

Connecting Australian Agriculture

November 2021



CONNECTING AUSTRALIA

100% CONNECTED

In this report:

The role of digital
technology in agriculture

To the farmhouse and beyond: leaving no paddock behind



100% CONNECTED

IN-PADDOCK CONNECTIVITY

Connecting Australian Agriculture

November 2021

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Acknowledgement of country

nbn acknowledges the Traditional Custodians of the land, seas and skies and we pay our respects to Elders, past, present and emerging across Australia.

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Regional Connectivity Program - improving connectivity in regional Australia



nbn™ Fixed Wireless overcoming agricultural black spots



Landcare and nbn - bringing sustainable outcomes into the digital future



How nbn™ satellite technology is monitoring the weather



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Foreword

Australian farms are on the brink of a digital transformation that may hold the key to industry's \$100 billion vision. Unlocking this potential will require a step change in collaboration between farmers, technology vendors and network operators.

In 2016, economic modelling found that full adoption of digital agriculture could increase the value of Australia's farm output by \$20.3 billion per annum (a 25% increase on 2014-15 levels). Research by **nbn** found that about three-quarters of this uplift could be achieved through internet-enabled digital agriculture.

The scale of this opportunity is comparable to historic leaps forward in agricultural production led by advances in genetics, or crop protection products - and it is exactly the sort of boost required to meet the farm sector's goal of becoming Australia's next \$100 billion industry by 2030.

Farmers are no strangers to digital innovation. Australia has long been a global leader in development and adoption of precision farming tools - with Australian companies like Beeline pioneering GPS navigation systems more than two decades ago.

The difference in this next chapter lies in connectivity. A new generation of connected tools is enabling remote sensing, automation, and unleashing the power of big data. Of course, this now intensifies farmers' demands on network infrastructure.

We know that connecting Australia's regional, remote and rural properties is not without its challenges. However, regional Australians are now gaining access to a greater number of options to get their homes, businesses and paddocks connected. The goal of connecting Australia's vast interior is growing more achievable each year.

Innovative Australian companies are leveraging the connectivity provided by networks like the **nbn**, to extend connectivity beyond the farmhouse and into the paddock - providing coverage that would not have been viable only a few short years ago.

This new breed of locally grown network solutions holds enormous promise, as we look for ways to complement and extend the reach of traditional networks.

For the National Farmers' Federation and **nbn**, this opportunity lies at the heart of our partnership.

Together, we're working to promote awareness of these technologies, and help farmers take a more proactive role in their own connectivity.



We have just signed a new, three-year partnership which places improving digital literacy, education and awareness of digital agriculture at the heart of the task of lifting the adoption of digital agriculture in Australia.

This paper is the beginning of this journey. We've invited participants in the digital farming landscape to share their perspectives on how new technology and connectivity options are making our farms better connected and more productive.

Achieving full digital adoption across Australia's farm sector is a mammoth task. It's a task larger than any one entity, and one that won't be achieved overnight. Success will hinge on partnership and collaboration. It will require innovation and risk taking.

Together, we're committed to playing our part to help realise the benefits of this transformation.

Fiona Simson

President,
National Farmers' Federation

**Stephen Rue**

Chief Executive Officer,
NBN Co



Message from the Minister



The Australian Government recognises that widespread adoption of digital agriculture is critical to lifting the value of Australian agriculture from \$60 billion to \$100 billion by 2030.

The Australian Government is committed to working with the sector to help support agricultural producers to grow their businesses, create jobs and enhance the economy through digital connectivity. The rollout of the **nbn**[™] network across regional Australia is a critical part of enabling digital agriculture, along with programs such as the Mobile Black Spot Program and the Regional Connectivity Program.

Based on research undertaken by **nbn** in 2020, we know that connectivity, combined with the right digital technologies, could increase the sector's gross value of production by \$15.6 billion per year by 2030, an increase of 20 per cent. This research shows that digital technologies can make the biggest difference to agricultural output in three key ways: decision support, which has an \$8 billion productivity growth potential; monitoring & sensors, which has a \$4.3 billion productivity growth potential; and robotics & automation, which has a \$3.3 billion productivity growth potential. The digital technologies opportunities in agriculture are enormous and span the digital spectrum, from sensors that monitor plant health and animal health, to autonomous tractors. Supported by ubiquitous connectivity, digital technologies offer significant opportunities to improve efficiency and productivity.

The Australian Broadband Advisory Council is currently exploring how the benefits of connectivity – both economic and social – can be realised by farmers and rural communities. While the Council has found an increasing range of sophisticated agri-tech solutions are now commercially available, the challenge now is to drive adoption beyond the 'self-starting' agri-tech pioneers across the sector more generally. This will require supporting farmers to understand the connectivity options available, to identify the agri-tech solutions that can be supported by that connectivity (and which are fit for local conditions and will help drive across-the-farm efficiencies) and to find ways that will allow them to integrate digital technologies into everyday farming practice.

The Hon Paul Fletcher MP

Minister for Communications,
Urban Infrastructure, Cities and the Arts

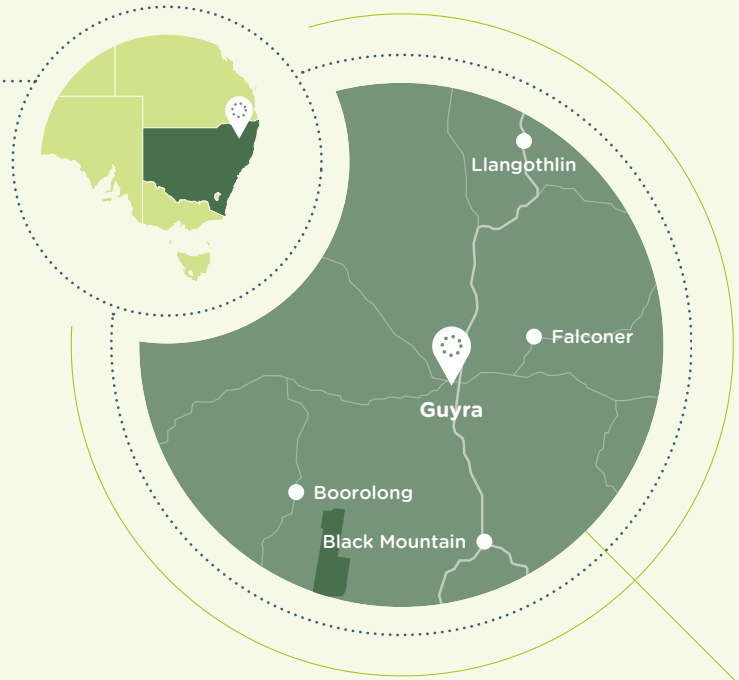
Case study

Regional Connectivity Program - improving connectivity in regional Australia

Costa is Australia's leading grower, packer and marketer of fresh fruit and vegetables, and operates across five core fresh produce categories - glasshouse tomatoes, mushrooms, citrus, berries and avocados. At their glasshouses at Guyra, in northern New South Wales, Costa currently has access to ADSL and nbn™ Fixed Wireless technology.

Costa was successful in receiving funding through the Australian Government's Regional Connectivity Program to change their nbn™ access technology covering two sites located at Guyra from nbn™ Fixed Wireless to nbn™ Fibre to the Premises (FTTP). This involves nbn deploying fibre optic technology to Costa's business premises. nbn™ FTTP will deliver a fast and reliable connection that helps future proof Costa through FTTP's ability to scale in speed as the business' need for higher broadband speeds grows. The switch to fibre will enable Costa to expand and enhance its digital access, especially in the area of robotics, Artificial Intelligence, big data analysis and Internet of Things.

The upgraded IT will also enable Costa to continue to be an industry leader in the investment and development of protected horticultural cropping, which is a billion dollar-plus industry in Australia and provides employment for 10,000 people.

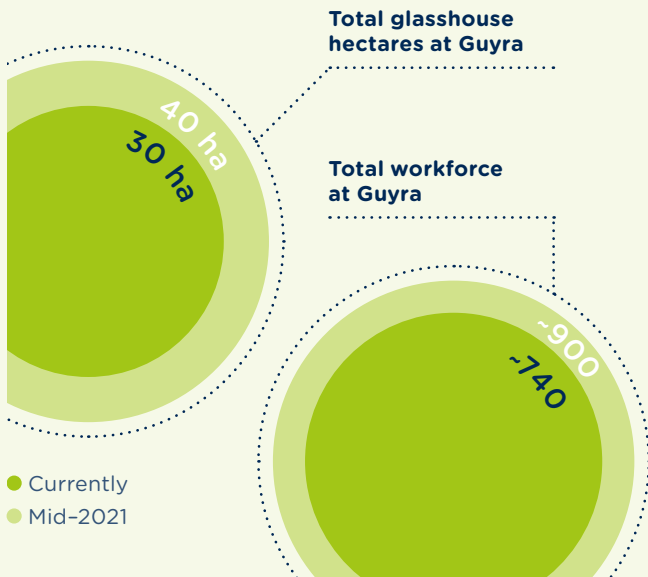


Costa is currently completing a \$75 million investment in constructing a further 10 hectares of glasshouse at Guyra (bringing the total hectares to 40) which will increase their total workforce by 160 to around 900.

