partnering with Advance Computing, designed a water acquisition and trading solution built in the Microsoft Azure cloud. This online portal, linked to an ERP system, allows farmers to buy water or sell their own unused allocation. The system essentially functions like eBay or an open trading floor, and farmers gain access to water immediately.

“The benefit from the online trading room has been immense. We are surprised how many people have adopted the solution so quickly and jumped on board.”

Julie Brack, Business Manager, Waterpool Co-op

3 EMPOWERING employees

➔ The farming workforce is becoming more mobile and accessing new productivity tools.

Farmers who embrace digital transformation open the door to a whole new world of mobile productivity and collaboration – and ensure their entire workforce has the latest information at their fingertips. Cloud-based software such as Microsoft Office 365 provides touch-enabled access on Microsoft Surface devices to familiar document workflow applications, messaging, social media and videoconferencing. Business applications built on the Microsoft Dynamics platform are easily configured and can be used on mobile devices, allowing access to records and the ability to record data on the go, even when offline.

At present, field solutions are focused more on improving employee productivity and eliminating errors. However, automation has the potential to drastically improve the efficiency of basic farming

tasks such as picking fruit, and spraying water and chemicals. The Australian Centre for Field Robotics, for example, has developed Shrimp, a 16-sensor robot that is being trialled in apple and almond orchards. Abattoirs are also beginning to use robots to precisely prepare different cuts of meat.

In the future, farms that rely on a largely seasonal workforce could use robots to offset labour shortages or reduce costs. We may soon see the role of humans on farms shift towards higher-value tasks that involve guiding and overseeing technology and away from manual labour or time-consuming inspections of livestock and crops.

“It’s a big upfront cost to use drones to measure pastures or put in robots to milk cows. There are potential efficiencies but it comes down to crunching the numbers – the cost of labour versus the cost of the machinery. The early adopters will have a crack at it and if the economics are compelling, others will follow.”

Peter Jones, General Manager, Australian Consolidated Milk

CASE STUDY

➔ Tracking tomatoes

Kagome, Australia’s biggest producer of tomato’s, used to have a highly inefficient method for transporting tomatoes from the field to the factory. Lacking real-time visibility into its operations, the company sometimes sent trucks to the wrong places, while at other locations, bins full of fresh produce remained uncollected. According to Production Manager Brad Free, “You didn’t need too much to go wrong to have an excess or shortage of tomatoes on your hands. We had old and ageing fruit – and it took quite a while to trace the fields where the tomatoes were coming from. We were also overwhelmed with paperwork”.

The company now uses radio-frequency identification (RFID) sensors to track the locations of containers bearing harvested tomatoes. Advanced scanning technology also supports number-plate recognition (currently in trial) as each truck returns to the plant. As a result, Kagome knows at a glance where each tomato has come from, and where it ends up. The solution has produced a 500 per cent return on investment, and a process that took an estimated 500 phone calls a day to coordinate has been cut by 90 per cent.

“It lets me sleep at night, because if I do happen to wake up, as I generally do during the tomato season, I can click on my phone and see what material we have in stock.”

Brad Free, Production Manager, Kagome

Real-time visibility of the harvesting process



4 ENGAGING customers

➔ Farmers increasingly need to know their market – and customers want to know more about farmers as well.

Digital transformation essentially requires farmers to become marketers. They have to know how to differentiate their product and use signals from customers to inform the way they grow and package food, or highlight particular product attributes. Increasingly, this requires them to master sophisticated solutions such as social media listening, sentiment analysis and multi-channel marketing.

Microsoft's Peter Schmidt notes that the Chinese market is so huge that even small inroads can make a big difference to Australian farmers. "Wagyu beef is selling in some restaurants in China for \$400 a steak, so there's a huge advantage for farmers who are willing to take the plunge and better understand their potential customers," he says.

For their part, customers are becoming more discerning and expecting superior experiences at every contact point. There is a growing demand for supply chain transparency, enabling people to trace the provenance of foods and ensure that farmers are adhering to the highest ethical, environmental and animal welfare standards.

