Submission No 2

TECHNOLOGY AND THE AGRICULTURE AND MINING SECTORS

Organisation: Charles Sturt University

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Charles Sturt University

NSW LEGISLATIVE ASSEMBLY COMMITTEE ON INVESTMENT, INDUSTRY AND REGIONAL DEVELOPMENT

NSW Legislative Assembly inquiry into technology and the agriculture and mining sectors

14 February 2022

Office of the Vice-Chancellor
Charles Sturt University

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Justin Clancy MP
Chair, NSW Legislative Assembly Committee on Investment, Industry and Regional Development
NSW Legislative Assembly
Parliament House, Macquarie Street
Sydney NSW 2000

Dear Chair

Charles Sturt University welcomes this opportunity to provide a submission to the NSW Legislative Assembly Committee on Investment, Industry and Regional Development inquiry into technology in the agriculture and mining sectors.

Charles Sturt University is Australia's largest regional university, with more than 43,000 students and approximately 2,000 full time equivalent staff. We are a unique multi-campus institution with campuses in some of New South Wales' fastest-growing and most vibrant regional communities: in Albury-Wodonga, Bathurst, Dubbo, Goulburn, Orange, Port Macquarie and Wagga Wagga with strong connections to surrounding rural and remote communities. We also have smaller campuses and study centres located in other areas throughout rural and regional south-eastern Australia.

Charles Sturt's history in agriculture education, research, and innovation extends back almost 130 years, to the establishment of the Wagga Wagga Experimental Farm. Charles Sturt is now the largest regional university training the future agricultural, environmental and veterinary workforce: we have more than 1600 students in agriculture and environmental sciences, and almost 700 students in veterinary and animal sciences. Combined, they make up around five per cent of total enrolments. According to Department of Education, Skills and Employment data, we train more than 10% of the country's vets (based on DESE data), and as around 75% of Charles Sturt graduates go on to work in regional areas, our contribution to the regional workforce in these fields is even more significant.

Our footprint extends across most of NSW's agricultural regions, and we have a long and proud track record in meeting the education, training, and research needs of regional students, communities, and employers. The new University Strategy 2030 builds on these foundations, with a focus on connecting our students with the knowledge and wisdom to shape the world; collaborating with our partners, including industry partners, on research with impact; supporting, empowering, and inspiring our staff and students; and engaging regionally and globally to drive sustainable prosperity.

Our experience, industry and community connections, and globally recognised research strengths mean Charles Sturt University is uniquely placed to comment on the growing importance of technology in the agricultural sector, the opportunities and challenges this presents for regional NSW, and their impact on the future workforce in this vital industry.

Our interactions with producers and regional communities and industries suggest that indicate that there is a need for better and more patient consultation around agricultural innovation, especially when it comes to the introduction of new regulation, and better coordination of efforts to promote the uptake of new technologies or improve on-farm capabilities. In recent years responsibility for such efforts has often devolved to the private sector, and to agtech firms in particular, with the result that producers are pushed to adopt off-the-shelf rather than tailored solutions, and there is little integration with regional, state, and national strategies

and plans. The creation of a NSW Government Ministry for Science, Innovation and Technology, the launch of the new Accelerating R&D Action Plan, and NSW universities' Memoranda of Understanding with Invest NSW provide a good context for improving coordination and collaboration on agricultural innovation and technology policies and programs. The knowledge broker network set up as part of the Australian Government's Drought Resilience and Adoption Hubs, and managed by the Department of Agriculture, Water and the Environment, could serve as a model for improving on-the-ground coordination.

The attached submission provides some information on the University Strategy, our research priorities, some key industry partnerships, and several initiatives and projects that are helping to develop and apply new technologies for Australian farmers, irrigators, and regional communities. These include the AgriPark, our growing innovation precinct; the associated Global Digital Farm, Australia's first fully-automated commercial farm; and the Southern NSW Drought Resilience Adoption and Innovation Hub, one of eight Hubs around the country established to combat drought through user-driven innovation, research and adoption.

The AgriPark, Global Digital Farm and Drought Hub are based on the Charles Sturt University campus in Wagga Wagga, and I would like to invite the Committee to visit the campus to see these exciting facilities in action and talk to our researchers and industry partners. The University would be happy to liaise with the Committee secretariat to make the necessary arrangements.

Charles Sturt University would be pleased to provide the Committee with more information on any of the issues or initiatives mentioned here, either through a more detailed submission or by presenting evidence at a public hearing. In either case we will draw on the knowledge and experience of our staff, many of whom would welcome the opportunity to discuss their experience with the Committee.