Costa's operations in Guyra provides an important means by which hundreds of workers and their families can live and work in regional Australia, and pursue meaningful careers with a large enterprise which is at the forefront of Australia's hi-tech horticulture industry. Costa Group spends approximately \$31 million annually on wages and salaries in the local economy.

The investment is expected to improve economic and social outcomes in the Guyra region and beyond, creating a number of multiplier benefits, including opportunities for educational facilities, such as the University of New England and TAFE NSW to embed and develop targeted agricultural courses for local students.

\$75m
investment project at Guyra






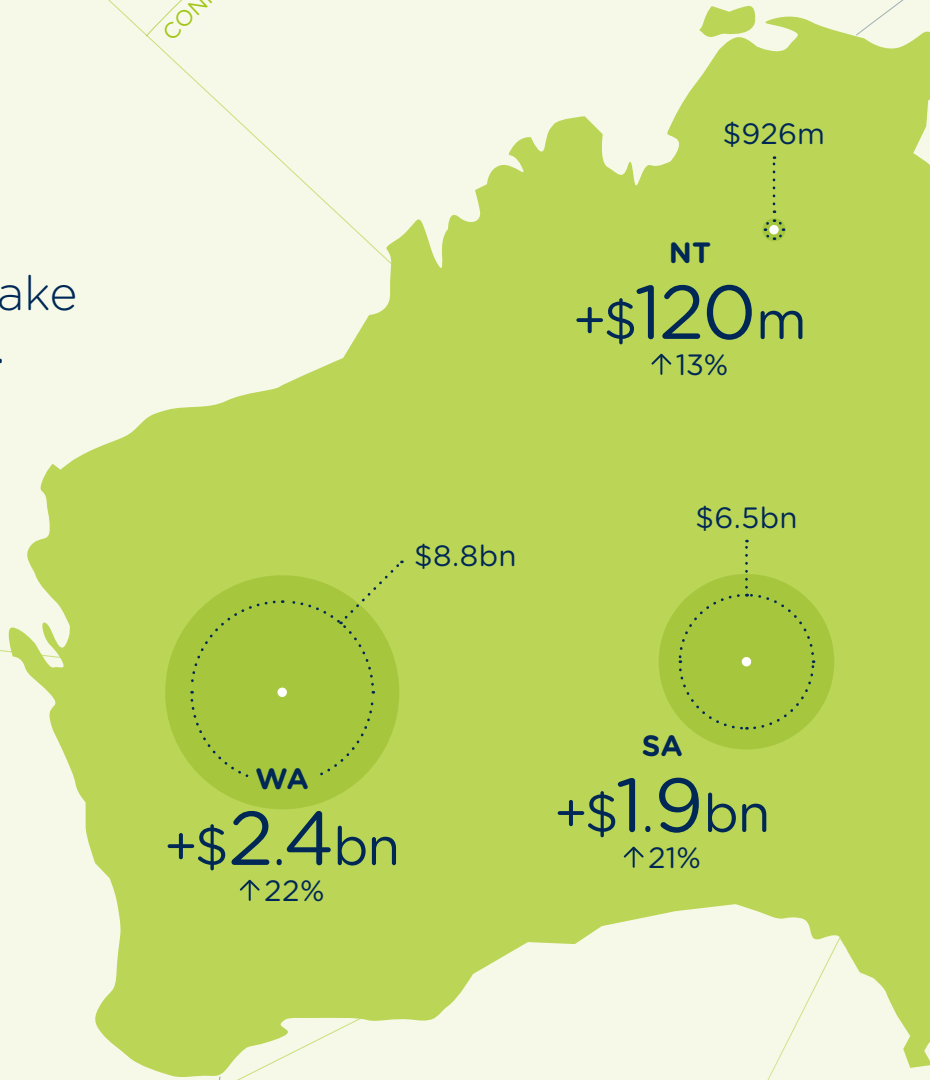
Connecting Australia

Agriculture is a major driver of the Australian economy. The **nbn™** network can enable farm business to save time, grow productivity and make more informed decisions.

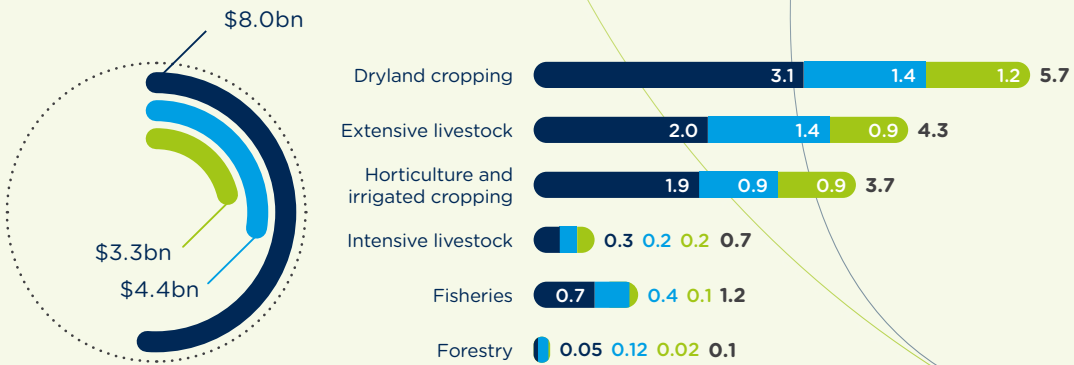
CONNECTING AUSTRALIA'S 300,000 FARMERS

Technologies enabling growth


-  Decision support
-  Sensors & monitoring
-  Robotics & automation



Impact of internet enabled technologies on national farming, forestry and fishing Gross Value Added by subsector



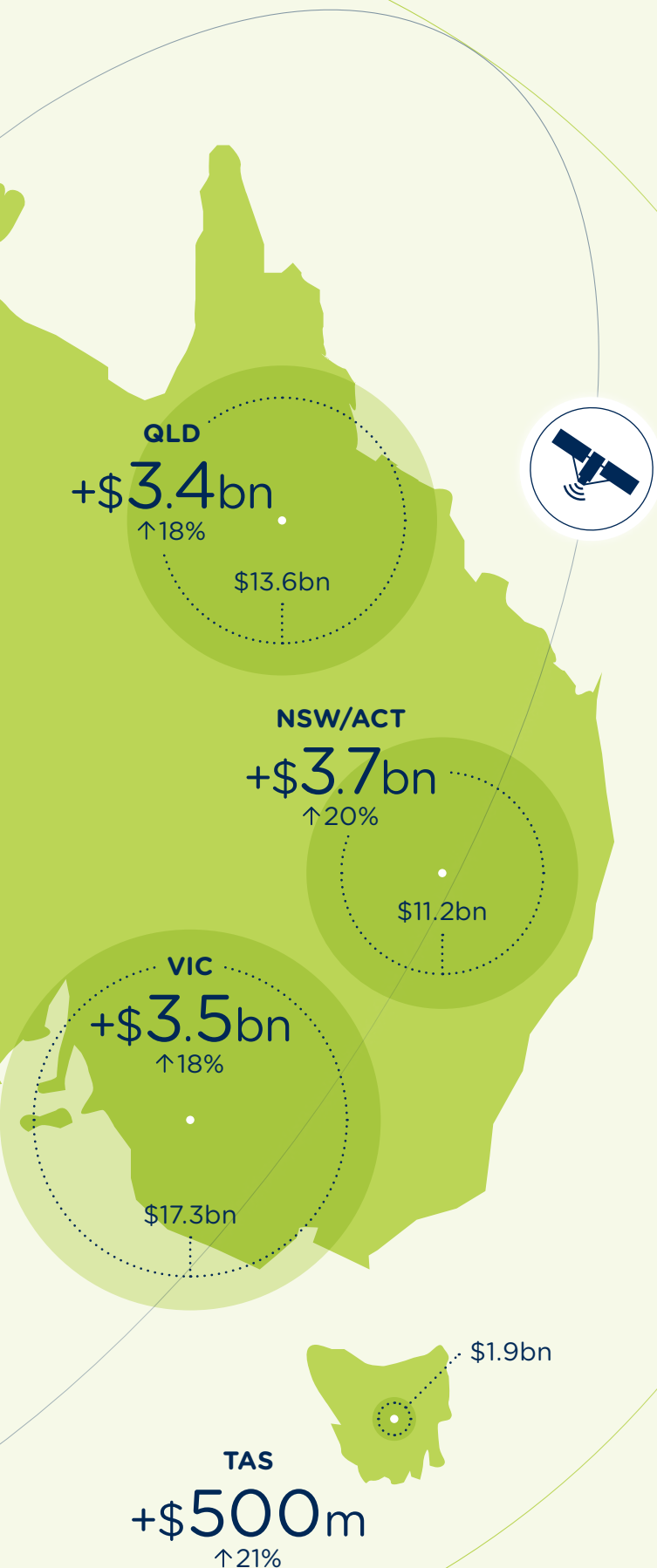
 Current value of ag production¹

 Potential value add to sector

 Potential gross value added increase

● Decision support ● Sensors ● Robotics

¹ As forecast for 2019/20
SOURCE: Precision 2 Decision project, CSIRO, ABS, ABARES, expert interviews, AlphaBeta analysis



By 2030 internet-enabled digital agriculture could add up to

\$15.6bn

to the value of the sector.

