

Agriculture technology (Agri-tech) Expert Working Group Project Brief

The Australian Broadband Advisory Council (ABAC) is advising the Australian Government about ways in which digital and broadband communications infrastructure can be used to lift the agricultural sector's economic output and the welfare of Australians more generally, particularly in regional areas.

To assist with its deep dive into agriculture, ABAC is setting up an Agri-tech Expert Working Group (AEWG). This paper describes its brief and its initial thinking on key issues. The AEWG will help inform ABAC's advice on opportunities to increase the use of broadband networks, including by small and family enterprises (SMEs) in the agricultural sector; barriers to using digital agriculture including financial and cultural/behavioural issues; and potential implementation, communication and outreach strategies.

Agriculture is expected to benefit greatly from the digitisation of the economy. Continuing investment in telecommunications infrastructure across rural and remote areas is building a platform of connectivity for enabling technologies such as Internet of Things (IoT), Artificial Intelligence (AI) and 'big data' applications that can transform the production of food and fibre. It is expected that full adoption of digital agriculture could yield \$20.3 billion to the gross value of the Australian agricultural industry.¹

But is Australian agriculture moving fast enough in digitalisation to maintain our global edge? How are investment decisions in agri-tech being made and are they being made within the right framework and at the right level in the farm supply chain? Are we recognising and leveraging common themes, opportunities and challenges of digitalisation across the life of regional and rural communities, from agriculture, to health and education?

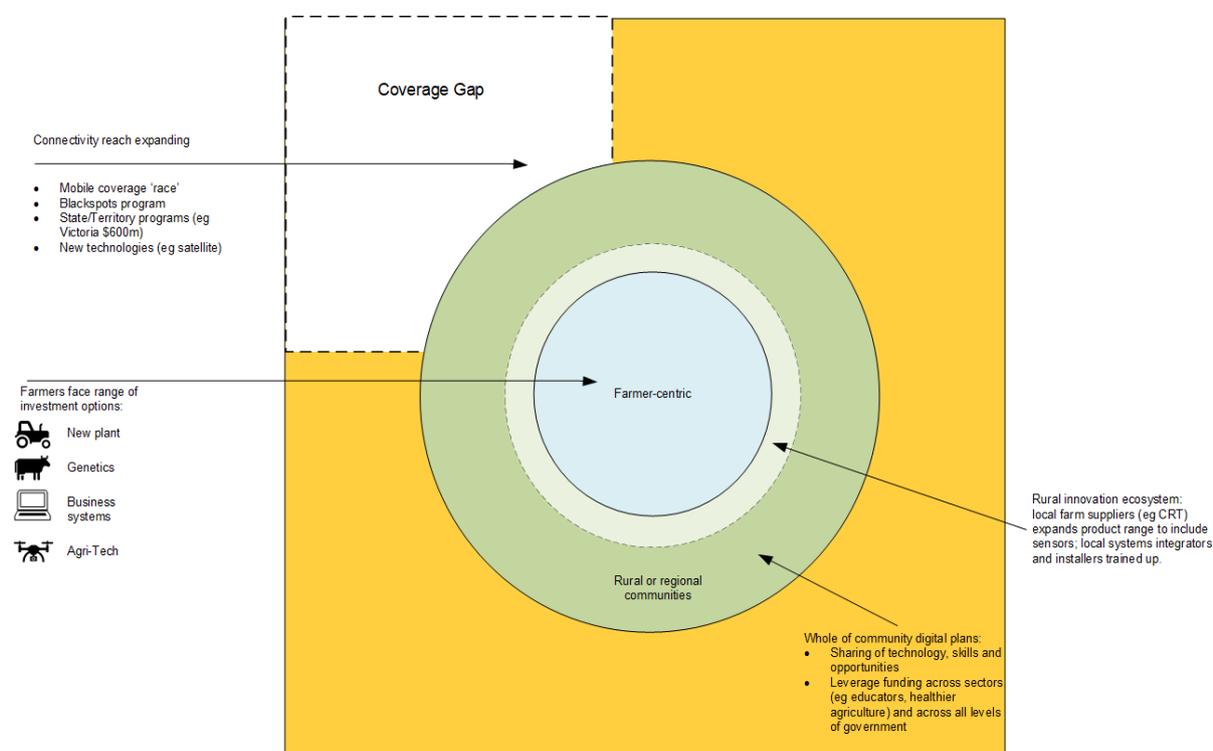
Ultimately, technology should work for people, not against them. How do we look beyond the excitement and promise of new technology to understand the impact on the economic and social life of regional and rural communities and the changes we will need to make? How can these technologies be used to build social as well as economic capital?