Yours sincerely

[redacted]

Professor Renee Leon PSM
Vice-Chancellor

Agricultural education, research, and innovation at Charles Sturt

University Strategy

The University Strategy 2030 will guide Charles Sturt's ten-year journey towards being Australia's leading regional university, advancing the careers of our students, inspiring research excellence and driving regional outcomes with global impact.

Charles Sturt will achieve this goal by:

- Strategic partnering with industry, government and our communities to focus on key areas in research.
- Providing excellence in teaching and graduate employment outcomes.
- Supporting our staff and promoting an inclusive, equitable and healthy culture.
- Engaging with First Nations and promoting cultural safety for all.

In research, Charles Sturt is commitment to building on our well-established, globally recognised strength in agriculture, water and the environment; expanding our capabilities in rural health research, and in cyber, data and security research; and continuing to meet the key research needs of our communities. The University's research priorities are supported by targeted investment in people, projects and facilities, such as the establishment of a new Agriculture, Environment and Water Institute.

As with the University Strategy as a whole, our research priorities also involve building our partnerships with industry. In the last few months Charles Sturt has formalised new partnerships with IBM, Transgrid, Marathon Health, and, most recently, global technology firm Axiom Connected, who have chosen the University's Port Macquarie campus as the site for their Australian headquarters. These new partnerships complement our more well-established relationships with Telstra, the Australian Government Department of Agriculture, Water and the Environment, and the NSW Department of Primary Industries, among others.

Charles Sturt's partnerships with technology and particularly information technology companies will enable the University to continue to provide leading-edge, workplace-relevant education, training, and research. Many of our undergraduate programs are designed in partnership with industry and involve hands-on placements with regional firms – for example, they are a core feature of our innovative Engineering program, named as an emerging leader in the field in *The Global State of the Art in Engineering*, a 2018 report from MIT.

Technology in Agriculture

Charles Sturt University has a key role in helping producers and communities across regional NSW embrace the opportunities and address challenges of a more technological approach to agriculture. The increasing importance of technology in agriculture has been acknowledged in several recent Australian Government policy statements and strategies.

The Government[1] and the National Farmers Federation[2] have adopted the goal of boosting the value of farm gate output to $100 billion by 2030 – the 'Ag2030' target. In adopting the target both the NFF and the Australian Government have recognised the importance of technological development, adoption and adaptation to sustainable, high-quality agricultural production and environmental management. The Ag2030 target forecasts that by 2030 one in three new jobs created in the agriculture industry will be technology related.

The Australian Government's National Agricultural Innovation Policy Statement[3] and National Agricultural Workforce Strategy[4] also recognise the importance of developing and adopting new technologies and providing the workforce with the skills to use them as essential to improve productivity and increase outputs while embedding more sustainable practices in agriculture. The National Agricultural Innovation Policy Statement envisages "a strong, vibrant and collaborative agricultural sector" in which producers are

[1] See https://www.awe.gov.au/agriculture-land/farm-food-drought/ag2030
[2] See https://nff.org.au/policies/roadmap/
[3] See https://www.awe.gov.au/agriculture-land/farm-food-drought/innovation/national-ag-innovation-agenda
[4] See https://www.awe.gov.au/agriculture-land/farm-food-drought/agricultural-workforce/naws

empowered to adopt the latest science, technology and tools … to improve how they operate, making our food and fibre systems more competitive, prosperous and sustainable." The Workforce Strategy, with a similar vision in mind, says that "modern training is required for advanced technology, high productivity and profits in the 21st century."

These issues were highlighted in the University's submissions to the relevant consultations. On the Ag2030 target we noted[5] the need for increased investment in agricultural technologies and associated R&D; measures to increase enrolments in agriculture education programs, especially at regional universities; and programs, including funding, to encourage greater uptake of new technologies. Our submission to consultations on the Workforce Strategy[6] highlighted the some of the challenges facing the sector, including low interest in agriculture careers, but also some opportunities, with growing participation by women, more tech-savvy graduates, and the potential for using online delivery of education and training programs – a particular strength for Charles Sturt – to improve producers' skills and knowledge.