↑ 20% increase

The key to unlocking this digital agriculture revolution is on-farm connectivity. Research commissioned by **nbn**, which built on the Australian Farm Institute's *Accelerating Precision Agriculture to Digital Agriculture* research, found that 75 per cent of the increased production attributable to the unconstrained adoption of digital agriculture requires internet connectivity.

The research highlights the critical role that the **nbn**[™] network can play in enabling the National Farmers' Federation's vision of Australia's agriculture sector being worth \$100 billion by 2030. Under the plan's third pillar, digital, connectivity and innovation are essential drivers on the pathway to \$100 billion – the **nbn** research demonstrates just how important internet-enabled digital agriculture can be.

A recent report by the Bureau of Communications, Arts and Regional Research² found that the **nbn**[™] network was the first continent-wide network offering ubiquitous, fast broadband³. This same research found that the benefits to agriculture, after accounting for the necessary infrastructure investment, could be as high as \$10 billion by 2030.

One of the benefits of the **nbn**[™] Sky Muster[™] Satellite network is its capacity to service every corner of Australia – as you will see later in this paper, **nbn** has been trialling solar-powered satellite solutions to support agricultural Internet of Things (IoT) solutions in remote southern Western Australia. Proving this capability ensures that Australia's farmers – no matter where they are located – can get access to the connectivity they need to drive better on-farm decision making.

Getting connected, though, is just the beginning – once a landscape is connected, the opportunities to map, monitor, manage and move the farm business in a new direction really take off.

² "Economic impact of ubiquitous high-speed broadband: agriculture sector", Bureau of Communications, Arts and Regional Research, Australian Government, May 2021

³ Specified as being 25/5 Mbps

The role of digital agriculture in industry's pursuit of \$100bn in pre-farm gate value by 2030



Digital technologies are rapidly changing our social and economic environments, accelerated by the COVID-triggered exponential uptake of digital workflows.

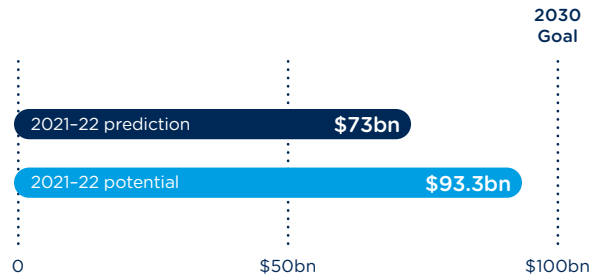
Digital agriculture is helping the sector address the law of diminishing returns (exacerbated by climate change) as a means of growing more with less. With productivity growth all but stalled¹ in the sector, it has never been more important to use digital tools to improve efficiency and sustainability.

Four years ago the Accelerating Precision Agriculture to Decision Agriculture research project predicted that full adoption of digital agriculture could increase the GVP of agriculture by approximately 25% - i.e. \$AU20.3 billion². If fully realised, digital agriculture thus has the potential to lift GVP from its current predicted \$73bn in 2021-22 tantalisingly close to the 2030 goal of \$100bn in pre-farm gate value. By improving enterprise efficiency and natural capital resilience, digital agriculture is also vital in meeting sustainability challenges in a resource-constrained future.

1 <https://www.farminstitute.org.au/why-has-australian-agriculture-productivity-growth-stalled/>

2 Perrett, E., Heath, R., Laurie, A., & Darragh, L. (2017a). Accelerating precision agriculture to decision agriculture—Analysis of the economic benefit and strategies for delivery of digital agriculture in Australia. Australian Farm Institute.

GVP of Agriculture



Yet despite this significant value proposition, the adoption of digital technology is far from universal across Australian agriculture. Connectivity and capacity are significant stumbling blocks on the path to realising the full productivity gains which digital solutions offer the sector. To address this, acceleration of both digital infrastructure investment and tech adoption incentivisation should be focus areas of equal importance for decision-makers.

Katie McRobert

General Manager,
Australian Farm Institute

Achieving agricultural productivity and sustainability gains with LoRaWAN IoT Networks and Solutions



With over 100 million end devices already deployed globally, LoRaWAN®, a Low Power Wide Area Network (LPWAN) technology, is the de facto LPWAN technology of choice for IoT solutions, due to its ability to meet 100% of all coverage needs.

As part of Agriculture Victoria's \$12m On-Farm Internet of Things Trial, NNNCo rolled out over 140 gateways to hundreds of farmers across 32,000 km² in regional communities, leveraging the flexible form factors and low power of LoRaWAN gateways. The trial is breaking down key barriers to the adoption of digital agriculture, providing farmers in regional Victoria access to a wide range of IoT Solutions. The establishment of network connectivity and delivery of data from apps and devices to a data lake have contributed to key deliverables and objectives of the trial, which has provided more than 300 farmers with grants to support new investments in digital technologies, and improved connectivity on-farm.

The nbn™ network has brought broadband connectivity to the farmers' doorsteps and the NNNCo LoRaWAN IoT network is bringing connectivity and solutions across the paddocks.

NNNCo is also nurturing a strong ecosystem of IoT Solution Providers, like GoannaAg, who are building smart agricultural applications to improve productivity for cotton irrigation using the LoRaWAN network. This is using wirelessly connected sensors to improve the monitoring of cotton crop water supplies and moisture levels.

By adjusting irrigation to optimise production, GoannaAg's pilot program with CSIRO demonstrated that smart irrigation technology can generate an additional \$177 in net benefits per hectare per season, a seven-fold return.

Smart agricultural use cases include better water and energy management, asset and people tracking, carbon measurement, virtual fencing, cattle monitoring, fertiliser use, etc.

NNNCo's N2N-DL IoT Platform harmonises access to a vast array of sensors and devices, empowering agtech vendors to deliver new capabilities for Australian farmers. Aggregated data across industries and geographies will also drive enhanced financial and insurance products.

David Spence

Co-Founder and Chairman,
NNNCo

Building a digital food future, one innovation at a time



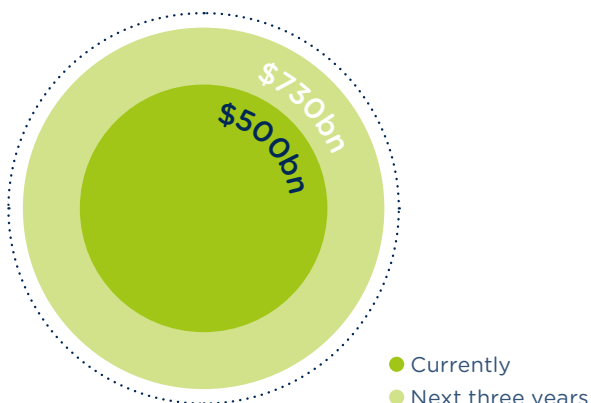
Innovation in Australian agriculture is not new. Australian farmers, supported by the research and extension system in which they operate, have been driving the creation of new technologies and farming systems since well before “agtech” was a word.

“Agtech” is a new phenomenon, characterised by the entrance of new players (e.g., startups and venture capital investors), new business models (e.g., software-as-a-service), and new technologies (e.g., robotics and machine learning).

Agtech is about creating new ways of solving industry problems, and has the potential to deliver massive value to agriculture, helping farmers be more profitable and sustainable, and creating new jobs and even new industries.

Although agtech is separate to agriculture, it is highly complementary. Today, the global market for agtech products and services is estimated at \$500bn and is expected to grow to \$730bn in the next three years.

Estimated Global market for agritech products and services



Some of the ways we see this happening:

Rapid business model evolution

Established companies often struggle to meet the changing needs of consumers quickly enough and get stuck in the mindset of “we’ve always done it that way.” Agtech startups break down these barriers and bring solutions to market at speed, ultimately able to deliver novel solutions and lasting value to producers.

Rejuvenated regional communities

As farming continues to use more digital technology, new skills and new jobs will be required to support farming systems and equipment.

Producers as more than agtech customers

Agtech presents new ways for producers to get involved in innovation, such as being the innovators themselves, providing feedback to ensure products are fit for purpose, and being advisors or even investors.

At the AgThentic Group, our mission is to help innovators build the food system of the future. We do this through our advisory work, where we help agribusinesses evaluate and engage with the agrifood innovation ecosystem, and through our investing work, backing agrifood startups such as Goterra, Vow, RapidAIM, and Swarm Farm Robotics.