The acceleration of digitalisation as a result of COVID-19, and the substantial investment being made by all levels of government in regional and rural communities as part of a post-COVID-19 economic recovery plans, bring both a new perspective to these questions and a sense of urgency in addressing them.

¹ Australian Farm Institute (2019) Perspectives on growing agriculture to a \$100 billion industry by 2030 <https://webcache.googleusercontent.com/search?q=cache:RkKuhMYx3nkJ:https://www.aph.gov.au/DocumentStore.ashx%3Fid%3Dfe582978-9cca-472a-bb31-5fdcebd757dd%26subld%3D671204+&cd=8&hl=en&ct=clnk&gl=au&client=safari> Accessed 9-12-20

1. What is our focus?

The following diagram illustrates the AEWG's early thoughts on how to frame its work:



Looking beyond connectivity

Telecommunications infrastructure is needed to support growth of digital technology in Australian agriculture. In many areas of regional and rural Australia we seem close to crossing the threshold which means that agriculture will be enabled, and not constrained by connectivity issues.

The significant advances in connectivity in regional and rural Australia over recent years include:

- the continuing expansion of mobile coverage, including funded through the Australian Government's Mobile Black Spots Program, and similar programs at state and territory level. Additional funding has been included in recent state and territory budgets as post-COVID-19 recovery initiatives, such as Victoria's \$300 million funding for improved mobile coverage.
- the deployment of the National Broadband Network (NBN) has resulted in broadband speeds much faster than achieved on the legacy copper network, given the extended length of many copper access lines from the exchange in rural areas;
- many digital agricultural solutions, such as IoT-based solutions only require narrowband connectivity solutions, and can be supported by mobile networks or low-power, wide-area networks (LPWANs). There are many SME deployments of LPWANs across rural and regional areas, including cooperative farmer group arrangements
- the mobile operators have begun their deployments of 5G coverage, including in regional and rural areas
- the current and impending deployment of new low orbit satellite solutions, such as Australian start-up Myriota and Starlink.

While we do not discount the connectivity problems which many people in regional and rural Australia face, the AEWG's focus will be on the digital applications and services which can be enabled by the expanding connectivity which clearly is out there.

This is not to underplay the real connectivity challenges which continue to be faced in regional and rural Australia – with large swathes of agricultural land with no or poor coverage or as disruptively for agri-tech solutions, with inconsistent coverage across an area which could be serviced by a single application (app) or IoT solution.

To the extent that connectivity issues are likely to persist into the future, ABAC will review how these can be addressed in regional and remote Australia by consolidating the requirements of residents, farming, tourism and other local businesses and the providers of health and education services. This work will be undertaken outside the brief of the AEWG so that this more consolidated view of connectivity can be taken, and to allow the AEWG to focus on how connectivity – current and future – can be utilised to support agri-tech solutions.

Farmer-centric approach

Agricultural supply chains are extended and complex, with many participants with diverse interests. The AEWG will focus its work to pre-farm gate productivity, including issues of production, regulatory compliance, marketing, on-farm safety, and farm and community safety. As much of the technology to enable digital agriculture is at hand (such as IoT), AEWG's focus will be more on the business, regulatory and 'human capital' issues involved in the uptake of digital solutions: how farmers evaluate the 'value proposition' of agri-tech in their business, the skills they need to use it and the data sharing protections to give them confidence in using it.