As these points suggest, universities – and particularly regional universities like Charles Sturt – have a vital role in the successful implementation of strategies and goals relating to agricultural innovation and technology. In recent years much of the focus on driving innovation and the adoption of new technology in the agricultural sector has been devolved to, and driven by, agritech firms, including small start-ups. Often these firms are focused on pushing off-the-shelf solutions, rather than developing tailored response to on-the-ground needs. A growing emphasis on intellectual property (IP) and recognition of the value of data has, at times, complicated the relationship between producers, agritech firms, and more established industry organisations, creating a barrier to innovation and the adoption of new technologies.

Universities can reduce or eliminate these barriers by serving as a trusted partner to all those involved. Universities by nature and tradition prefer to share knowledge (and data), and without being tied to a sole source of technology, or driven by a need to generate a profit. Universities can also draw on a wide array of ideas that can be adapted to meet local requirements, such as research and technologies developed overseas: academics from Charles Sturt have led or participated in projects in south-east Asia funded by the Australian Centre for International Agricultural Research (ACIAR), the results of which are now being applied in Australia. Low-cost technologies developed by our researchers to allow important food fish species to safely traverse hydroelectricity installations on rivers in Vietnam are being used in the Murray-Darling Basin as part of a collaborative project between the University and Snowy Hydro.

Four initiatives at Charles Sturt provide examples of how universities can act as trusted partners and help producers across NSW – and around the country – take advantage of the opportunities provided by new technologies, while reducing the barriers to them doing so.

The AgriPark[7] brings researchers, agritech firms, producers and innovators together in an environment that can develop new technological and other solutions to Australian challenges, or adapt those developed elsewhere.

The Global Digital Farm[8] acts as a test-bed and demonstration platform for digital technologies, increasing uptake and improving digital literacy in the in the agricultural sector.

The eXtended Reality Centre (XRC)[9] provides leading-edge simulation capabilities that can improve the use of on-farm data and reduce the risks associated with new technologies.

[5] See https://cdn.csu.edu.au/__data/assets/pdf_file/0010/3354391/Growing-Australian-Agriculture-To-100-Billion-By-2030.pdf
[6] See https://cdn.csu.edu.au/__data/assets/pdf_file/0004/3759520/200601-Charles-Sturt-Submission-Ag-Workforce.pdf
[7] See https://agripark.csu.edu.au/
[8] See https://news.csu.edu.au/latest-news/look,-hands-free-australias-first-fully-automated-farm-to-be-built-at-charles-sturt-in-wagga-wagga
[9] See https://research.csu.edu.au/our-profile/current-research/extended-reality-collaborative

The Southern NSW Drought Resilience Adoption and Innovation Hub[10] will facilitate transformational change in the Riverina and beyond through user-driven, co-design of research, development, extension, adoption and commercialisation activities.

Underpinning all of these is our new Gulbali Institute[11], focused on agriculture, water and environment research. It includes 20 new research-only positions, and is fully integrated with the AgriPark, Drought Hub, Digital Farm and other initiatives. More information on each is included below.

Above all, there is potential for the NSW Government to coordinate the efforts of regional universities, agricultural and agritech firms, peak bodies including producers' groups, and regional communities to make the most of the opportunities for regional NSW offered by agricultural technologies, reduce the barriers to their adoption, and ensure the best possible outcomes from their use – including recognition of agriculture as a high-technology, high-wage and rewarding career. The creation of a NSW Government Ministry for Science, Innovation and Technology, the launch of the new Accelerating R&D Action Plan, and NSW universities' Memoranda of Understanding with Invest NSW provide a good context for action.

As a first step, Charles Sturt recommends that the NSW Government:

1. explicitly identifies agricultural innovation and technologies as priorities in the Accelerating R&D Action Plan, and
2. ensures that research and innovation funding programs support appropriate activities in regional areas as well as metropolitan centres.

AgriPark

Charles Sturt's Wagga Wagga campus is home to our Agrisciences Research and Business Park, or Agripark. The AgriPark provides a platform for collaboration between farmers, firms, and researchers, combining the latest research with industry know-how. The AgriPark is designed to become a world class agri-food innovation precinct that fosters collaboration between researchers, government, industry, and entrepreneurs to drive productivity growth in our agricultural and food sectors.

With a base in the heart of the Riverina the AgriPark is perfectly positioned to support current and future industry and government priorities in agriculture, manufacturing, research commercialisation and regional development, including the Parkes and Wagga Wagga Special Activation Precincts.

The AgriPark encompasses:

- Global Digital Farm, a fully integrated digital learning and research environment working within a full-scale, commercial, mixed farm operation. It has the ability to change the agricultural industry and the way it operates by bringing together for the first time all digital farming components. More information on the Global Digital Farm is included below.

