IoT in agriculture – how is it evolving and which policy areas need addressing to facilitate its uptake

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Over the past few years technology and agriculture have come together in an unprecedented way, as advances in the ‘Internet of Things’ (IoT) and big data analysis are increasingly applied to the production, processing and marketing of food and fibre.

The purpose of this article is to de-mystify the IoT and how it will change agriculture in Australia. It explores the drivers, IoT in the broader context of farming technology and why IoT is important for the future of agriculture. It looks at how the IoT is evolving in Australia, within the R&D sector, industry and government. Finally, policy areas that must be addressed to facilitate the adoption of IoT in agriculture are considered.

Introduction

In 1999, British technology pioneer Kevin Ashton coined the term ‘Internet of Things’ to describe a system where the physical world is connected to the internet via sensors. He envisaged a system where computers would gather data and track, count, monitor and understand every aspect of the physical world without the limitations of human-entered data, leading to greatly increased productivity, effectiveness and efficiencies. The Internet of Things, or IoT is now a household term.

The utopian vision for IoT is a world where anything can connect to anything via connectivity infrastructure that is significantly cheaper and far more granular than existing mobile networks, and devices can be added

1 http://www.rfidjournal.com/articles/view/4986
to the network at any place and time. Devices and applications talk to each other across the network. Data is open and shared widely, with huge amounts of data (big data) being combined, analysed and fed into cloud-based software which automates and manages almost every aspect of life.

Significant developments in standards and protocols for connectivity, as well as intelligence built into sensing devices and networks has enabled the IoT to flourish, with an estimated 10 billion internet-connected devices in 2014 expected to grow to up to 50 billion by 2020. The proliferation of smartphones has heightened progress dramatically, providing a mobile platform for human interaction with IoT applications.

Agriculture, more than almost any other pursuit involves daily interaction between humans and very complex physical environments – the land and its soil, water and vegetation, farm equipment and machinery, animals, seeds, chemicals and other inputs, fuel, vehicles, buildings, tanks and fences – the list goes on. It makes sense then that as the IoT has evolved, agriculture has become a key sector of focus.

Drivers of IoT

According to the 2015 Enabling the Internet of Things for Australia report, three key drivers are enabling the IoT – dramatic decreases in the cost of intelligent sensors and actuators; the availability of near-ubiquitous connectivity at a progressively decreasing cost per bit; and increasing sophistication in handling large volumes from disparate sources of data (big data analysis). A fourth and equally important driver is interoperability. Each of these are explored in more detail below.

Cost of sensing technology

Sensing devices measure changes in their environment and send data to a central computer to be gathered, analysed and turned into information that feeds into decision-support systems. Data from sensors can trigger actuators, components of a system that move or control mechanisms. Sensors and actuators together in the IoT can automate processes that may have been previously carried out by humans. Sensors are increasingly tiny, some as small as a grain of rice, and are being embedded into all manner of objects during manufacturing.

According to Yole Development, technology improvements and volume decreases sensor prices dramatically over the coming decade, with forecast decreases from between $2500 and $250 per device for today’s technology, to $0.05 in 2024 using printed electronics. At this price, true IoT ubiquity becomes achievable. By applying this economics to soil moisture sensors as an example and reducing the cost from thousands of dollars to just dollars per unit, it becomes affordable to have a network of them covering every soil and topography zone across the paddock. Zoning for variable rate and section control driven by on-the-go sensors will be achieved at levels of granularity unimaginable today. The challenge will be to ensure that reduced cost doesn’t come at the price of accuracy and integrity of data.

Connectivity

Developments in IoT connectivity solutions and technologies are a moving feast, there is a plethora of wired and wireless solutions being trialled and tested for different geographic dispersion, mobility, and energy requirements. One thing is for sure, connectivity will no longer be provided solely by traditional telecommunications carriers and service providers. Already LoRaWan (a Low Powered Wide Area Network) and Bluetooth networks designed specifically for IoT connectivity are being deployed in cities across Australia by local councils, businesses, universities and community groups.

Big data analysis

Sensors generate large volumes of data that must be captured, analysed and interpreted to make any sense or add any value to human enterprises. Large reductions in the costs of computer processing power and storage and the advent of cloud computing have created a capacity to gather and analyse big data and to look for patterns and trends that can be used for predictive decision-making.

Data-driven agriculture takes data collected from multiple sources including sensors, stores and aggregates and processes the data in software platforms and applications that provide a more complete picture of what is happening on the farm environment than can be discerned by human observation alone.

Interoperability

Interoperability – the ability for devices to connect, discover and communicate easily with each other, across multiple operating systems and platforms – is critical to the IoT. This requires open source standards and architectures that can be used by application developers and device manufacturers so that their services and products will communicate across the IoT.