Farming communities

Agriculture does not exist in a vacuum. It operates within the context of a rich and diverse ecosystem of the surrounding regional and rural area. The success of agri-tech will depend on the continued growth of a sustainable 'rural innovation eco-system', businesses co-located with their sectors, providing technology and keeping it running smoothly. This includes agriculture supply retailers stocking IoT devices, technicians who can install and repair equipment, and upskilling farming service providers and consultants, such as agronomists, who can work with farmers to apply the outputs from the technology in transforming farming practices.

Agri-tech also should not be considered in a silo from other digital initiatives in regional and rural communities. Solutions to improve the take-up of digital agricultural services are likely to be more vibrant, enduring and cost-effective if considered as part of a broader digital plan or strategy which addresses other economic and social needs of the surrounding regional and rural community. There will be synergies and shared opportunities between agri-tech and other public and private digital transformation projects in regional and rural communities, including health and education. To take a simple example, the computing and other technical support services needed for an agri-tech app equally can support remote health apps or advanced digital services used in local schools.

2. What questions will we seek to answer?

What is the state of the 'digital agricultural nation'?

As both a gauge of the 'digital agricultural nation' and to build a baseline for its work, the AEWG will identify and document the stories of the 'digital pioneers' across the 15 agricultural sectors.

Anecdotal evidence suggests that agri-tech is more advanced, vibrant, diverse and risk-taking than might be understood. This should be no surprise given Australia's agricultural industries are amongst the most efficient and innovative in the world. The same economic imperatives and entrepreneurial culture which drove the take up of earlier non-digital technologies now drives the next generation of farmers to push into agri-tech in the search for more efficiency, new products and new markets.

This does not mean that agri-tech can make its own way, with no barriers to be cleared, or no boost needed but it does mean that we are not from starting from nowhere.

Case Study: Australian adoption of Conservation Agriculture and No-Till Cropping

Australia leads the world in the adoption of Conservation Agriculture, including the practice of No-Till cropping. This farming system relies on chemical rather than physical tillage of weeds, and utilises technologies such as direct drill seeding, GPS automated steering driven by pre-set paddock maps, geospatial yield mapping on harvesters and variable rate applications of fertilisers and herbicides based on previous performance across the paddock.

Around 80-90 percent of Australia's 23.5 million hectares of winter crops are now grown this way, a remarkable rate compared with other international markets. From its inception in the 1960's and a long period of experimentation, adoption grew rapidly through the 1980's and into the 2000's, driven by capital investment by farmers and supported by sustained public and private investment in agricultural R&D²

By embracing this technology and innovation, Australia's cropping sector has enjoyed well recognised and sustained productivity increases. However a little known co-benefit has been the dramatic decrease in soil erosion and improvement in soil condition across cropping lands. Farmers understood and were motivated by the opportunity to improve soil structure and stability from the get-go, alongside the pragmatic driver of cost reduction and increased production.

What are the current and future sources of capital for Agri-tech?

A big clue in understanding what is currently happening in agri-tech – and assessing its future potential - is to 'follow the money'. Private capital already plays a key role in agri-tech. Many of the existing, mature technology providers in the rural innovation ecosystem are self-funded – a lot of energy, effort and imagination on the part of the founders and achieved with limited, if not spartan, capital resources. There is increasing sophistication and growing private equity investment in this field.

² [The development of Conservation Agriculture in Australia—Farmers as innovators](#)

Over the past few years, a new crop of agri-tech ventures has emerged, driven by the establishment of a dozen or so start-up accelerators and incubators, pitching to a small but growing field of venture capital funds and family offices. Private equity (PE) investors are now turning their attention to investing in aAgri-tech. PE investors will bring substantial capital resources and strong commercialisation skills to aAgri-tech start-ups.

Australian agriculture has a long and successful history of collaboration between Government and the private sector. Around \$3 billion per annum is spent on agricultural research, development and extension. Until recently, the main pathway for delivery of value-add has been through extension back to industry. Now, governments are increasingly supporting commercialisation pathways for agricultural research. Agri-tech ventures are being supported through state and territory Government and research sector programs including government initiated or supported accelerator and incubator programs across the nation, and demonstration 'digital farms' in livestock, cropping and rangeland settings. These programs continue to be expanded and supported through private partnerships, such as the Advance Queensland Agtech and Logistics Hub in Toowoomba.