We, alongside many others, have also helped to advance our mission by fostering a thriving, collaborative agtech ecosystem in Australia, recognising that many different perspectives – from farmers to startups to investors to agribusinesses – are required to solve the challenges and capitalise on the opportunities ahead.

Sarah Nolet

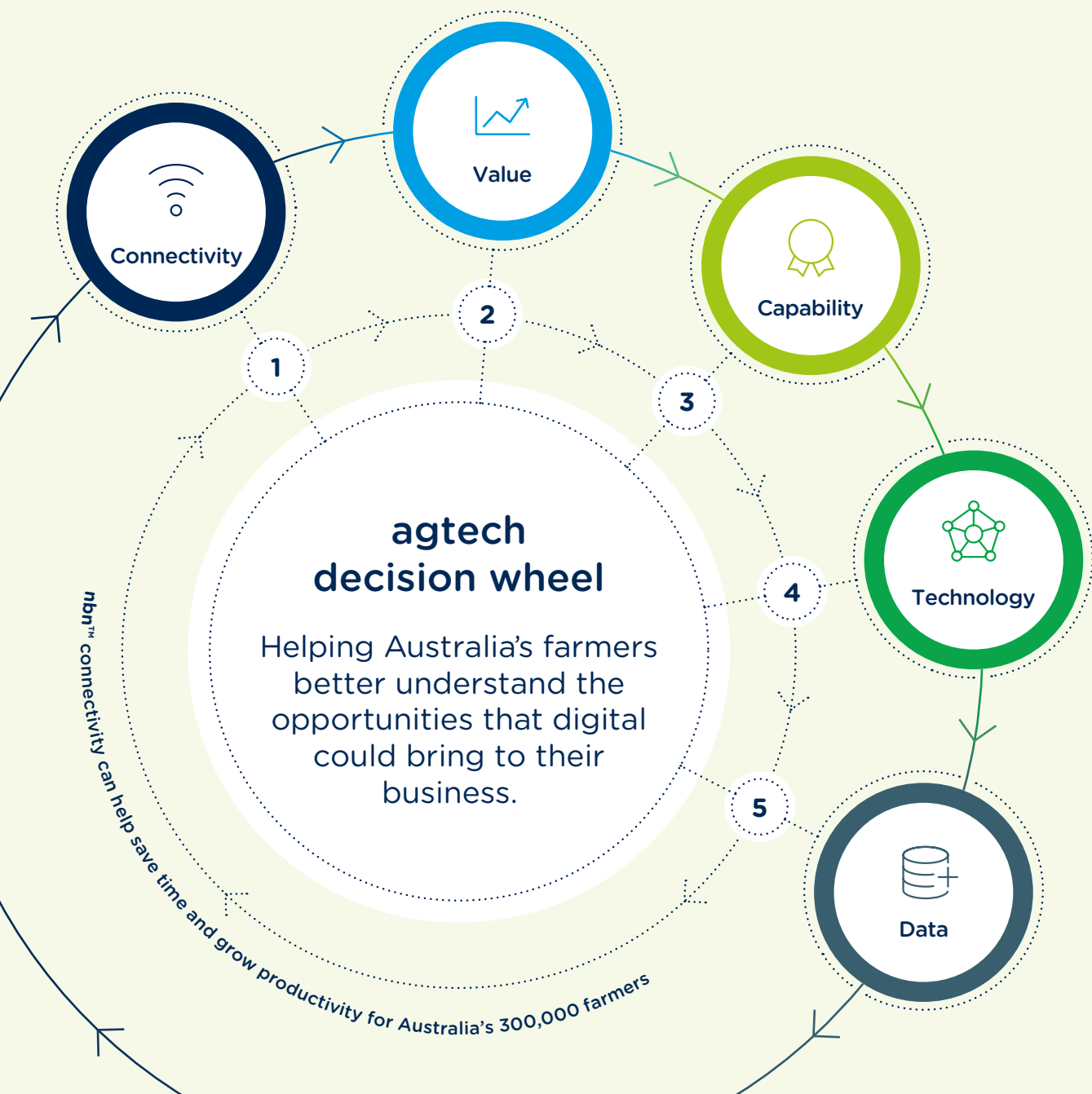
CEO and Founder,
AgThentic

What is agtech and why is it important?

In the National Farmers' Federation 2030 Roadmap, the role of disruptive technologies is called out as an 'opportunity' for Australian agriculture.

The Roadmap explains that automation is a key emerging technology, to improve quality of life for Australian farmers, and their families, by improving and enhancing on-farm automation.

The way we farm today is different to previous generations - for one thing, our farms today are much larger than in the past. Changing farming practices have adjusted the way we look to deploy technology, or how we consider the need for connectivity to enable features in the latest machinery.



nbn has been working with the National Farmers' Federation to help farmers understand the opportunities that digital agriculture can bring to the future of farming. We know that the \$15.6 billion opportunity of internet-enabled digital agriculture is founded on reliable connectivity – and our nation-wide **nbn**TM network has the capability to deliver fast broadband where it is needed.

There's more to agtech than just devices and platforms. **Our agtech decision wheel can help Australia's farmers better understand the opportunities that digital could bring to their business.**

AgTech is the tools and technologies that enable agribusiness to innovate, grow and adopt more efficient production practices. It covers sensors, farm management software, imagery, smart farm equipment and genomics and has the potential to advance the profitability and sustainability of agriculture¹

Department of Primary Industries and Regions
South Australia



Connectivity

The availability of connectivity where it is needed is critical, and it's a two-step process. First, consider what connectivity you already have on farm, such as mobile or home-based **nbn**TM connections supported by repeater systems. Secondly, think about the places where you need connectivity and what that connectivity would enable you to do differently from today.



Value

The value of connectivity and agtech will be different for everyone, but at the end of the day, a farmer's time is valuable – driving long distances to check if something is working is not always time well spent. How you define value will determine the worth of the investment.



Capability

Your digital capability, and the capability of those around you is important. If you're not feeling confident, who in your network can help you? Once you know what you're capable of, you can then consider the digital capabilities you need on farm to get the job done. If you're still unsure, try the **nbn**TM Online Skills Check and Resources (OSCAR)² tool to uncover your digital capability journey and discover resources and advice for self-improvement.



Technology

Now you can go shopping! There's an almost unlimited supply of technologies and tools available to help you get your agtech journey underway. With resources such as Agtech Finder³ available to guide you through the capabilities of different devices, be sure to thoroughly research the way the device operates – is it simply plug and play? What type of connection and power does it require? Does it integrate with other tech already in use on-farm?



Data

Once you're connected, what you do with the data you're collecting, and how you analyse it is where the opportunity lies. This will determine whether you can make changes to the way you farm, allowing you to grow your business for the future.

¹ https://www.pir.sa.gov.au/primary_industry/agtech?shorturl_agtech

² You can determine your digital capability by visiting www.onlineskillscheck.com.au

³ AgTech Finder is Australia's most comprehensive AgTech database featuring products and companies servicing broadacre, livestock, and horticulture www.agtechfinder.com

Q Case study

nbn™ Fixed Wireless overcoming agricultural black spots

nbn is funding a range of research partnerships with leading agtech companies to develop innovative ways to improve Australia's on-farm connectivity.

One such partnership has brought together **nbn** and wireless networking company Zetifi to dramatically improve connectivity at Bullarto Downs, a large broadacre cropping farm owned by Warrakirri Cropping Group in Hopetoun, western Victoria.

By utilising Zetifi's ruggedised networking hardware that is designed specifically for farm environments, the project has enabled Farm Manager, David Drum and his staff to access the **nbn™** Fixed Wireless network and has transformed voice and data blackspots into connected spaces.

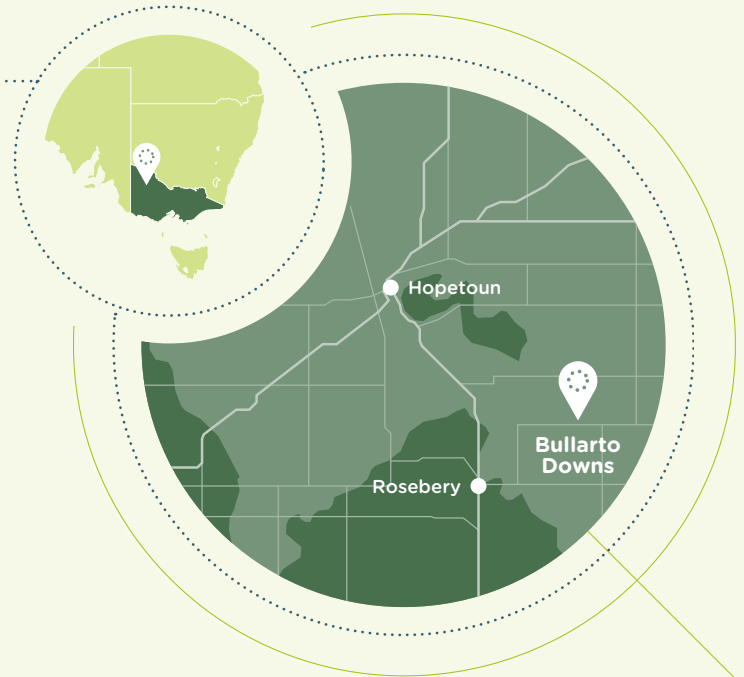


"The connection we had before was very marginal because of the distance from town but with the new **nbn™**-Zetifi system, we're able to run Zoom meetings and use Wi-Fi Calling to help our phone calls. It's been good this year because with COVID we've had a lot more meetings via Zoom," said David.