It is early days for the development of these standards. There are a range of emerging and competing standards and choosing the right ones depends on the requirements of the industry and participants. It is a chicken and egg challenge – without adopting a standard, the IoT won’t grow, but which to choose at this early stage?

In the smart cities arena, the Internet of Things Alliance Australia (IoTAA), Australia’s peak body for IoT has advocated picking one, picking quickly and getting the infrastructure in place so that innovation and application development can get going on the network. In November 2016, IoTAA came together with the Australian Government to launch Hypercat as an IoT interoperability standard to support the development of smart cities in Australia.
In order to advance IoT in agriculture, similar decisions will need to be made, but how this occurs and who decides is not yet entirely clear.

**IoT as part of smart farming and why it is important**

‘Smart farming’ is an umbrella term that describes the adoption of digital technology allowing farm decisions to be augmented by information that comes from sensors, drones, farm software and outside sources. It also refers to the automation of farm decisions, where machines and systems such as robots, autonomous vehicles and smart irrigation systems, act in accordance to data coming in from the environment.

IoT is part of a smart farming, but not all technology for smart farms requires the IoT. Machine to machine (M2M) communications is a precursor to IoT, and is well developed in Australian agriculture, enabled by the mobile networks. M2M includes the operation of specific solutions within farms and small networks, and is characterised by process specific sensors that gather site specific data and use telemetry to send data streams back to a centralised computer. These sensors feed straight into dashboards on smartphones and tablets for use by farmers and agronomists. Connectivity is mostly via mobile phone networks. Increasingly, actuators are being embedded for alarming applications, to manage water allocation in irrigation for example.

IoT will be an enabling infrastructure for the development of increasingly cost-effective and sophisticated smart farming applications, across all sectors. While M2M farm technology is well advanced in some sectors, it is still expensive as it is often reliant on mobile networks and proprietary sensing technologies.

The transition from M2M to true IoT will take data flows from sensors and actuators out of the closed farm system, and into an open data system that involves data not only on-farm but the world at large, that is connected to the IoT. In other words, it will take farm data beyond the farm gate. It enables the flow of data from individual farms and aggregated data from groups of farms to regulators, suppliers, customers, banks, financiers and insurance providers. This is where IoT will come into its own in agriculture – in the delivery of transparency and traceability through supply chains, in opening up smart capital and payment gateways, in managing regulatory compliance, and in closing gaps between producers and their markets. This transition can be described as a move from ‘precision agriculture’, a range of individual technologies that may or may not be connected to each other that contribute to improved farm practice, to ‘decision agriculture’, whereby data from these precision agriculture technologies and other data sets are seamlessly connected and used in big data analytics for improved decision-making both on farms and along supply chains to markets and consumers.

Consumers and markets will be aligned with producers through supply chains in ways that have not previously been possible, allowing for authentication of production values and mass customisation. This vision is attracting a whole new range of players into agriculture and agribusiness, excited by the commercial opportunities for applying IoT technologies to the food system.

This also opens up a range of questions: What will be the benefits of IoT for farmers, their customers, their suppliers, regulators, and consumers? How will industry standards for interoperability and connectivity be evaluated, selected and implemented? How will the rural data drought be broken, and who will pay for and install new IoT connectivity networks? Who is thinking about the security of data – how safe is sensitive data and who is in control of the security of data over the IoT? These questions are wide open.

**Government, research sector and industry responses so far**

These questions and others are being discussed within the *Accelerating Precision Agriculture to Decision Agriculture* (P2D) project, funded by the Federal Department of Agriculture and Water Resources and involving all 15 research and development corporations (RDCs). The goal of the project is to design a solution for the role of big data in agriculture, to increase the profitability for producers, provide clarity about data ownership and access rights, and improve farming strategies. The fact that all 15 RDCs are involved shows how seriously all agricultural sectors are treating these transformative and disruptive technologies. Not only will farming and food supply chains be transformed, but also agricultural research, development and innovation.

The Research and Innovation Network for Precision Agriculture Systems (RINPAS) was established in 2014 to create a national agenda and a collaborative framework for the successful realisation of precision agriculture in Australian agriculture and includes 19 university and industry organisations across Australia. IoT development should be well served by the research sector. The Federal Government’s Cooperative Research Centre program will also play a part. The Data to Decision CRC is a research provider for the P2D project, and the agtech, IoT focused Food Agility CRC bid is awaiting news from the eighteenth selection round.

Conventional agribusinesses are investing heavily in IoT and big data analytics through a range of strategies, including internal start-up...
incubators, through acquisition, and by investing in agtech start-ups. As is well documented, big data in agriculture became mainstream when Monsanto purchased Climate Corporation for US$1 billion in 2013. All major agribusinesses and equipment suppliers including John Deere and Case IH are actively pursuing digital agriculture, having well recognised its disruptive and transformative nature.