The Agri-tech Expert Working Group will consider:

- Current investment in gri-tech, including in support of broadband connectivity and digital transformation.
- Existing trends in capital sourcing and how this might reshape the digitalisation of agriculture.

How well is Australian agriculture able to take up digital services?

The AEWG will consider:

- are there technical barriers, e.g. interoperability, or data processing constraints?
- how do we shift from mindset where farmers see data collection used mainly as a compliance tool to where they see it as an enabler for them?
- are common data standards required and how would these be efficiently developed?
- are there skills barriers?
- is capacity building required at both farm and surrounding local community level?

It is likely that the answers to these questions will differ across the 15 agricultural sectors. The working group will identify:

- current 'best practice' in each of the 15 sectors
- how the innovation adoption curve looks for each sector, have they 'crossed the chasm' and if not, why not? What are exemplars?
- the data relationships in each of these exemplars (e.g. soil moisture probe providers +/- agronomists +/- farmers)?

Understanding how digital technology can and will be adopted by farmers also requires a clear picture of the backdrop in which farm businesses operate. Farming can be a complex business requiring a variety of skills, investing in a range of capital intensive equipment and systems and involving a unique risk/return profile. Digital technology will be one of a number of opportunities open to a farmer to improve productivity and generate new business – others include more efficient physical and mechanical equipment, infrastructure such as sheds and fences, animal and plant biotechnology and more sustainable farming techniques.

In the context of these competing demands on a farmer's available capital, it is important to test whether there are our unconscious biases. Is it possible that we are assuming that digital technologies will increase productivity when in actual fact they won't? Are we looking at the right problem?

Case Study: National Livestock Identification System

There are 135,000 farming businesses in Australia ranging from highly sophisticated corporate enterprises through to small family farms, across fifteen different sectors. For most of these sectors, there is technology deeply embedded in some core aspect of the farming system. A few examples:

The National Livestock Identification System (NLIS) requires that every cow, sheep, goat and pig in Australia must be tagged, identified and traced, either individually or as part of a herd. Many tags have RFID embedded and movements are recorded and stored on the central web-based NLIS database. NLIS tagging of cattle has been mandatory since 2006 and individual tagging of sheep, goats and pigs is being progressively rolled out across the country.

There are over 50 robotic dairies operating in Australia. This includes outfits where cows take themselves in to be milked and contentedly stand on a rotating platform while laser guided robotic arms attach milking cups and then wash udders before the cow steps off and back out to pasture. RFID collars enable farmers to keep tabs on each girl in the herd from the office. The world's first robotic rotary dairy was installed at Camden NSW in 2010, Australia punches high in the use of this technology.

Over the past ten years there has been a strong uptake of soil moisture sensing probes and digitised weather stations, particularly in irrigated systems and increasingly in dryland cropping and horticulture. Cropping farm management software systems abound.

Impact of changes in regional/rural areas on agri-tech

COVID-19 has changed the way the world works – potentially no place more so than in non-metropolitan areas. This change, that literally happened overnight, was enabled by digital and broadband technology – the ability for teachers to pivot their lessons into online learning; and whole enterprises to shift work from the office, to home; and the scale of movement for Australians has shifted from 'global' to 'local'.

As a result of this pivot there is a demographic shift that is occurring right now in Australia. Urban Australians have suddenly become more 'country minded', many realising that they can just as easily work from a country town.

How this demographic shift plays out, we can't yet know. But it plays right into policies that support decentralisation and regionalisation. The movement of skills and money into country areas needs analysis within the context of this report.

Funding and initiatives maximised to promote digital transformation

Post COVID-19, there are unique opportunities for the digital transformation of economic and social life in regional and rural Australia.

There is substantial additional Government funding available for digital projects across agriculture, education, and health. There is funding for infrastructure that will have synergies with digital services, such as energy. There is funding for economic development such as tourism which would be boosted by digital services. For example:

- the NSW Government's Electricity Strategy sets out a plan to deliver three Renewable Energy Zones (REZ) in the State's Central-West Orana, New England and South-West regions
- the Victorian Government's \$115 million agricultural plan incorporating \$65 million for a new agriculture strategy to help farmers take advantage of new technology and remain "internationally competitive". Additionally, Victoria is investing \$626 million to improve mobile coverage.
- the Queensland Government's \$10 million interest free loan in support of Australia's first tier III regional data centre at Toowoomba.
- the South Australian Government's focus on the Space Industry including investment in the South Australian Space Industry Centre.

