

5G and the Australian Agricultural Sector

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Introduction

In Australia, as elsewhere around the world, 5G, the fifth (and latest) generation of mobile standards, is currently being rolled out, and has been available for consumers to access since mid-2019. As is common with most generational upgrades, 5G is said to significantly improve network speed and capacity, delivering higher, multi-gigabits per second peak data speeds.

In addition, the fifth generation of standards promises much more than the expected upgrade to infrastructure and mobile networks we have seen with previous generations. This set of standards ushers in a constellation of new technologies, which may represent a step-change in mobile telecommunications, particularly for industry. For example, the promise of ultra-reliable low latency communication, and the ability of telecommunications providers to 'slice' up their network to service different types of network traffic and cater to specific industrial use cases, opens up manifold 5G enterprise possibilities.

One much-discussed industrial sector said to reap the benefits of 5G network technology in Australia is *agriculture*. According to the Australian Mobile Telecommunications Association, 'over the next decade, 5G will play a critical role in smart farming and precision agriculture, which promises to be the key to optimising resources and enhancing productivity' (<https://amta.org.au/agriculture-5g-will-play-a-critical-role/>).

And yet, Regional Telecommunications Reviews published in 2015, 2018, and 2021 have highlighted persistent challenges faced by those located in regional Australia. These include ongoing issues with the reliability and extent of mobile coverage, an out-of-date Universal Service Obligation, and inadequate, inaccessible, or inaccurate data on the actual performance of telecommunications services in regional Australia.

It is against this backdrop that we present findings from ten exploratory interviews conducted with participants across Australia's farming and agricultural sector in 2022. These interviews were with individuals from industry peak bodies, telecommunications providers, agri-business, not-for-profit organisations, and state governments.

Participants were asked about their expectations, perceptions, and experiences of 5G for the agriculture sector. They were also asked to reflect on what they saw as the main barriers and opportunities they have observed in relation to telecommunications infrastructure within the sector.

Our findings (a) highlight areas of opportunity in automation, compliance, and efficiency, (b) emphasise the need for continued development in expanding connectivity and coverage, and for (c) improved education around the value of 5G to the sector, as well as (d) recognition of the sector's diverse needs for connectivity. While respondents generally expressed positive views about the integration of 5G across the sector, they nonetheless saw it as one part of a larger system of connectivity options.

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Findings

1. Connectivity and coverage barriers persist

A common theme throughout interviews emphasised that accessing a baseline level of 3G or 4G connectivity remains an ongoing challenge across the farming and agricultural sector. Minimum standards of connectivity therefore may need to be met before many will be interested in pursuing 5G. As a respondent from a state Agriculture body observed:

The rural guys have been pretty well bitten by a lot of these technologies. You can still go to any farm today and you still won't get coverage.

Some participants reported farmers are fearful they will be left behind when the 3G network is shut down in favour of 4G, 5G, and beyond. On the question of infrastructural investment, there is therefore a desire to see the prioritisation of these areas that are currently lacking base-line connectivity. One respondent from an industry peak body explained:

I'd hate to see a rollout of 5G technology in an area that's already serviced by high-bandwidth connections. Let's target some areas where there's better bang for buck. The businesses that we represent are perhaps a bit different to what you might see in other parts of ag supply chains. We're talking about facilities that employ 500 people, 1000 people, 2000 people. They might have a billion dollars of turnover and they're typically the largest employer in the regions that they operate in, and a lot of them have got nothing in terms of connectivity – literally zero – and we're talking literally the biggest business in the community. If I was to be angling for any advice, it'd be certainly to prioritise on that basis.

Adding to this sentiment, a respondent from a not-for-profit organisation reflected:

At the end of the day, to utilise 5G, you've got to have the towers. So, until we get to a point where Telstra says yes – or whoever it is – 'I want to put a 5G tower out in Wagga Wagga', or Wodonga, or wherever it is, there's not going to be that adoption.

Attendant to the need for rural telecommunications infrastructure, there is likewise a concern over the ongoing maintenance of that infrastructure – as the above respondent noted, 'If it breaks, who's fixing it?'

2. Need for education and clarification around 5G use cases

Respondents highlighted concerns around education and technical knowledge as another key barrier in the utilisation of 5G technology within the farming and agricultural sector. This is

manifesting as confusion around use cases for the technology, particularly in terms of how 5G will benefit the day-to-day operations and/or bottom line for those working in the sector. As one respondent from state government noted:

There's got to be a clear use case. There's got to be a clear benefit. The numbers have to stack up, otherwise they're just not going to be interested . . . Expecting farmers to deploy Agtech on their property when no one can tell them how much it's going to generate in additional income for them is an uphill battle already.