The non-agricultural technology, innovation and investment sector has also come alive to agriculture. Agricultural technology, or agtech, is a new and fast growing sector for venture capitalists with global investment growing from US$400 million in 2010, to US$3 billion in 2015. This has generated a vibrant and enthusiastic wave of agtech start-up activity particularly in the US and Israel.

In 2016 Australia’s own agtech community emerged. Australia now has a handful of venture capital (VC) funds focused on agriculture and agtech. There were a host of meetups, pitch events and competitions including or specifically targeting agtech.

The National Farmers’ Federation teamed up with Findex to establish SproutX, a A$10 million agtech incubator, and put 100 people from SproutX, a A$10 million agtech incubator, and put 100 people from

into the space, some with deep domain expertise in agriculture, some with none.

How IoT is evolving in Australian agriculture

While images of smart farms connected up with sensors on everything that moves and doesn’t move – gates, fences, water tanks, equipment and machinery, pumps, and animals – are enticing, the reality is that IoT in agriculture is more likely to evolve from technologies, farming systems and processes that are already in use. Despite the enthusiasm of some of the newly formed agtech community intent on ‘solving the farm’ the reality is that the use of sensing technology, telemetry and M2M applications on-farm is well established, in highly integrated farm systems. The development of IoT in Australian agriculture is part of the next chapter in precision agriculture – as the P2D project title suggests.

The existing ecosystem of innovation in rural areas that provides, supports and services the use of technology on farms will naturally evolve and drive IoT to become more reliable. The farmer-led precision agriculture (PA) sector has developed strongly over the past 20 years, convening regularly through the industry association, SPAA (the Society of Precision Agriculture in Australia). PA has its own Australian start-up culture and the sector is well serviced by innovative, industry focused technology and service providers who collaborate with researchers. Many of these businesses are exporting Australian technology, including PCT-Ag, ICT International, AgWorld and Next Technologies, to name just a few. US-based company AquaSpy grew out of Australian irrigation innovation developed in Western Australia and South Australia through the 1990s and 2000s.

Until recently the focus of PA has been very much inside the farm gate, and as such, a true IoT infrastructure has not really been an imperative. The road ahead for the sector is understood however, in which data-driven decisions on-farm will be coupled with information and feedback across the supply chain and through to consumption in a ‘whole-system considerate’ approach that takes the use of sensing technology beyond the farm gate. Key to this however, is proving to farmers that letting their farm data go into upstream supply chains will add value and won’t harm their businesses.

Corporate players from the technology, communications and investment industries are now engaging with agriculture through the newly formed agtech sector in Australia. New sources of capital and funding are flowing in through agtech focused VC and other investment funds. The new agtech start-up community is building quickly and with enthusiasm. Corporates with no previous interest in agriculture are investing, for example German electronics and engineering company Bosch has injected A$2.5 million into Australian agtech start-up The Yield.

Many of these newcomers are interested in how IoT will transform food systems and supply chains. There is an on-farm focus, but with a much broader view of how farm data can be utilised to transform the food economy. This explains the interest from the banking, finance and insurance sector.

One of the challenges will be to ensure that this new injection of resources and know-how meets, engages with and

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emphasizes the existing agricultural technology sector, rather than reinventing the wheel. Deep domain knowledge isn’t everything in the start-up world, but it will help to ensure agtech is readily adopted. Australian start-up Full Profile is a great example of a new tech business being started by industry participants with deep sector knowledge. They have produced the world’s first commodity settlement on a blockchain, enabling grain farmers to be paid in real time as their grain is traded.11

**Which policy areas need to be addressed to facilitate its uptake?**

In the main, Australia is already on the right trajectory for the vision of IoT in agriculture to become a reality. The strong PA sector and its supporting rural innovation ecosystem will increasingly drive farm systems towards IoT applications. The emerging Australian agtech sector will inject new capital, know-how and resources and speed up the rate of innovation.

Bringing these two sectors together to combine the strengths of each will help the market to operate effectively and efficiently in bringing IoT to agriculture and food systems.

For both groups, addressing the need for interoperability standards and architecture for agricultural data sets is important. The technology sector understands this, but it is the agriculture sector that must engage and drive the discussion – after all, it is farm data that is at stake. US farmers have been far quicker to get out ahead of these issues through the Open Ag Data Alliance.

If there is a role for government, in addition to continued investment in agricultural research, development and extension (RD&E), it is to address rural connectivity and to ensure that data privacy and security is adequately regulated.11

**Rural connectivity**

Rural connectivity remains the most fundamental barrier. There is a data drought in many parts of rural Australia. It sounds like a broken record, but it is important to realise that decades of communication policy simply did not foresee what is occurring now. The most recent Regional Telecommunications Review in 2015 focused largely on the inadequacies of mobile and internet coverage, but did not anticipate the need for low cost IoT connectivity.