"We use it for a lot of things. I have regular Teams meetings with my manager and all the data for our monthly reports is in the cloud, so we need to be able to access that. There's nothing worse than working on those reports and the systems aren't talking to each other properly."

As well as these uses of connectivity in the office, it's the increasing use of software to manage the day-to-day running of the business that is really changing things.

"It's not until you really think about it that you realise how much we use the internet. We run software that manages our cropping program and spray treatments, online safety software, and our tractors run the MyJohnDeere platform which means I can login and see the same screens as the bloke out in the paddock, and you need good internet to do that," said David.



"Computers are getting faster and becoming more important and sometimes out here you may not have that connectivity on your phone, but with the **nbn™** we've got good high-speed data coming through. Knowing that we've got a reliable connection through the Fixed Wireless network and the **nbn™**-Zetifi setup has made a big difference."

From this initial success, the site is now one of many farms across Australia at which Zetifi utilises the powerful backhaul capacity of the **nbn™** network to provide true last-mile connectivity to sheds, yards, machinery and paddocks.

As Zetifi CEO Dan Winson explains, these projects extend the benefits of the **nbn™** network beyond the farmhouse and offer new possibilities that will improve productivity for agricultural businesses of all sizes.

"When you talk to farmers, you quickly realise that they're some of the most innovative people you'll meet so they're naturally very switched on to technology and what it can offer them"

"These days, a lot of that technology requires connectivity, so extending Fixed Wireless beyond the farmhouse or office and into the paddock has enormous potential for IoT devices and other agtech solutions"

"There is a rapidly growing market for connected devices that track the movement and weight of livestock, with electronic identification and precision agriculture as well as smart tractors becoming the norm"

"The backhaul capacity of the **nbn™** is absolutely vital for us to deliver these solutions in many locations around Australia"

Dan Winson, CEO, Zetifi

Digital agriculture and the COVID effect



The global health response to COVID-19 has dramatically increased the adoption of internet-enabled digital technologies.

Whilst the impact of community lockdowns and travel restrictions have been felt most acutely in our cities, farmers and agribusiness operators have also needed to adapt to this digital revolution.

Many farmers have embraced new technologies that will provide long-term productivity gains and the associated increase in their digital capabilities and literacy represents a generational inflection point for digital technology in agriculture.

On-farm digital technologies are maturing rapidly and are delivering real productivity, efficiency, and profitability benefits. They save farmers time and give them access to new information and insights about the things that matter to them, such as the health and welfare of their stock, water and soil.

This period has also brought the critical importance of digital inclusion and access to reliable phone and internet services into sharp focus. In 2020, the digital inclusion index was 7.6 points higher for capital city residents than it was for rural Australians (65.0 vs 57.4), but the good news is that this gap is narrowing as new technology options become available.

2020 Digital inclusion index



As new technologies become available, this gap narrows

Australian farmers have access to more technology and connectivity options than ever before. The needs of each farm are different, but thanks to these new technologies, genuine farm-wide phone and internet connectivity is within reach.

Zetifi is proud to be helping Australian farmers by providing long-range Wi-Fi options that enable them to access the present and future benefits of connected digital agriculture.

Rob Lansdown

Marketing Manager,
Zetifi

From on-farm data, anything grows



Agricultural practice is in a process of rapid evolution. There are a multitude of discussions underway about the changes that are impacting rural production systems. A grab bag of considerations, to name just a few, would include:

- Changing market expectations with respect to the impact of rural production systems on the environment;
- Changing global markets; and
- Impacts of a changing climate.

One common factor which flows through all of these matters - the question of data. The words of the father of the modern Quality movement, W. Edwards Deming immediately come to mind - and two of his quotes in particular:

**“It is not necessary to change.
Survival is not mandatory”**

**“Without data you’re just another
person with an opinion.”**

Digital transformation is usually used in the context of business and commerce. Agribusiness is the new focus for these transformations.

The Ecothought team have been designing, building, testing and selecting some of the technologies that could inform these changes for more than seven years on our research farm at Harcourt in central Victoria. One thing has become very clear, if we first understand the question that we want to answer, we can build sensors and data collection platforms to gather the data that will inform the answer to the question being asked. Using the **nbn™** platforms we can transmit the data to national data repositories where analytics can be applied based on that first question - to aid the farmer/agribusiness owner in applying decisions which precisely address the question being asked.

Slade Beard

Director,
Ecothought Smart Digital Architecture

Q Case study

Landcare and nbn – bringing sustainable outcomes into the digital future

Using technology to support better decision making about the impacts of dryland salinity

Dryland salinity impacts landholders, consumers and communities causing more than \$270 million in lost production and remediation interventions, and affects more than 2.5 million hectares of Australian farming land.

With funding from the inaugural **nbn**™ Sustainable Agriculture Landcare Grant, the Meningie East Field Healthy Soils Group, supported by the Coorong Tatiara Landcare Assistance Program, implemented a project to provide technology-driven tools to landholders, farmers and advisors in South Australia's upper southeast region. The tools aided these individuals to make decisions about managing salinity impacted landscapes and helped them avoid salinity issues in threatened areas.

The project's research aimed to determine the causes or patterns relating to 'transient' salinity and the environmental or seasonal data which indicates or forecasts dryland salinity processes. Initial findings from interpreting the soil probe data showed that there are two different soil salinity processes occurring across the region, often in close proximity.

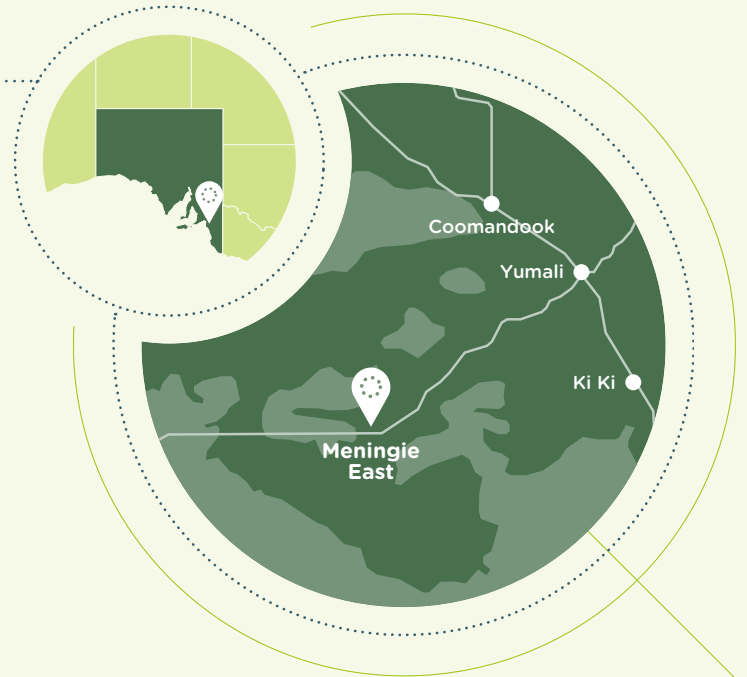
Local farmer and project participant, Kevin Roberts, hopes his legacy from a lifetime of farming will be to improve or reclaim unproductive land while increasing production and leaving his farm in better condition for the next generation.

He feels that having a greater understanding of soil moisture levels, through the use of soil probes, and its effect on salinity impacts is helping him achieve these goals.

“Knowing what's happening under the ground has revealed potential scope for summer cropping and shown the importance of reducing recharge around the low-lying areas and further reinforcing the need to retain groundcover”

“When you can't control your own decision-making process, it can be quite stressful, but this new technology is helping me make well informed decisions which also gives me more flexibility and the capacity to participate more in the community.”

Kevin Roberts, Farmer



65

local producers and stakeholders involved in the project

32,000 ha

of land under management by project participants

8

community events held





We're strengthening our commitment to regional Australia

Regional Australia can now connect to the **nbn**TM network.
And with **nbn**TM Local, that's only the beginning:

Improving technology

nbn is investing over \$2 billion in improving regional Australia's digital backbone, to help give more homes and businesses in these areas access to higher wholesale broadband speeds and greater network capabilities.

Understanding local needs

Our dedicated team works with your community, helping to provide localised solutions for a network better suited to your region.