Adding to this, another respondent from a telecommunications provider observed that, alongside connectivity barriers:

There is also a very significant skills and awareness problem. Indeed, in some cases, the industry hasn't yet formed an opinion on how to even understand whether a particular technology or digitisation in a particular area adds value or not.

However, this need for greater education and clarification surrounding 5G in the sector was qualified by a respondent from a digital agri-business who observed:

I think that there's a tendency to see farmers and to see growers as not particularly technical. I think they're really quite technical, generally speaking. People don't pick up things that aren't actually going to help their business, so, they're discerning, absolutely. I'm starting to see the change in – rather than, 'Why should I adopt this?' or 'Why should I do this?' it's, 'How do I get started?'

This respondent registers a preparedness on the part of often tech-savvy farmers to, where possible, adopt newer technologies that they think will positively impact their business.

3. Diversity in needs complicates 5G integration across the sector

Another complicating factor in the uptake of 5G technology across Australia's farming and agricultural sector relates to the great diversity in operational needs for constituents, which makes it harder to rollout a standardised approach to 5G. As a state government respondent observed:

Agtech is dozens of different types of devices with dozens of different types of user cases across at least six different major agricultural industries.

The standards of required connectivity differ greatly across these various setups and systems, and the utility of 5G connectivity is therefore dependent on these particular functionalities and operational needs. A participant from the telecommunications sector explained:

A lot of people judge connectivity on that thing [smartphone]. So, if I can't stream the Kardashians in 4K glory on that, then I don't have connectivity. But connectivity for a pump sensor is very different to [...] doing video analytics to establish if there is trash in a header ditch, or not, before a pump starts. So, understanding what connectivity means for different applications, what the toolbox of connectivity is, and then choosing the right tools.

It is not only imperative to recognise these diverse requirements, but to consider whether and how 5G technology can meaningfully meet use cases.

4. The sector is taking initiative

For all the challenges outlined above, Australia's agricultural sector is taking initiative when it comes to improving connectivity and technological integration. Farmers and agricultural teams are implementing independent workarounds to address their connectivity needs, showing that 5G is not always the best option. As noted above, there is a reluctance to introduce changes without first establishing there are clear and well understood benefits for farmers, who do not have the time or resources to take unnecessary risks every time a new technology is released.

Mesh networks and private networks are being set up to fill the gaps in nationalised coverage infrastructure, to ensure that farmers can access the level of connectivity they require for their operations and daily life. This makes apparent the inequity between those who are included and excluded from existing coverage. Farmers and agricultural businesses must bear the costs of these initiatives to catch up to the populations within coverage range. Of course, they are only expending these costs because they see the value-for-money benefits of improved connectivity for their businesses. One respondent discussed an example where a property installed a booster enabling Wi-Fi with a 3km radius, along with vehicle-mounted Wi-Fi rovers, and the \$15,000 outlay costs were recouped within the first year of use because of the enhanced efficiency.

A respondent from the telecommunications sector argued that issues around connectivity should not be used as a 'cop out' for avoiding digital innovation. They explained:

There are coverage technologies that can get pretty much anywhere in the country one way or another. It's a matter of understanding the tools and the business case to do it. So, yes, there are the cellular technologies. There is also Wi-Fi. There is LoRaWAN. There is geostationary and low earth orbit satellite technology. There is quite a rich toolkit available. It's a matter of understanding the economics and understanding how to construct the business cases to be able to get the level of connectivity that you need.

Likewise, a state government respondent explained how just putting up more towers is not the answer:

I've been approached by a number of organisations now wanting to talk about, 'Should we put up more cell phone towers? Where should we put the cell phone towers?' I don't think 4G is the answer. I certainly don't think 5G is the answer. I think it's: how do we encourage farmers to set up their own wireless networks now to ensure that we're placing the backhaul capacity in the right spots to ensure that those networks operate as they should? Do we go out, and do we identify 20 or 30 farms who want to install a mesh network and then site our 4G or 5G tower in an area where it gets best coverage for those farmers? Just randomly plonking towers in black spots is not the answer. Not for 4G, certainly not for 5G, because it's more towers to cover the same spot.

Sky Muster is another option being taken up among these alternatives to standard coverage, though it remains a less desirable choice. As the same respondent noted:

[Sky Muster], you're bouncing a signal off a satellite, so latency and lag are going to be a significant issue. Atmospheric interference and other things also seem to cause an issue with that. [Sky Muster]'s seen as an unreliable and very expensive solution. 4G is preferred because it's more reliable. Farmers understand it, and it seems reasonably cost effective.