Many farmers are already privately subsidising patches for inadequate mobile and internet coverage while waiting for the NBN to catch up, but IoT connectivity is a whole new ballgame. The agriculture sector and, in particular, farmer groups would do well to look to the smart cities space for new business models and technology offerings.

**Privacy and security**

Data that moves along food supply chains will largely originate behind farm gates. To realise the full benefits of IoT in agriculture, network security and farm data privacy and security must be addressed. In the fast moving and open data development environment, these issues can be overlooked. Australian farmers are lagging behind their US counterparts in understanding and developing industry-led solutions. The American Farm Bureau took the lead in establishing a set of Farm Data Privacy and Security Principles in 2015, which has set a good standard in the US.12 This is an area that requires careful discussion in Australia and regulatory solutions may be needed.

**Conclusion**

The IoT will transform all sectors of the economy over coming years, and agriculture is no exception. Australia has its own unique strengths and weaknesses in meeting this transformative challenge. Australian farmers supported by an innovative Rural connectivity remains the most fundamental barrier. There is a data drought in many parts of rural Australia. It sounds like a broken record, but it is important to realise that decades of communication policy simply did not foresee what is occurring now. The most recent Regional Telecommunications Review in 2015 focused largely on the inadequacies of mobile and internet coverage, but did not anticipate the need for low cost IoT connectivity.

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Unlocking the economic potential of digital agriculture

There has been much recent hype about Australian agriculture entering a golden era of prosperity. There is certainly reason to be bullish. Record harvests, strong prices for many commodities, and favourable spring conditions in 2016 lifted farm confidence and saw the industry’s gross value of production surge past $60 billion for the first time. Looking forward, one of the keys to the industry’s long-term competitiveness, productivity, and profitability will be its ability to seize the opportunities associated with digital agriculture.

The Australian Farm Institute (AFI) is continuing its work on big data with a focus on identifying cases where the use of digital agriculture is likely to have high-impact profitability and productivity benefits. AFI is undertaking a detailed analysis of the current and future economic benefits of digital agriculture in Australia, examining the projected use and benefits to farm business decision-making, risk management and profitability. This work is forming part of the Accelerating Precision Agriculture to Decision Agriculture (P2D) project, a partnership that now includes all 15 Australian rural research and development corporations (RDCs) as well as other research organisations. (For more information please visit: www.farminstitute.org.au/P2Dproject)

Technological advances have dramatically reduced the costs of farm data collection. Over the past two decades there have been significant developments in machinery GPS and operating information, harvester yield monitors, automated weather monitoring technology, telemetric irrigation control systems, crop and pasture monitoring data from drones or satellites, detailed digital soil maps and soil test data, electronic livestock identification and performance monitors, and robotic dairy systems. Translating the basic raw data collected from these technologies into improved decision-making remains a much bigger and elusive challenge.

AFI’s work will include evaluating the options, merits and risks of business models to take advantage of digital technologies. It is likely that new business models will be associated with the products and services of decision agriculture, whether they are delivered by small start-ups, large companies, research agencies or governments.

Big data has already changed many sectors of the economy, including retail and financial services. The ‘digital disruption’ that new technologies and business models can bring will likely have major impacts on agriculture. For farmers, the drivers of change will come from the availability of new production technologies and decision support tools as well as new requirements up the value chain. One of the key objectives of the project is to help define the value proposition for farmers to engage with digital agriculture, as well as the benefits to the wider Australian economy.

To date, the benefits of analysed data collected from precision agriculture technologies have been fragmented and mostly confined to the US corn-belt. AFI’s work will consider case studies from the US, while exploring the factors that will enable Australian innovations. Studies conducted by other research organisations as part of the P2D project will explore key barriers to digital agriculture adoption identified by AFI’s 2016 report: The implications of digital agriculture and big data for Australian agriculture including:

- the availability of appropriate data
- the availability of decision support systems that can utilise that data
- data connectivity
- trust in systems and protocols used to manage digital information.

AFI’s research will deliver recommendations to RDCs to help ensure levies are strategically leveraged to support cross industry collaboration and the commercial application of big data in agriculture. A series of workshops for the cotton, grain, sugar, wine, forestry, dairy and meat industries will be held in 2017.
Is your farm business investment ready?

There continues to be a need for alternatives to traditional farm business structures which enhance the prospects of obtaining external capital so that reliance on bank debt finance is reduced.

The October 2016 review of farm funding models and business structures by the Australian Farm Institute (AFI) highlighted the growth in bank debt finance from A$10 billion in 1990 to today’s figure of A$60 billion. While the increase in total debt seems alarming the review also found that the rate of increase is on par with the rest of the economy and that debt serviceability and equity levels have been relatively stable.