Supporting digital innovation

We're working with industry groups to enhance what's possible in the fields of business, health, education, agriculture and more.

With **nbn**TM Local, we're committed to delivering a better **nbn**TM network for regional Australia.





Connectivity and Agtech – minimising inputs and maximising outputs

Enabling digital agriculture by providing a connectivity layer across a farm is core business for the team at Connected Farms.

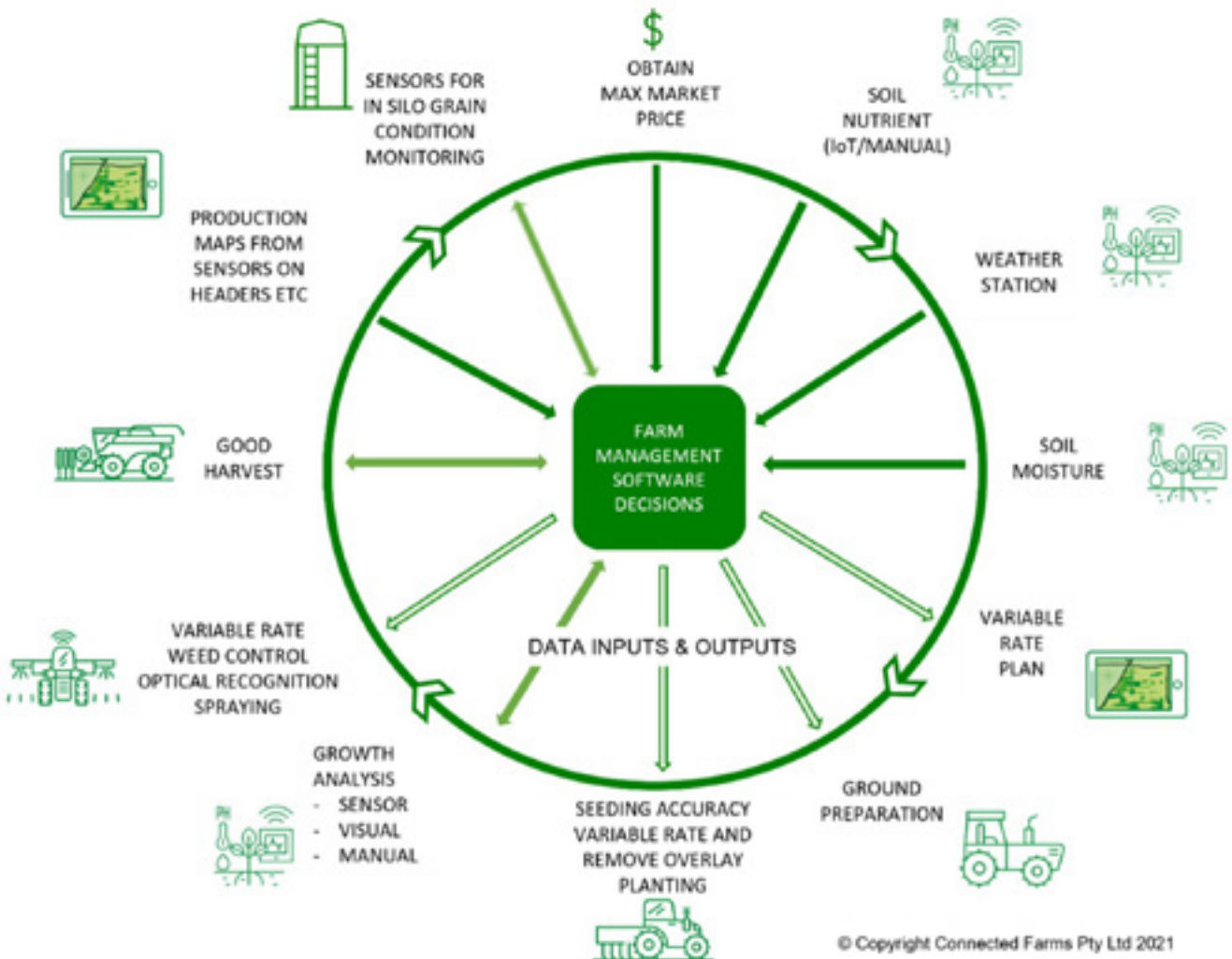
Connected Farms undertakes a holistic review of a farm’s operation and develops customised connectivity solutions that are technology agnostic with a focus on minimising inputs and maximising outputs for farms. By working directly with farmers to identify the productivity benefits of using a connectivity layer across the farm, Connected Farms have been able to develop the Connectivity Lifecycle model (see below) to visually capture and represent the potential benefits to farmers of agtech across the production season.

By enabling farmers to adopt best practice methods of implementing agtech driven tools and methods, supported by the appropriate connectivity layer, Connected Farms creates a unique value for the farmer, particularly when viewed in terms of their seasonal farming lifecycle. This approach not only has the benefit of cost savings to farmers, but also significant positive environmental benefits when a reduction in inputs such as fertiliser and weed spray is realised through variable rate applications. Feedback from our farmers has also identified significant social and community benefits as a result of over farm connectivity.

Louise Bradford

Head of Government, Regulatory and Carrier Relations
Connected Farms

CONNECTIVITY LIFECYCLE



Case study

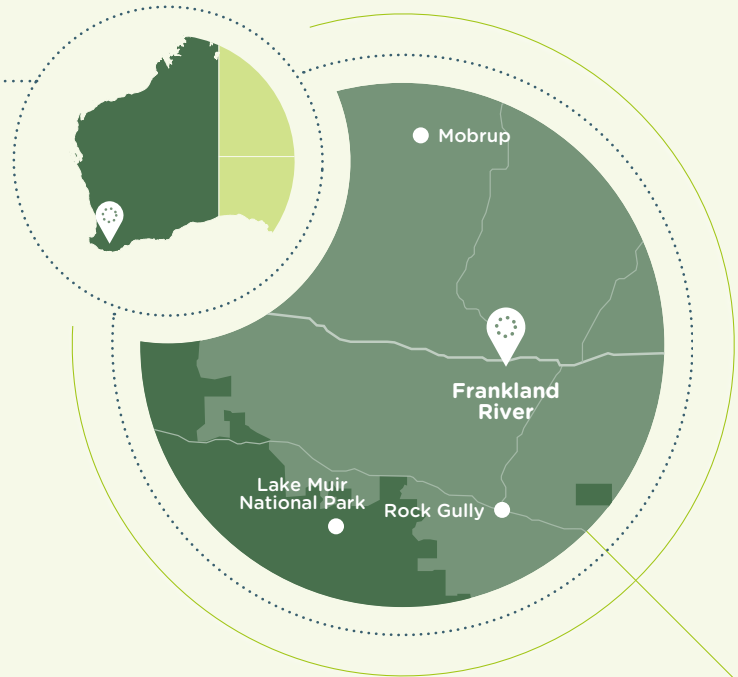
How nbn™ satellite technology is monitoring the weather

A trial underway in the Frankland River district of Western Australia is demonstrating the role that nbn™ Satellite services can play in supporting remote digital agriculture across Australia.

Kicking off in January 2021, MultiWave Networks and technical partner Pivotal deployed a solar-powered satellite solution connected to the nbn™ Business Satellite Service (BSS). The trial area, known for its heavy cloud cover, was selected to demonstrate the capability of the BSS, powered by solar, to support agricultural internet of things (IoT) networks - in this case, a weather station. The connectivity solution, and the data captured, is being monitored by the WA Department of Primary Industries and Regional Development (DPIRD), which currently manages more than 200 remote weather stations across the state.



With Australian agriculture stretching well beyond the boundaries of traditional telecommunications networks, ensuring that farmers can get connected no matter where they are is a key opportunity to grow the value of the industry to \$100 billion, and beyond, by 2030.



As Frankland River is more than 400km from Perth, testing at a site closer to Perth was undertaken before it was deployed in-field. Initially, summer sunlight levels kept the batteries charged; the system even managed to survive the aftermath of Cyclone Seroja which dumped heavy rain across the district.

However, as winter approached and the hours of daylight shortened, and Western Australia continued to endure its wettest start to the growing season on record, the trial demonstrated that the capacity of the batteries to support both the weather station and satellite service declined. While the device was able to store the data it was capturing, the requirement to send packets of data at regular time intervals was challenged by a lack of power - this meant that there were long periods without information about what was occurring on the ground. From an agricultural perspective, such data blackouts make it difficult to make real-time decisions, like the need to move stock to higher ground in the event of a rainfall event.

Working closely with nbn™ Satellite experts, and engineers providing the satellite equipment, solutions to more efficiently store and generate power were considered and deployed. Later in the trial, a small wind generator was added to provide additional, renewable power in the event of extended periods of heavy cloud cover preventing solar recharging.

Further testing and analysis of the trial will continue over coming months; with the trial due to end in January 2022, nbn and its partners will consider the operation of the device over a year to determine next steps and the possibility of turnkey solutions for the agriculture and IoT industries going forward.