Another respondent, who relies on Sky Muster, noted that when latency exceeds more than half a second, they cannot access their myGov website:

Irrespective of the strength of the signal, if you have latency, you can't seem to run myGov, which means you can't do your online tax returns. This stuff drives producers nuts.

What comes through here is how Sky Muster offers an additional or alternative form of connection, yet it is an often less than ideal option given the strong signal and low latency requirements of farmers.

5. Opportunities for the sector

The aforementioned challenges notwithstanding, respondents also highlighted opportunities enabled by 5G technology integration in the farming and agricultural sectors, in areas such as automation, compliance, virtual and augmented reality, provenance tracking and certification, and efficiency. They expressed an overall view that it is unhelpful to focus on the existing deficits in coverage, where farmers and agricultural businesses can instead be looking to make the most of the possibilities and opportunities that are available.

A state government respondent spoke about the processes required to enable automation, which will rely on adequate connectivity:

The real frontier is in automation, farm automation, so that's what we're doing. So, to have automation in a farm, your measurements and your accuracy, everything that you want to automate has to be established, and that information has got to be secure and updatable, and then readable by any machine that you want to bring into the farm. So, the robotics revolution is there, but there's going to be a lot of work at the farm level to ensure that it's operating.

Another respondent from an industry peak body pointed to the potential opportunities in auditing and compliance enabled by 5G technologies:

A good example would be a food safety auditor. So having them actually based in Canberra or a capital city somewhere but be able to undertake an audit remotely and not actually physically come to the plant to do that. That's something that's obviously really important for our industry, but one of the main constraints we have is, obviously, a VR headset is streaming a pretty high quantum of data and that's just physically impossible in some of the existing plant operations. So, opportunities like 5G are there.

From these respondent insights, perceived longer-term benefits of 5G for the agricultural sector are viewed as being around opportunities for increased automation and in response to logistical and inventory management challenges, including improved auditing, compliance, and product verification.

6. Cautioning against the 5G hype

While most respondents acknowledged the potential and existing benefits of 5G for Australia's farming and agricultural sector, a final theme that emerged from the interviews was a sense of reservation in over-stating the necessity or novelty of 5G. Though 5G is valuable for some use-cases, 4G is already fulfilling the needs of many everyday functions. As one respondent reflected, 5G is not 'mission-critical' for the sector:

I'm going to suggest that 5G in agriculture is not mission critical. Just having 4G, having a baseline, tens of megabit-per-second telecommunications backbone all over the country, is mission critical. Whether it's achieved by 4G and a few bits of 5G that pop up, so long as there's a minimum level.

For this respondent, 5G is

just part of the mosaic. It's not the silver-bullet solution, but it's part of the mosaic on offer.

In addition, one respondent emphasised the importance of not over-promising in trying to integrate 5G across the sector:

Going out there and promising 5G's going to change the world, all it's going to take is one farmer to look at it and go, 'Yeah, but I could do all that with a [LoRa] network or a farm Wi-Fi network on 4G or something else and it's not going to cost me anywhere as much,' and things start to fall apart. Don't over promise. Don't over hype. Be very clear about where it adds value, how it adds value and focus in on those areas.

The same respondent also highlighted the importance of recognising that alternatives to 5G might have equal or more benefit in some situations, and that 'railroading' farmers and agricultural businesses down the 5G path may exacerbate existing resentments:

I think somebody has to stand up and weigh the pros and cons of each of these technologies, and provide an unbiased source of information so that people in rural areas can make an informed decision. Being railroaded down the NBN path with [Sky Muster] has just created a massive amount of resentment. The fact that 4G coverage is patchy has created a massive amount of resentment. I don't see 5G solving those problems. I see 5G, actually, if it's not done well, exacerbating those problems and creating even more resentments.

Conclusion

This report summarises key insights from ten exploratory interviews conducted with participants across Australia's farming and agriculture sector. Our findings: (a) highlight yet to be fully released areas of opportunity in automation, compliance, and efficiency; they (b) emphasise the need for continued development in expanding connectivity and coverage, particularly in regional and rural areas; they (c) emphasise the value of improved education around the value of 5G to the sector; and, (d) call for greater recognition to be paid to the sector's diverse needs for connectivity. While respondents generally expressed positive views about the integration of 5G across the sector, they nonetheless were cautious not to overhype it, tending to view it as just one part of a larger system of connectivity options.