It must be remembered however, that this increase in debt has occurred in an environment of historically low interest rates and since the end of the millennium drought, generally good seasonal conditions and high commodity prices. There remains a wariness amongst farmers and financiers alike that a return to high interest rates or a run of bad seasonal conditions would severely test the sustainability of the debt that has been accumulated.

Fund managers and capital raisers report that there is no shortage of appetite for capital to be placed in agriculture and that there is wide appreciation of the desirability of agriculture as an investment sector. This suggests it should be easy to replace or compliment bank debt with alternative capital, in the form of equity investment. Unfortunately, the reality is that very few Australian farm businesses understand what it means to be investment ready and this is severely limiting the flow of equity capital into the farm sector.

The AFI review referenced a BDO survey of superannuation fund managers1 which asked for the reasons why only 0.3% of Australian superannuation funds are invested in the agriculture sector. The survey found that the primary reason for lack of investment in agriculture was the lack of investable products, but what does this mean?

Garry Edwards (AAM Investment Group), in his presentation on investment in Australian agriculture at the AFI’s 2016 Agriculture Roundtable Conference, talked about the necessity to establish the ‘terms of the divorce before any marriage is entered into.’ Garry was referring to the desire of corporate investors to understand how they can exit investments before they make a commitment to invest. This is a challenging concept for most family farming businesses.

Figure 1 shows that Australian agricultural businesses have a disproportionately high number of partnerships and low number of company structures compared to the rest of the economy. There are real and practical reasons for this being the case. Partnerships provide stable, long-term structures that have a degree of flexibility and are suited to the extreme unpredictability of the Australian agricultural business environment. Farm business partnerships with high equity levels and spare borrowing capacity have been able to cope with long periods of drought and low returns while waiting patiently for better conditions to build equity. This is a formula that has worked for families who have no intention of leaving their businesses or setting up structures that make it easier to exit.

Traditional farm business structures may create stability and security however that can also lead to a lack of clear focus on the real profit drivers and risks associated with the business. The BDO survey found that a lack of competent asset managers was an impediment to agricultural investment and one of Garry Edwards’ key investment criteria is a counterparty that truly understands their business and its risks. Businesses that are investment ready should have a deep understanding of how profits are generated and be able to model the impact of entry and exit of external capital under a range of production scenarios.

It seems ironic, but having a clear exit path is just as important as having an attractive, well managed and profitable business for potential investors in Australian agriculture. This will be a significant cultural challenge for farm businesses as much as it will be a business challenge.

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Digital agriculture and connectivity

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Q1. New developments in agriculture, including farm machinery that has the capacity to be constantly connected to the internet and to exchange information in real time, and autonomous machinery that relies on reliable data connections, have the capacity to dramatically improve productivity in the sector. However, the sector is currently not able to take advantage of some of these developments due to poor connectivity, leaving Australian farmers lagging behind their international competitors. How can Australian agriculture best ensure it is not left behind due to poor connectivity?

David Lamb, UNE

In terms of farm operation, connectivity goes beyond office internet connectivity. Many on-farm decisions are made outside of the office (eg on the tractor, in the paddock or in the yards) and the information used to base the decisions is derived from within the farm itself, and based on data extracted from the soil, plants, animals and machinery.

The boundaries between within-farm and external connectivity are no longer distinct and it’s no longer just about mobile phone or National Broadband Network (NBN) connectivity either. It’s also about radio links and even accessing some of the satellite-direct Internet of Things innovations. Speaking to producers around Australia who have succeeded in this space, there appear as many on-farm telecommunications ‘innovations’ and potential solutions as there are farms.

Activities like the Productivity Commission’s data access inquiry, and of course the ACCC mobile roaming inquiry, are all important steps in shaping up the country to meet the rapidly evolving connectivity needs of farmers. But there is also the issue of spectrum management; freeing up segments currently redundant to the needs of existing spectrum holders, for innovative businesses to offer farmers solutions to fill that ‘last hundred metres.’

Tim O’Leary, Telstra

The use of digital technologies in agriculture has grown at a rapid rate over the past decade and is likely to continue along that path over the coming decade. But providing ubiquitous connectivity to farms is a challenge across much of the globe, including in Australia, particularly for farms that cover large unpopulated and remote areas (see Figure 1).

To ensure the potential of precision digital agriculture is realised, farms need appropriate bandwidth connectivity at a reasonable cost. Mobile satellite internet is available now but it is expensive, does not offer fast data rates and the signal can fade during rain, while local area network solutions require regular maintenance and can be complex and difficult to run.

The best technology for meeting farm connectivity requirements is mobile network coverage. It provides capacity for the basic safety of farm workers through to the operation of the most sophisticated precision agriculture tools with carrier-grade data security, and all at standard national rates that ensure remote users pay no more than people in the cities.