- the University's new Agriculture, Water and Environment Institute which will employ more than 20 new, research-only positions and invest in dedicated business development support to enhance Charles Sturt's ability partner with end-users and conduct research at scale.

- the Southern NSW Drought Hub, an Australian Government funded initiative that enables regional stakeholders to have a voice in drought resilience activities, collaborate with experts, gain access to resources, and participate in adoption programs such as workshops, seminars, and field days.

- the AgriTech Incubator which offers incubator programs, founder events, innovation, and entrepreneurship programs to support participants to develop a business, product or service idea.

[10] See https://research.csu.edu.au/engage-with-us/research-impact/southern-nsw-drought-resilience-hub
[11] See https://research.csu.edu.au/our-profile/research-centres/gulbali-institute

- the Extended Reality Centre (xRC), which uses next-generation and future-focused multi-media technology to design and deliver practical simulations and drive regional outcomes with global impact in the areas of agriculture, water and environment. More information on the XRC is included below.

- the Red Meat Innovation Centre, which provides a single location to product test from paddock to plate and be unique in Australia to test products driving animal production, meat quality and consumer adoption at the same site.

- the Food and Beverage Manufacturing Innovation Centre, a large-scale research facility to pilot existing and emerging processes for manufacturers without their own, or equitable access to, product innovation capacity.

The development of the AgriPark spans three phases. Phase 1 is largely complete: the AgriPark has attracted 18 partner organisations (and over 120 staff) representing the full range of agriculture and regional investment sectors (government, industry and entrepreneurial). Key existing partners include AgriFutures Australia, ChemCert Australia, Regional Development Australia, Eurofins Agroscience Services, Riverina Local Land Services, Syngenta Seedcare Institute, Genetic Hub and Hutcheon & Pearce.

In Phase 2 the University will grow the AgriPark over three years and establish it as a hub for agri-food innovation and collaboration. The Phase 2 expansion of the AgriPark is a 'shovel ready' project scheduled to start in 2022. It includes shared office accommodation, collaboration and innovation spaces, and industrial R&D facilities for partners, enabling growth to meet expected demand for over 200 staff and 30 organisations by 2025. The project will also deliver digital and organisational capabilities to support collaboration and innovation with impact that actively builds production and resilience in our regions. Charles Sturt has developed an investment proposal for this phase of the AgriPark, which we have provided to Federal and State Governments and other potential investors.

Phase 3 (2025-30) will expand the AgriPark further and consolidate the precinct as a locus for regional innovation, skills and collaboration.

eXtended Reality Centre (XRC)

The Charles Sturt University eXtended Reality Centre (XRC) is a large-scale initiative that enables next-generation research from interdisciplinary fields and industry collaboration, using future-focused immersive technology for the public good. The XRC is distinctive in that it threads research and creative practice into infrastructure projects which intersect across multiple disciplines and industries.

The XRC focuses on advancing practical simulations which model real-world situations, applications with significant cost and efficiency benefits inspiring research excellence, and driving regional outcomes with global impact in the areas of agriculture, water and environment, cybersecurity and IT, health, and creative industries.

Pairing creative arts and science with cutting edge technology, the XRC uses augmented reality, virtual reality and mixed reality to develop digital simulations that model real-world scenarios. For businesses, this means the ability to digitally transform new or existing services and enhance user experience beyond the physical world.

Through the XRC, immersive technologies can be applied in a wide range of industry sectors, including agriculture, to develop projects that are:

- Smarter – world-class innovation in creating original digital content, augmenting education and industry with future-focused technology, inspiring research excellence and driving regional outcomes with global impact.

- Faster – real-time production workflows that accelerate ideation/conceptual design processes to tangible real-world outcomes that grow our reputation for excellence in quality education, impactful research and social responsibility by fostering courage, credibility and trust in times of rapid change.

- Cheaper – reduce manufacturing and environmental costs, streamline processes with virtualisation and become an exemplar for attracting, developing, and retaining high-value stakeholders driving sustainable prosperity.

- Safer – accurately simulate real-world consequences repeatedly with variation and reduced costs with no physical harm or financial/environmental hazards, demonstrating impactful applied research and social responsibility for our people, industry partners, government and community for the public good.