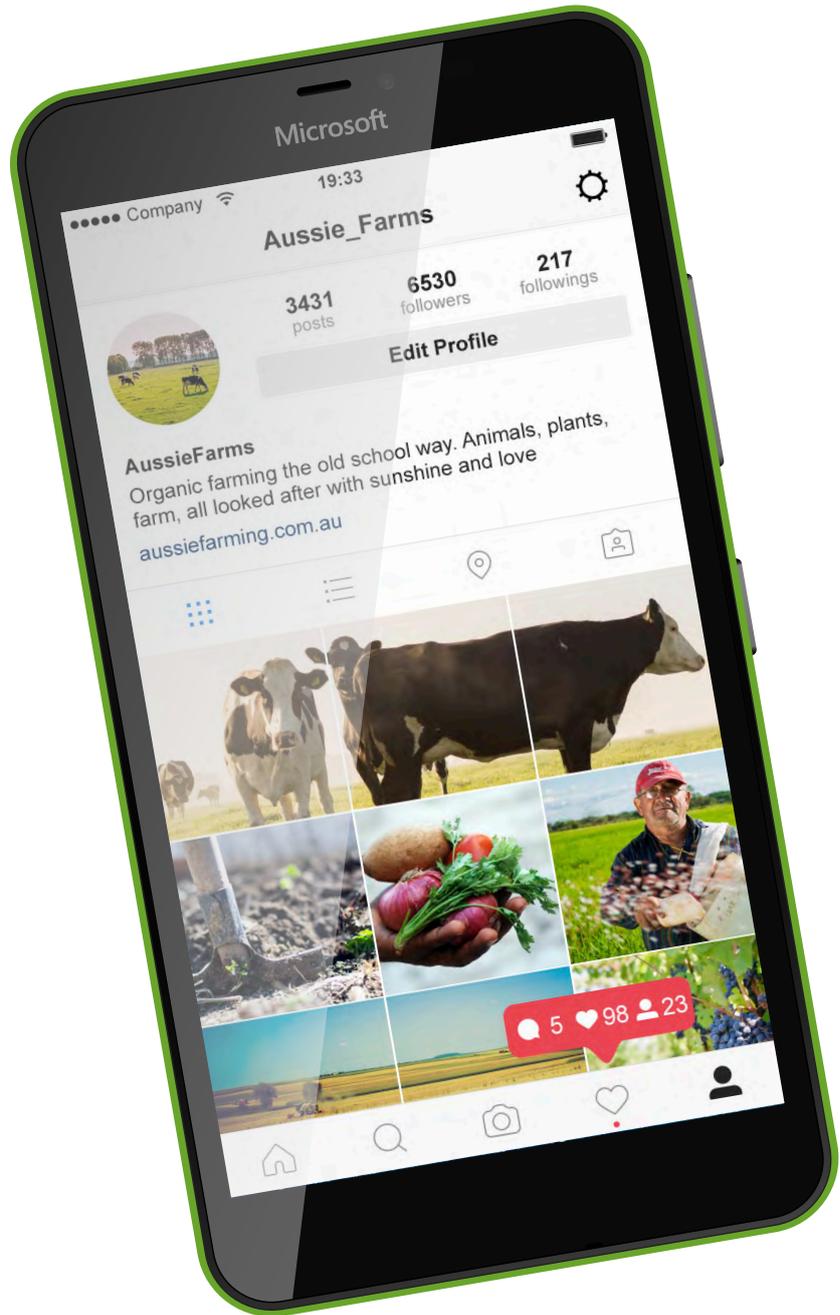
In the dairy industry – and particularly for A2 and organic

milk – this means giving customers the ability to trace every drop to the originating farm, perhaps by scanning the barcode on the packet. In the wine industry, precision filling of bottles to the exact millimetre below the rim can help convince customers that they really are drinking from a prestige Australian brand rather than a cheap imitation. Customers also increasingly expect to be able to provide feedback to farmers. There is great scope for advanced social networking strategies that allow 'clean and green' conversations between

producers and consumers, both domestically and in key export markets. Technologies such as Microsoft's Blockchain as a Service can provide an irrefutable ledger that tracks produce throughout the supply chain to verify its provenance and authenticity.

"Consumers want to know that they're really eating Australian beef and not something that's been substituted."

Mike Briers, CEO, Food Agility



Learn more

➔ How Microsoft can help farms digitally transform.

Australian farmers are used to making technology investments that require a balancing between short-term costs and long-run benefits.

Today, digital solutions have never been more viable thanks to rapidly improving broadband connectivity in rural and regional Australia through the roll-out of the national broadband network and associated satellite services. Better mobile coverage and local area networks – as well as the reduced cost of sensors and other devices – mean that technology capabilities could soon exist to solve every conceivable farming problem.

Microsoft's commitment to digital transformation within Australian agriculture begins with our trusted, flexible and open cloud platform. This is hosted within our locally-based data centres and features higher levels of security, privacy and regulatory compliance than most customers can achieve on their own. Our services span the full spectrum of business needs, including big data and advanced analytics tools, greater mobility for field personnel, and enhanced productivity and collaboration capabilities. In addition, we are constantly working with leading systems integrators and independent software vendors with domain knowledge in agriculture to bring the most innovative solutions to market.

For more information, **1800 718 177**.