Australian agricultural communities can ensure mobile connectivity expands as quickly as possible across Australian farmland by promoting investment and innovation while actively opposing regulation to mandate roaming between networks, which would destroy the incentive for carriers to invest in delivering new technology and coverage. Local communities can also work together to influence the amount and location of government co-investment in mobile network improvements, including by encouraging third party co-investment.

Q2. The Universal Service Obligation (USO) ensures that all Australians have equitable access to standard ‘copper wire’ telephone services. Should the Universal Service Obligation be reframed to ensure the equitable access of all Australians to digital and data services?

David Lamb, UNE

Yes and it needs to accommodate cellular communications. But it doesn’t have to be that scary. Firstly, what do we mean by ‘Universal Service’ today, and does it carry...
the same meaning now as it was when first coined? Why not focus on offering a uniform baseline coverage; not physical access into venues, but, say based on open air signal strength offered at a certain height above ground (eg 30 metres). Then, let the market place offer solutions to blast it inside the venues and let the network operators offer refinements in terms of background network speed and capacity (eg some of the beam forming innovations we are hearing more about) to differentiate themselves? If we start with a different end in mind, say based on physical rather than people-based principles of accessibility, then we could redefine the name as well as the contents.

Tim O’Leary, Telstra

Strictly speaking the USO does not mandate ‘copper wire’ connections for universal service provision (although Telstra is currently required to maintain such active copper connections as currently exist). Other technologies, including fixed wireless network connections, can and should be used to deliver USO services where their use is more efficient and appropriate than copper.

The NBN has a mandate to provide a high-speed internet connection to every premise in Australia, regardless of geography. In most cases – perhaps all cases – the NBN service will support good-quality telephone calls. Once the rollout is complete, the NBN will provide the infrastructure necessary for retailers to supply phone and internet services to everyone.

In Telstra’s view the Federal Government should formalise this ‘universal infrastructure’ role for the NBN so that its existing general ubiquitous coverage mandate is complemented by a specific obligation to provide infrastructure at any premise on request. This, along with revision of the various technical consumer quality regulations, should replace the existing USO once the NBN has been fully rolled out.

Q3. Increasingly, on-farm connectivity is being provided commercially by innovative local area network solutions. One of the challenges with such solutions is that if the service that provides the link between the farm and the internet has limited capacity or reliability, then it severely limits the viability of the on-farm system. How can farmers be sure that any investment they make to provide on-farm connectivity is not compromised by the quality of the service linking the farm to the internet?

David Lamb, UNE

It is acknowledged that ISPs, for example, can sometimes get trapped between users and network operators for technical constraints outside of their control. This can be critical if the system being offered/used is related to safety of life or security (eg asset monitoring against theft). Who compensates? We need to develop simple processes whereby service providers establish service level agreements (for a fee if necessary) with network operators around what they consider is necessary in order for them to provide the system ‘advertised on the box.’

Tim O’Leary, Telstra

Remote locations are most economically provided with internet service by satellite technology, which is why the most remote few percent of Australian premises will be offered NBN satellite services. But satellite bandwidth is limited – far more so than NBN services provided over fixed-line or fixed-wireless technology. Such satellite bandwidth limitations could in some cases be the ‘bottleneck’ that prevents local area networks operating at full capacity, even when care is taken to ensure limited bandwidth is reserved for time-critical data transfer.

If alternative infrastructure (such as mobile, fixed line or fixed wireless) is available, farmers can address satellite bandwidth limitations by encouraging their broadband provider to continue investing in alternative infrastructure, including by supporting regulatory and policy settings that facilitate further investment. They can also encourage mobile operators to provide mobile infrastructure to their locations by supporting co-investment programs like the Mobile Black Spot Programme and encouraging or participating in private co-investment opportunities.
Policy success fails to be newsworthy

One of the frustrations associated with becoming a politician must undoubtedly be the divide between public discussion about policy matters – usually confined to criticism – and the available evidence about the positive results some policies achieve.

Two current examples are the Australian Government’s climate change and drought policies. Both these are issues on which the government has at different times received unrelenting criticism, yet available hard evidence indicates that current policies have achieved considerable success, and are working as intended.

The current government’s climate change policies have been the subject of constant criticism from some sectors of academia, some public commentators, and certainly most environmental groups. The main policy instrument currently in place is the Emission Reduction Fund auction process, under which the government has made available $2.55 billion for emission abatement projects that deliver internationally-recognised reductions in greenhouse emissions. To date there have been four auctions held, with the fifth to be held in early April. These auctions provide an opportunity for proponents who have developed an emission reduction project (utilising one of the authorised methods) to make a bid for these funds and to enter into contracts of up to 10 years duration to deliver certified emission reduction units (carbon credits) to the government that can be counted in the nation’s greenhouse emission inventory, and will help the nation achieve its commitments of a 26–28% reduction in net emissions by 2030.