Taking a silo-ed approach between agri-tech and other digital initiatives in regional and rural areas will likely miss opportunities for shared opportunities, economies of scale, and a broader digital vision for the communities in which farmers live and work.

The AEWG will consider:

- opportunities for agri-tech initiatives to form part of a more holistic digital plan in a regional or rural area.
- how telecommunications and digital infrastructure helps to leverage agricultural productivity relative to other private and public infrastructure investments such as the public/private inland rail project funded by the Australian Government and the private Wellcamp Airport in Toowoomba and similar initiatives across the nation.

How will agri-tech play into Australian agriculture's international competitive advantage?

Australia's agriculture industry is pre-dominantly export oriented, with around 70 percent of what we produce being exported. In all of this discussion about the digitisation of agriculture, we can't lose sight of the need to maintain the competitiveness of our agricultural sector in global markets.

It is likely that Australia already leads in some aspects of digital technology that support agriculture, and this provides Australia with an ongoing competitive advantage in international markets. Whilst not the main focus of this work, keeping a lens on how we are placed in the world in the development and adoption of digital technologies for agriculture will provide global context to what we as a nation do next, and how Governments can continue to invest in and support agricultural exports.

What are the threats to the uptake of agri-tech?

Diffused or decentralised technology solutions, such as would be used in agri-tech, carry significant cybersecurity risks, which will need to be addressed robustly and consistently across agricultural sectors as reliance agri-tech grows.

Threats also need to be viewed through a wider lens. Trust amongst users is universally identified as the key to the successful uptake of advanced technologies such as AI. Speaking on AI and ethics at the University of Melbourne last year, Chair of the UK's Centre for Data Ethics and Innovation (CDEI) Roger Taylor said:³

³ [Artificial intelligence and ethics video](#)

“One of the main things that is holding [societies] back here is a lack of trust. A sense that technology is going off the rails...that data is being used in ways that are not helping [people] but designed to exploit them....all these elements are conspiring to prevent us from getting to grips with these new technologies and using them in a way that could be hugely beneficial for our populations, if we can find a way through that public trust issue.”

There is a threat that a lack of trust which may hold back digitalisation:

- currently, for many farmers, online data collection is for compliance monitoring purposes, such as livestock tagging and tracking systems. While farmers benefit from the improved integrity of the supply chain, data collection can seem a burden and can carry severe economic consequences for non-compliance, such as suspended rights to sell cattle. A compliance ‘mindset’ is not the place to start in promoting the benefits of digitalisation.
- Australians generally have amongst the highest levels of distrust in the developed world of artificial intelligence and big data. In 2019 Lloyd’s Register Foundation and Gallup found Australians were among the most fearful of AI in the developed world: 44 per cent of Australians believed AI would harm them in the next 20 years compared to the 30 per cent average.⁴
- Farmers, like other citizens, are concerned about ownership and control of data collected from them by providers of new technology and services. The Precision 2 Decision research⁵ conducted in 2017 identified deep levels of concern amongst farmers about the privacy and security of farm data. The National Farmers Federation is leading a response to these concerns through the Farm Data Working Group and launched the Farm Data Code in February 2020. This is a good start, but there is much more to be done in developing sound regulatory and data management frameworks that engender trust in the gathering, use and sharing of farm data.

How do we move to a more positive environment of trust where the ‘value proposition’ for farmers and communities of digital technologies is more readily seen and embraced?

The increased levels of government funding for digital technologies and connectivity to benefit agricultural and regional and rural communities is welcome, but there are threats here too. Funding at this increased levels cannot be expected to continue. How do we make sure that the increased government funding is used to maximum effect while it is here? How we ensure that government programs and priorities maximise and support innovation?

3. What is our approach?

This is a big, ambitious set of questions, and we have a short time in which to answer them.