Opportunity is the core of the agtech challenge

Farmers
2Founders



There are well-documented and consistent views expressed about the challenges and impediments that must be overcome if the benefits of digital technologies are to be realised.

Foremost amongst these is the challenge of connectivity, a seemingly intractable problem that is clearly increasing tech development costs and slowing adoption of digital technologies. When combined with issues such as interoperability, portability of data, and data rights and security, we are presented with a complex interaction that has all the hallmarks of a ‘wicked’ problem that will require both technological and human-centred approaches to problem-solving.

However, the question we must ask ourselves is, what is really at the core of the problem we are trying to solve? Is it with the technologies themselves caused by tech developers working in isolation on solutions that are too complicated, too expensive, not fit-for-purpose, or not addressing real end-user painpoints? Or does the problem rest with farmers who lack the necessary skills, are too conservative, not confident in making the right decisions, lack the capital to invest, or not convinced about the return on investment that the technologies can offer? Most likely the answer lies in all of the above.

At Farmers2Founders (F2F), we believe the solution to this ‘wicked’ problem can only be found by placing farmers at the centre of the innovation process from the beginning.

Our experience is that a significant proportion of Australian farmers are, in fact, eager to adopt new technologies, and many have already done so driven by the commercial imperative to remain competitive. Many farmers (and agtech developers) are finding workarounds and alternatives to address issues of connectivity. F2F is contributing to the solution via a platform which brings the ‘problem holders’ (farmers) and ‘problem solvers’ (developers) together and provides them with a common language and innovation framework. In doing so, we create the enablers for them to collaborate and succeed.

Providing the right conditions for the agtech industry to flourish will provide farmers with the insights and tools they need to make informed decisions and capture the value of increased production and profitability that is promised from adoption of digital technology.

Dr Christine Pitt

Managing Director,
Farmers 2 Founders

The CSU Global Digital Farm: creating value for Australian farmers



The collection, sharing and use of digital information is transforming the way farm businesses operate and presents a substantial opportunity for Australian agriculture to build towards a \$100bn industry.

From automated daily live weight measurements of livestock, monitoring of stock water systems and real time tracking of animal location and health metrics to continuous measurement and reporting of soil moisture status, the use of satellites and drones to assess crops and pastures and the transfer of data between staff, advisors and autonomously operating equipment, data is enabling previously unimaginable tasks to be seamlessly introduced and automated.



The Charles Sturt University (CSU) and Food Agility Cooperative Research Centre's Global Digital Farm Initiative is transforming the CSU 1900ha commercial mixed farm in Wagga Wagga to a fully connected and digitalised landscape laboratory to develop, evaluate and demonstrate the use of digital technologies.

As a platform for research, teaching and community engagement, the Global Digital Farm is working with industry to meet current challenges and prepare for future adaptations.

Central to the operation of the Global Digital Farm is the requirement to demonstrate the range of communications options to connect devices, people, livestock and equipment across the farm landscape and beyond the farm gate. When successfully implemented, this integration of data and technology, combined with the vast bank of farmer knowledge and experience will improve efficiency, safety, profitability and sustainability of farming businesses and communities.

Jonathan Medway

Senior Research Fellow – Spatial Agriculture
Graham Centre for Agricultural Innovation,
Charles Sturt University

How to overcome salt and pepper connectivity in Australian agriculture

The Ag2030 \$100bn goal requires adoption of digital agriculture.

The 2021 ABAC Agritech Working Group discovered a threshold of connectivity in rural Australia that is holding back adoption. This is caused by 'salt and pepper connectivity', localised connectivity gaps across and between farms, beneath the coverage of the mobile carrier, and **nbn**TM fixed and wireless networks. It causes problems for:

- Online farm business and administrative functions
- Digital functionality on existing agricultural equipment
- The use of new digital technologies that need reliable and ubiquitous connectivity
- Agritech businesses who must use expensive offline workarounds.

The market is responding. New providers with innovative technologies including intermittent and 'always on' narrowband as well as broadband connectivity solutions are rapidly emerging to fill in the salt and pepper at localised scales. Continued market innovation is key to removing the connectivity threshold and enabling full adoption of digital agriculture.

There are two critical enablers; access to fibre backhaul and liberalising class licensed spectrum. There is also scope for more innovation in how the **nbn**TM network is utilised in conjunction with lower cost infrastructure second tier providers, such as the wireless ISPs.

Rural communities are highly motivated to solve connectivity problems at their local places. Rural people are up for it.

The desired future state for digital agriculture has fibre highways across the country with back haul off-ramps into every rural community; locally developed plans to connect off-ramps to locally supported connectivity infrastructure; and government investment within a long term, intergovernmental planning framework, that is complementary to business investment.

Andrea Koch and Peter Waters

Co-Chairs, Agritech Expert Working Group,
Australian Broadband Advisory Council

The case for a strong and independent Australian agtech industry



A vibrant, independent Australian agtech industry is critical in helping Australian primary producers unlock the value that digital technology promises.

Despite this, and a stated objective to achieve a \$20bn boost to productivity through the adoption of digital agriculture technologies, conversations around digital agriculture often lead to concerns about data rights, privacy, connectivity, and pathways to improve adoption such that farmers reap the rewards. These concerns are well-founded.

The best solution to address these valid concerns lies in Australian primary producers supporting and being meaningfully involved in the growth of a vibrant, independent agtech industry in Australia. In other words, we must be makers of agrifood technology in Australia, not just takers. In doing so we can customise technology and applications that are designed and fit for how Australian agribusiness works.

This not only means improvements to domestic yields and efficiency gains, but also realising the potential for Australian farmers to participate in opportunities for new revenue streams and access novel and resilient supply chains.

Being makers of agtech ensures Australian farmers will be rewarded for being part of our transition toward a net zero future.

If we don't act now to engage with, and ensure proper support for the emerging Australian Agritech industry, then our agriculture sector risks being limited to adopting innovations that have been developed by and for other markets. Our farmers will be takers, and we will risk leaving a \$20bn opportunity to the whims of offshore agtech industries who may see Australian farmers and agriculture as a secondary priority.

This is not the future we believe in. Instead, we fully support the need for an independent and viable agtech industry in Australia generating Australian jobs, intellectual property and capital.

In turn those companies can collaborate and guide international technologists for the benefit of Australian farmers now and into the future.

Matthew Prior

Founding Director,
Aus Agritech Association

Digital Agriculture – the industry's pursuit of \$100bn in pre-farm gate value by 2030



If there was a community that I would lean on knowing full well that they could rise to a challenge it is the rural community of Australia.

Regional Australia has surpassed great challenges over many years, including feeding our defence forces during times of war, and locally with floods, droughts and bushfires.

The national challenge of \$100bn in pre-farm gate value by 2030, which is not that far away, will benefit from ongoing agtech developments. However, even the adoption of existing technologies by the broader farming community would get us to the target well before 2030. The challenge is, how do we get all farmers to rise to the level of the early adopters, and have the entire industry benefit from technological advances?

Succession planning is seeing new farm managers entering the sector, looking for new opportunities to grow their business through the use of technology.

We are also seeing small farms consolidating into larger corporate farms and family companies. The larger the farming enterprise, the more complexity and the greater need for technological solutions.

Technologies such as Precision Agriculture, Internet of Things (IoT), big data, robotics, autonomy, artificial intelligence, sensors and improved satellite communications are all available now and already making an impact. Research suggests that if existing precision agriculture technology alone was adopted more broadly the 2030 goals are achievable.

Historically, connectivity in regional Australia has been the greatest barrier for agtech adoption. Satellite communications have improved and IoT networks now cover much of our arable land.

If connectivity has been holding back producers agtech ambitions of greater productivity and efficiency gains, solutions are now available, and we recommend a review with the **nbn™** Local team or one of their partners.

At the AgTech and Logistics Hub in Queensland we're ag industry led, providing a function that bridges the gap between industry challenges and agtech solution providers. Industry is encouraged to connect with the Hub as it seeks to solve these challenges.

Stephen Dummett

Community Manager,
AgTech and Logistics Hub

The role digital agriculture plays in bridging the gap to \$100bn by 2030



Since 2004 Australian agricultural productivity growth has slowed to 0.7% average year-on-year growth.

Annual gross value 2030 target



The industry currently has an annual gross value of \$70.5bn (ABARES forecast for 2020-21). At least a four percent (4%) compound annual growth rate (CAGR) is required to achieve the \$100bn annual target by 2030 (real value - not adjusted for inflation). Assuming a CPI rate of 2% the rest of the growth (2%) is needed from productivity and new value creation, and this is where producers are looking for digital agriculture solutions such as agtech to deliver value. So much so that we estimate over the next 10 years, one in three new jobs in agriculture, fishing and forestry will be technology related.

Clients often ask us at KPMG for help to estimate the full costs and benefits of investing in using technologies to determine the quantitative and qualitative benefits over and above the way jobs are currently performed on farm today.