To date, approximately 360 projects have been successful, and will deliver an annual emission reduction of approximately 180 million tonnes CO₂-e, at an average cost of approximately $11.83 per tonne. About 80% of these projects are on farmland, and are generating about $240 million in annual revenue for the owners of those projects. The auction process has operated very smoothly, there has been strong levels of participation, and perhaps most important of all is that the emission reductions that will be achieved will be at a considerably lower cost than most projections.

Not only is the policy delivering inexpensive and robust emission reductions, but it is also generating very significant income for farmers, and at the same time resulting in the preservation or regeneration of large areas of native forests on farmlands. It has also had minimal impact on the broader economy, and no impact on energy prices or additional costs to consumers.

Critics of the policy usually claim it is not working (which is directly refuted by the results to date), and that it will be too expensive (again the evidence is that this is not the case). A further criticism is that once the current funding is allocated (likely in the forthcoming auction) there will still be a need for further emission reduction, which means that more funding or additional policies will be needed.

This latter criticism is accurate, but the experience of the policy to date has provided some very important lessons, and an extremely robust framework and systems that constitute a ‘platform’ on which future policies can be built. Plus, all this has been achieved without the rorts, corruption and outright policy failures associated with much more grandiose policies implemented overseas! Hardly the policy failure which it is so often painted as.

The second example of a set of policies that seem to be achieving good results are current Australian drought policies. These have undergone substantial reform since 2010, and the mainstays are now enhanced incentives for drought preparation – either through grants or the ability to reduce annual tax in high income years by putting money into Farm Management Deposits (FMDs) – welfare payments for low-income farm families, and the availability of concessional loans for some farmers.

While there is no doubt that several good seasons in southern Australia and current high livestock and wool prices have been a big help, changes the government made to FMD eligibility have seemingly encouraged farmers to put money into these, with some $4.3 billion dollars held in FMDs at the end of December 2016, an all-time record for the December quarter. This means that farmers are very well-prepared for a future drought. In addition, the Farm Household Allowance and concessional loans have been very well-received, and despite some initial hiccups over loan eligibility, state governments and Centrelink now appear to be successfully administering these programs, and they are working as intended.

No doubt these policies will be tested by the next significant drought, but to date they appear to be performing very well. Perhaps the best evidence of this (apart from the FMD statistics) is that despite dire predictions to the contrary, there has not been a rash of farm foreclosures by banks as a consequence of the recent extended drought in northern Australia.

Perhaps Australians are culturally more comfortable throwing brickbats than bouquets, and that explains the lack of acclaim for these policies. However, there is no doubt that both are delivering substantial long-term benefits for Australia, and for farmers in particular. Perhaps it’s time these successes were acknowledged.
US farmland values decline for third year running

The 2016 Iowa State University Land Values survey shows that average Iowa farmland values have declined for the third year in a row. The statewide average per acre for farmland is now estimated to be $7183 which is about 17.5% lower than 2013 values, when farmland prices were at an historic high of $8716. This is the first time that prices have declined for three consecutive years, and the longest and sharpest decline, since the farm crisis of the 1980s. Lenders and analysts expect the price slide to continue for a year or two.

Dr Wendong Zhang, from Iowa State University, who led the Iowa State survey said that another farm crisis was unlikely due to steady farm income accumulation before the downturn, a stronger government safety net, and overall lower debt in the agriculture sector.

Nearly 40 countries report bird flu outbreaks

Nearly 40 countries have reported new outbreaks of highly pathogenic avian influenza of various strains in poultry or wild birds since November, according to the WHO. In mid-January, Reuters reported that the H5N8 strain of bird flu has spread in Europe and the Middle East since late last year – leading to the slaughter of hundreds of thousands of farmed birds and the confinement of flocks.

According to the Center for Infectious Disease Research and Policy, the H5N8 strain was recently found in Lancashire in the UK at a pheasant farm of about 10,000 birds – several birds died, and the rest are being culled. In Italy there has been an outbreak at a turkey farm in the Veneto region for the second time – killing 254 of 22,630 birds.

In the Czech Republic veterinary authorities, in separate reports to the OIE, confirmed two H5N8 outbreaks in backyard birds and wild birds. In Croatia, the H5N8 strain has been detected among ducks on a farm 30 km from its capital, Zagreb.

Two strains of bird flu have been detected in China this winter. The H7N9 strain has infected 225 people since September, killing at least four. An outbreak of the H5N6 strain in poultry has also occurred, with more than 170,000 birds culled since October and some live poultry markets closed.

Japan has also reported a H5N6 outbreak, at a large poultry farm in Miyazaki prefecture. Japan and South Korea have been battling a spate of H5N6 outbreaks since late 2016.