A recent example of the potential of the XRC is the Centre's work with AgriPark partner ChemCert Australia. The XRC helped to transform its chemical certification training from traditional face-to-face delivery to a virtual, 360-degree environment, enabling students to experience hazardous environments that are impractical to deliver via traditional instruction methods. The XRC is working with a wide range of other partners and stakeholders including:

- Australian and international universities such as the ANU, Deakin, UTS, Newcastle, and the American University of Sharjah,
- Australian and NSW Government agencies such as CSIRO, Geoscience Australia, the Department of Agriculture, Water and the Environment, AusIndustry, TAFE NSW, NSW Health and the NSW Department of Primary Industries,
- IT companies such as Anomaly Software, Microsoft, NVIDIA,
- communications and entertainment companies such as Elsevier, Foxtel, Telstra, and the Nine Network
- industry peak bodies such as the Australian Meat Processor Corporation
- local organisations including Headspace Wagga Wagga, the Murrumbidgee Primary Health Network, Wagga Wagga City Council, and Wagga Wagga TV

Global Digital Farm

Charles Sturt University is home to Australia's first 'hands-free' farm, part of a new high-tech collaboration between the University and Food Agility Co-operative Research Centre.

While digital technologies have the potential to boost productivity, ensure food security, and improve the management of natural ecosystems, they are not yet in wide use. Nor are they well understood. The digital maturity of the agricultural sector has been described as 'ad hoc', with decision-making too often based on limited use of data. The barriers to greater adoption of digital technologies include industry leadership, industry culture, the technologies available, data and analytics, and the level of training or digital literacy of potential users.

The Global Digital Farm can help address these challenges by offering a fully integrated digital learning and research environment working within a full-scale, commercial, mixed farm operation.

The project is located on Charles Sturt's 1900-hectare farm, which is operated as a commercial enterprise and incorporates a range of broad acre crops (wheat, canola, barley), as well as a vineyard, cattle and sheep. As Australia's first fully-automated commercial farm, the Global Digital Farm can demonstrate the future of farming through robotics and artificial intelligence and by creating new sustainability and carbon models to drive improvements in farming practice. It serves to showcase the future of farming through robotics and artificial intelligence, and by creating new sustainability and carbon models to drive improvements in farming practice.

The Global Digital Farm brings together a range of proven and new technologies, such as:

- the Internet of Things that helps us capture and exchange data,
- farm management software programs that keep track of past and planned management activities,
- cloud computing for data storage and protection,
- computer integration of individual pieces of information that on their own would tell us little,
- predictive software programs to analyse the system and run 'what if' scenarios,
- connections to external information sources and sinks, integrating the farm into agribusiness, regulatory and supply-chain networks, and
- a digital interface to view, interact and make sense of it all.

Useability is central to the project, ensuring a regular farm manager in a real commercial setting can apply and integrate technologies efficiently and effectively in their day-to-day farm activities.

By developing and demonstrating technologies, the Global Digital Farm will shape the digital workforce of the future. The combination of university education and research and a commercial farm setting will build skills, knowledge and experience for the agricultural industry of the future, increase innovation and leadership and attract a wider range of entrants to the agricultural sector – a key component of the Australian Government's National Agricultural Workforce Strategy.

The Global Digital Farm will be a key resource for surrounding communities, boosting digital knowledge, skills, and capabilities in one of Australia's most important agricultural regions. Producers and industry professionals will have a source of digital agriculture training, service provision, skilled graduates, and a collaborative partner for new initiatives in the heart of a major agricultural region. Schools and communities in the region would benefit from the development of innovative resources and outreach programs to lift digital literacy and environmental stewardship.

The Global Digital Farm also has the potential to transform agricultural R&D by carrying out on-site validation of research outcomes, the use of multidisciplinary research teams, and directly collaboration with industry. Over time, we expect the Global Digital Farm to become a magnet for public and private research and international collaboration and 'fast-track' farm adaptation to emerging challenges.

On Farm Wifi[12], the first major project at the Global Digital Farm, was launched in October 2021[13]. The project is a collaboration between Charles Sturt, UTS, the Food Agility Co-operative Research Centre, and agtech company Zetifi.

Zetifi is an innovative technology that will provide 'last mile' wifi coverage for farms and regional and remote areas. The technology will enable tractors, trucks, and other equipment to become roving Wi-Fi devices with a range of up to five kilometres, using bespoke and adapted off-the-shelf antenna arrays that can be fitted to farm equipment to provide long-range communication.