The key benefits of interest to agriculture, fisheries and forestry industries from agtech are:

- Improved efficiency of on-farm practices and decision-making impacting profitability, productivity and risk mitigation including worker safety and animal welfare;
- More efficient use of natural resources and ability to access the full benefit of natural capital markets for Australia through trusted data services to validate environmental claims;
- Narrowing inter-regional variations in competitiveness based upon access to connectivity, to enable more value to be produced in more remote regions; and
- Understanding the value proposition digital technologies present to the farming business is the leading barrier to adoption within Australia.

Ben van Delden

Head of AgriFood Tech & Circular Economy Advisory, KPMG Australia

What does the digital agriculture revolution look like?



The Australian agricultural sector of 2030 will look very different to that of 2021.

By 2030, the role of digital in Australian agriculture will be cemented. Through investments made in the good years, farmers are reaping the rewards of a data windfall, possibly even sharing data along the supply chain to realise financial dividends as well. Improved access to where and how food is produced is informing consumer trends; emerging middle class consumers in other countries and within flying time of major Australian airports will be able to purchase fresh Australian produce almost on the same day as it was picked, knowing fully the journey from paddock to plate.

Farming in 2030 will be different compared to today – it will most likely be **carbon neutral**, in line with industry's own vision, supported by a digitally-enabled virtual stewardship and sustainability marketplace.

Droughts will still be a feature of farming in Australia, but resilience and adaptability will have changed how we tell the story.

On-farm digital connectivity has seen farmers connect all manner of sensors – on everything from water troughs and windmills to livestock and fruit trees – which has allowed them to reduce the cost of inputs such as fertiliser, water and chemicals. Advances in telecommunications are allowing farmers to do more things digitally in more remote places – while it is already possible to digitally-trade cattle from one property to another without the need to first transport them to a livestock selling centre, there's every chance this presently 'disruptive' technology could become the norm.

Vastly improved, real-time connected digital platforms are enabling farmers to better manage their soils and pasture, optimising the grazing of animals for better animal welfare outcomes and improved consumer consumption quality. Our grains industry will have reduced the use of chemicals and, through paddock mapping, ensured fertilisers are applied in areas to even yield and improve crop quality. Our tree crops and other water-intensive plant varieties are using much less water in production, thanks to investments in plant-level water monitoring devices which can be remotely managed.

Beyond the farm gate, the digital revolution has changed the way consumers consider the food journey. Meat processing now involves carcass-by-carcass tracking and tracing, allowing a consumer to know exactly where their lamb chop or pork medallion has come from. Increasingly environmentally-conscious consumers will be able to see how the meat they are consuming has been treated on farm, understand the way the food was produced and how it was ethically and sustainably made available for consumption.

Have you adopted any new connectivity enhancing solutions in your home/farm to improve connectivity?



36%
✓ Adopted
✓ Successful

25.5%
✓ Adopted
✗ Unsuccessful

19%
✗ Not adopted
✓ Plan to¹

16.5%
✗ Not adopted
✗ No plan to¹

What solutions have you adopted to improve connectivity?²



64%
Boosters (in-line amplifiers)

58.5%
Antennas

21.5%
Other

26%
Repeaters

Do you believe there is a lack of information to allow consumers to identify, choose and use the best connectivity options for their personal circumstance?



57%
Yes

15%
No

28%
Unsure

On your property, what technologies do you use that require connectivity?²

- 59% Business compliance reporting
- 35% Machinery
- 34% Weather station
- 29% Security
- 27% Tag readers
- 24% Sensors of any kind (gate, water, troughs, geofencing sensors)
- 20% Pumps
- 18% Drones
- 17% Livestock monitoring
- 15% No technology requires connectivity
- 13% Soil monitoring
- 9% Crop sensors
- 3% Virtual fencing
- 20% Other

According to NFF members, there are key challenges still to overcome to address on-farm connectivity.
(Source: NFF submission to the Regional Telecommunications Independent Review Committee, Sept 2021).

Our fibre industries will be leading the charge on the international stage; wool producers will join other livestock producers in demonstrating the tracking and tracing of their product, proving the quality of Australian wool on the world stage. And cotton growers, through further efficiencies in water use, will continue to grow the world’s most sustainable cotton.

On-farm connectivity will enable better connected machines to process our food and fibre products. The horticulture sector, heavily reliant on physical labour, will be increasingly mechanised, with automation and robotics increasingly used to plant, pick, process and pack high-quality, fresh fruits and vegetables. Better-integrated machinery can improve supply chains, and help farmers secure a better price for their product. New growing methods will see indoor protected cropping take-off.

Australia’s farmers, now and in 2030, are at the forefront of innovation, and their capacity to achieve these outcomes is diminished only by self-doubt. Many of the technologies enabling this 2030 vision are available now. We know that the nbn™ network can connect farmers across Australia. Through on-farm investment in communications infrastructure, and the creation of a digital farm plan that matches needs and wants with actionable outcomes, Australian farmers can take full advantage of the coming digital revolution.

Together with the National Farmers’ Federation, nbn looks forward to working with Australia’s farmers to connect them to the \$15.6bn in internet-enabled digital agriculture opportunities available in this decade. Like the nbn™ network, Australia’s farmers are made for more!



Robert Hardie

Head of Segment – Agriculture,
NBN Co

Key agtech terms

| Key Term | Description |
|------------------|--|
| Backhaul | Backhaul typically refers to the mid-to-long-distance transport of data from a series of disparate locations back to a more centralised location. This transport may involve some level of concentration (also referred to as aggregation). |
| Bandwidth | Bandwidth refers to how fast data flows through the path that it travels to your computer. It is usually measured in kilobits, megabits or gigabits per second. |
| Bit | A 'bit' is a basic unit of information in computing, essentially a '1' or '0'. Bits per second (bps) is a common measure for data transmission speed. The speed in bps is equal to the number of bits transmitted or received each second. Larger units are often used to denote high data speeds: kbps (kilobits per second) being one thousand bits per second; mbps (megabits per second) being one million bits per second; and gbps (gigabits per second) being one thousand million bits per second. |
| Broadband | Broadband is a term used to refer to 'always on' high speed Internet. In the past, broadband services and technologies were defined in terms of a capability to transfer information at higher rates than traditional dial-up services. Today broadband is more commonly associated with the speeds equal to or greater than those provided by Asymmetric Digital Subscriber Line (ADSL), that is, a minimum download speed of 265 kbps and minimum upload speed of 64 kbps. |
| Byte | A unit of storage measurement – a byte is made up of 8 bits. All information is stored as bits and bytes, which determine the size of the document, picture, video clip, for example, that you may wish to download or send via email. |
| Gateways | Antennas that send and receive broadcasts between devices and the network. Devices use low power networks like LoRaWAN to connect to the Gateway, while the Gateway uses high bandwidth networks like Wi-Fi, Ethernet or Cellular to connect to the internet. |
| Latency | Or delay refers to how much time it takes for data to get from one designated point to another. |
| LPWAN | Low Power Wide Area Network. A broad term that describes a variety of technologies used to connect IoT devices to a network beyond the reach of the traditional networks such as Wi-Fi. LPWAN encompasses a range of approaches including LoRaWAN, Sigfox, Cat M1, NB-IoT and others. |
| LTE | Long Term Evolution is the name given to 4G network (which the main mobile telco companies use), i.e. a progression from 3G/GSM. |

Key Term**Description****Mesh**

A mesh network (or mesh Wi-Fi) is a network system that transmits Wi-Fi evenly over an area through a network of devices. Instead of functioning like a Wi-Fi extender, mesh Wi-Fi spreads Wi-Fi signals out evenly.¹

nbn™ connection box

Also known as an NTD or Network Termination Device. This is the box that is installed in your home for an NBN Fibre to the Premises or Wireless service.²

Protocols

A communications protocol or network protocol is the specification of a set of rules for a particular type of communication.

Repeaters

A wireless repeater takes an existing signal from a wireless router or wireless access point and rebroadcasts it to create a second network.

Satellite

Common in rural and remote areas, broadband satellite uses a home radio link and radio dish to bounce a signal off a satellite and down to an earth station. It's used for fast Internet access and sometimes phone calls. One-way satellite connections utilise a satellite link to download data to the broadband user and a standard telephone connection for uploading data back to the Internet. Two-way satellite connections use the satellite link to both upload and download information.

Spectrum

The radio frequency bandwidth on which a gateway and device communicate.

Wireless

While the specific technology used to provide wireless broadband services varies, each service provider uses radio frequencies to transmit and receive data between their customers and a local transmission point. Normally, this requires a number of base stations, similar to mobile phone towers, which transmit to customers who have a small transmitter/receiver connected to their computers or other digital devices.

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¹ Sourced from: <https://www.canstarblue.com.au/internet/mesh-networking/>

² <https://blog.iinet.net.au/nbn-glossary-handly-guide-nbn-related-terms-acronyms/>



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