Two locations in Uganda have also detected bird flu, one in wild birds and another in domestic birds (strains unspecified).

China to invest A$580 million modernising agriculture

In September, Chinese state media reported that the Agricultural Development Bank of China, one of China’s main policy lenders, had agreed to loan at least 3 trillion yuan by 2020 (approximately A$580 million), for the modernisation of the country’s agriculture industry. The agreement was signed between the Ministry of Agriculture and the bank, to protect national food security, support exports and develop China’s seed industry, with aims to increase the sector’s efficiency and foster rural income growth.

Trump dumps the TPP

One of Donald Trump’s first acts, following his inauguration as US President, was the signing of executive orders withdrawing the US from the Trans-Pacific Partnership (TPP) trade deal.

Australian Trade Minister Steve Ciobo says a version of the TPP, ‘12 minus one’, could still be an option for the remaining countries wishing to ratify a deal, and that he had held conversations about this with Canada, Japan, New Zealand, Singapore and Malaysia.

The trade deal would need to be revised to proceed without the US. As currently the TPP needs to be ratified by six countries comprising 85% of the group’s total GDP, with the US accounting for 60%.

British farmers grappling with post-Brexit era

The dominant issue for discussion amongst British farmers over recent months has been what British agricultural policy should be once the separation from the EU has occurred, presumably in two to three years. At present, British farmers receive up to half their annual income in the form of subsidies or payments from the EU, and this funding would obviously be the first casualty of the impending separation from the EU. There is some suggestion that the UK Government has committed to maintain that level of payments to farmers until at least 2020, but what happens after that time is very uncertain.

Adding to the uncertainty is the potential future trading arrangements that will be put in place for trade between Britain and the EU. Currently, some 75% of British agricultural exports go to the EU, and British agriculture is somewhat protected from non-EU import competition by the same trade barriers that apply to agricultural imports to the EU more generally.

Any nation with which Britain might try to negotiate a trade deal in the future is likely to insist on lower trade barriers for agricultural trade – something which British farmers have stated would be devastating for them, and in particular livestock producers. So, the post-Brexit shopping list for British farmers includes maintaining current farm subsidy levels, maintaining current British trade barriers to restrict competition from agricultural imports, and negotiating lower trade barriers for British agricultural exports.

Sounds reasonable – although British taxpayers and food consumers might not see it that way!
In the news

In October the Institute released *A review of farm funding models and business structures in Australia*. Considerable media attention followed, including the articles: ‘Bank debt alternatives needed for ag says Farm Institute’, by Andrew Marshall on *Farm Online* (1/11/2016); and ‘Farmers told to seek alternatives to the bank loan, overdraft’, by Sue Neales in *The Australian* (2/11/2016).

In November the Institute held its Agriculture Roundtable Conference for the thirteenth consecutive year. Conference sessions were reported in the articles: ‘Talking Point: New index will take the guesswork out of buying farm businesses’, by Jan Davis in the *Mercury* (30/11/2016); and Andrew Marshall’s article in *The Land*, ‘Long-term ag investors are keen, but can’t find what they need’ (24/11/2016):

The Australian Farm Institute’s (AFI) Agriculture Roundtable Conference has highlighted a few home truths behind the miserly levels of investor sector support for farming, but a lack of patient, long-term investment interest was not really one of them.

AFI’s Research General Manager, Richard Heath, said financial advisory group BDO had observed investment funds were cautious about ag largely because not enough ‘investable products’ were available, and funds ‘expected’ levels of return would be too low.

Too few asset managers covered the sector and information about agricultural investment was insufficient.

Free trade agreements and foreign investment in agriculture are two topics that the Institute has been closely following for a long time. Richard Heath, General Manager Research, was recently interviewed by George Yang from Phoenix Satellite Television on the benefits of the China-Australia Free Trade Agreement for Australian agriculture, and whether recent extreme weather conditions would impact on exports to China this year (6/01/2017).

Out and about

Recently the Institute’s Executive Director, Mick Keogh, has spoken at:

- AgFutures Innovation and Investment Conference, Brisbane
- Ruralco Annual Conference, Gold Coast, Queensland
- AgLink Conference, Sydney
- AgriMinds, North Sydney
- CSIRO AgCatalyst – ‘Innovation – why should we care?’ panellist, Sydney
- International Nitrogen Initiative Community Forum panellist, Melbourne.

AFI staff update

Ed Perrett has been appointed to the role of Research Officer at the Institute. Ed has recently returned from the Netherlands where he completed a Masters of Agricultural Production Chain Management at Van Hall Larenstein University of Applied Sciences. His studies focused on value chain management and included a thesis investigating price risk management in the Australian dairy industry. Ed has experience working on his extended family’s grazing properties in Victoria and the NSW Riverina, and spent two years working for the Sheepmeat Council of Australia.

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