We can draw on the many reports over the last few years on the opportunities of agri-tech, including ‘Accelerating Precision Agriculture to Decision Agriculture’.⁶

The Department of Agriculture, Water and the Environment (DAWE), as part of the National Agricultural Innovation Agenda, is also currently undertaking consultation on barriers to the uptake of digital technologies in agriculture to inform an Australian Government Digital

⁴ https://wrp.lrfoundation.org.uk/LRF_WorldRiskReport_Book.pdf

⁵ [Technical report: Accelerating Precision Agriculture to Decision Agriculture](#)

⁶ [Webpage: Accelerating Precision Agriculture to Decision Agriculture](#)

Foundations for Agriculture Strategy. This work has identified the following potential opportunities that government could explore further:

- building digital skills across the agriculture ecosystem, focusing on ensuring high quality, appropriate vocational education and training
- boosting interoperability across data systems and apps, potentially through creating strong governmental frameworks
- supporting improved collaboration, including partnerships, to ensure tech design is fit-for purpose in the Australian farming sector
- raising awareness of the value of investing in digital technology, including how they can lift productivity across the entire ecosystem.

The AEWG will complement this work by identifying 'industry pioneers' through:

- in-depth face to face interviews undertaken by the co-convenors – feedback from these interviews will provide a narrative of the issues and case studies as they emerge
- space on the ABAC website for 'industry pioneers' to tell their own stories.

We will also create an Agriculture Industry Sector Framework to ensure good and consistent coverage of the issues and that we don't miss anything. As digital progress in the different agricultural sectors will differ, for each sector the framework will track:

- what is current best practice (identify pioneers and early adopters), and what do the laggards currently look like?
- who are the leaders and what motivates them?
- what problems are being solved?
- what are some examples of disruptive/game changing digital technologies?
- how do these technologies add and create value?
- what are the data relationships in each of these exemplars (e.g. soil moisture probe providers +/- agronomists +/- farmers)
- what does the innovation adoption curve look like for each sector, have they 'crossed the chasm' and if not, why not? Again, what are exemplars?
- what is the adoption trajectory and is it moving at the right pace for the sector? What is needed to push it up the curve?

We will post this on the ABAC website as a 'work in progress' and invite comments and feedback we continue to populate it for the different sectors.

4. What are we aiming to achieve?

In its first report, *Riding the Digital Wave*, ABAC said "it will look at where it can have the greatest impact."

There is already a large stack of Government, academic and consulting reports on the opportunities for agri-tech in Australia. We will not be repeating this work.

We will be focused on how to realise the unique opportunities presented post COVID-19 for digital transformation of agriculture and the regional and rural communities that rely on its success. Post COVID-19, there seems to be an optimism in many regional and rural communities that things could change. But the time in which to get it right is short.

Our report to ABAC, to provide advice to the Minister for Communications, Cyber Safety and the Arts, will aim to:

- celebrate the successful agri-tech stories that are already out there
- identify gaps, threats and barriers to agri-tech take up and make recommendations about how they can be addressed by government
- highlight the existing strengths in the rural innovation ecosystem and identify the opportunities for growth and expansion through take-up and use of Australia's digital and broadband communications infrastructure
- situate agri-tech in the broader economic and social life of regional and rural communities through recommendations for the development of the 'rural innovation ecosystem'
- promote a more 'whole of community' approach to digitalisation and use of broadband infrastructure in regional and rural Australia through recommendations which leverage initiatives across different sectors, from agriculture, to education, to health, and between different levels of government.

Co-conveners

The co-conveners for the AEWG are:

- Andrea Koch is on the NFF Board and manages her own consultancy firm Andrea Koch Agtech Pty Ltd. Her experience includes 15 years in marketing and product development with IBM, Optus and News Limited, and six years leading a soil policy think tank program at the United States Studies Centre at the University of Sydney.
- Peter Waters has a long history in the telco sector with Vodafone, Telstra and GSMA, predominantly from a legal perspective, and has expertise in data, AI and connectivity for agriculture as he's currently a farmer.

For more information about the Agri-tech Expert Working Group, please email ABAC@communications.gov.au.