Now a stand-alone technology company based in Wagga Wagga, Zetifi is a direct outcome of the AgriPark, the Global Digital Farm, and Charles Sturt and NSW Government innovation programs. Zetifi has received funding from the NSW Physical Sciences Innovation Fund and the Boosting Business Innovation Program.

Drought Hub

The Southern NSW Drought Resilience Adoption and Innovation Hub is a consortium of nine regional partners including primary producers, Indigenous, industry and community groups, researchers, entrepreneurs, education institutions, resource management practitioners and government agencies.

The Southern NSW Innovation Hub is one of eight hubs established with funding from the Australian Government's Future Drought Fund. The Hubs form the epicentre of user-driven innovation, research and adoption and facilitate transformational change through the co-design of research, development, extension, adoption, and commercialisation (RDEA&C) activities. The Southern NSW Hub is focused on water management, food security, and farming systems, and therefore has strong links with the other Charles Sturt initiatives described above.

Based at Charles Sturt's AgriPark, the Southern NSW Innovation Hub will enable regional stakeholders to have a voice in drought resilience activities, collaborate with experts, gain access to resources, and participate in adoption programs such as workshops, seminars, and field days.

Current program highlights include:

- Economic resilience for an innovative and profitable agricultural sector,
- Social resilience for resourceful and adaptable communities, and

[12] See https://www.foodagility.com/research/on-farm-wifi
[13] See https://news.csu.edu.au/latest-news/improved-connectivity-rolling-onto-farms-due-to-innovative-research

- Environmental resilience for sustainable and improved functioning of farming landscapes

The Hub will encourage stakeholders, end-users, and the public to have a voice in hub activities, collaborate with experts, gain access to resources and participate in extension programs such as workshops, seminars and field days. In late 2021 the Australian Government provided additional funding to the University to expand the capabilities of the Southern NSW Drought Resilience Adoption and Innovation Hub to support broader agricultural innovation, including in fisheries and aquaculture.

In June 2022 the Southern NSW Drought Resilience Adoption and Innovation Hub will host the second annual 'Science to Practice Innovation Forum', connecting researchers, practitioners, farmers, agri-businesses, governments, and end-users who are making regional Australia more drought resilient.

Other projects

The Murray-Darling Basin Diversion Screening initiative

A pilot project, funded by Ian Potter Foundation and carried out by Charles Sturt and the NSW Department of Primary Industries, led to the production of Australia-first best-practice guidelines which are now forming the basis for roll out across the Murray-Darling Basin.

Modern diversion screens protect fish and other aquatic life from being abstracted from rivers during the diversion process. However, well-designed screens also stop debris (like gum nuts, sticks, leaves) from clogging pumps and irrigation sprinkler jets. Implementation sites have shown significant decreases in adverse impacts on native animals, while farmers are reporting productivity increases through reduced maintenance and water savings. It is an example of a win-win application of AgTech which is supporting regional manufacturing industries (for instance, AWMA Water Solutions).

The research gave birth to the "Screens for Streams" initiative which has now attracted $26 million in funding as part of the Northern Basin Toolkit and additional funding through the NSW DPI capital works program. This is a noteworthy example of applied research: a university-government-private partnership providing on-ground outcomes which are benefitting farmers, the environment and regional manufacturing.

The Next Generation Water Engineering and River Management Hub

Funded through the Australian Government's Regional Research Collaboration Program, the Hub is committed to applying innovation, and co-design principles, to develop long term sustainable water solutions. The Hub will contribute to local and regional priorities through co-delivered research projects in water and environmental management, drought resilience and boosting agricultural productivity.

The Next Generation Hub will develop and trial innovative engineering solutions and water management practices, including the incorporation of Indigenous knowledge, to secure the social, economic, cultural, and environmental future of Australia's inland rivers, particularly the Murray-Darling Basin and the livelihoods they support. The Hub is about challenging current water management practices and trialling new, holistic ways, of doing things that are inclusive and innovative.

The Next Generation Hub will include:

- Eco-Engineering innovation, where the ecological needs of the river drive innovative approaches to engineering solutions. The idea is to generate win-win outcomes that enable productive use of water in a sustainable way.

- Community and traditional owner engagement where we will consult and engage with key community groups to help co-design and implement the generated solutions. If regional communities are engaged in the development of solutions, they are more likely to "own" and support the outcomes.

- Pre-commercialisation, where new technologies with potential for scale-out in the Murray-Darling basin will be piloted. The idea is to ensure these can be sustainably engineered, supported by community groups, then assessed for wide-scale application.