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TECHNOLOGY AND THE AGRICULTURE AND MINING SECTORS

Organisation: NSW Farmers' Association

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About NSW Farmers

NSW Farmers is Australia's largest state farming organisation, representing the interests of its farmer members in the state. We are Australia's only state-based farming organisation that represents farmers across all agricultural commodities. We also speak up on issues that matter to farmers, whether it's the environment, biosecurity, water, animal welfare, economics, trade, or rural and regional affairs.

Agriculture is an economic 'engine' industry in New South Wales. Farmers across the state produce more than $17 billion worth of food and fibre every year, or around 25 per cent of total national production, and contribute significantly to the state's total exports. Agriculture is the heartbeat of regional communities, directly employing almost two per cent of the state's workers and supporting roles in processing, manufacturing, retail, and hospitality across regional and metropolitan areas. The sector hopes to grow this contribution even further by working toward the target of $30 billion in economic output by 2030.

We have teams working across regional New South Wales and in Sydney to ensure key policies and messages travel from paddock to Parliament. Our regional branch network ensures local voices guide and shape our positions on issues affecting real people in real communities. Our Branch members bring policy ideas to Annual Conference, our Advisory Committees provide specialist, practical advice to decision makers on issues affecting the sector, and our 60-member Executive Council makes the final decision on the policies we advocate on.

As well as advocating for farmers on issues that shape agriculture and regional areas, we provide direct business support and advice to our members. Our workplace relations team has a history of providing tailored, affordable business advice that can save our members thousands of dollars. Meanwhile, we maintain partnerships and alliances with like-minded organisations, universities, government agencies and commercial businesses across Australia. We are also a proud founding member of the National Farmers' Federation.

Executive summary

The future of farming is rooted in the ability to achieve more profitable and sustainable agriculture through significant incentives to upgrade plant and technology for conservation and production, while also improving farm management skills, encouraging youth to enter the industry, and increasing farm returns through improved efficiency.

NSW is already beginning to utilise technologies such as blockchain, artificial intelligence, big data and the Internet of Things (IoT) to increase agricultural productivity. This potential increase for farmers in NSW will also bring opportunities for the regions that are supported by agricultural industries. As farming continues to use more digital technology, new skills and new jobs will be required to support farming systems and equipment.

Integrating new technologies into production systems and operations require a different skill set than those traditionally associated with agricultural industries. Additionally, there remain to be significant barriers to adoption for many producers including awareness, engagement, cost, available time and connectivity.

It is clear that regional, rural, and remote users consider that infrastructure has not kept pace with the expectations of use of telecommunications. Improvements to rural, regional, and remote telecommunications infrastructure are required to provide fit-for-purpose access to what is increasingly essential services.

As the AgTech sector continues to mature and grow there are a variety of measures that can be implemented to ensure the increased uptake and full realisation of the value of this industry. Agribusiness, biotechnology, and equipment companies with significant R&D budgets were the first and only users of AgTech in Australia. Attracting new participants in non-traditional forms such as entrepreneurs, venture capitalists, investors and developers bringing will bring in different skillsets, networks, and expertise to help advance the industry. As this shift occurs, it also opens new pathways for technological development across the supply chain.

1. Opportunities for regional NSW presented by agricultural and mining technologies and innovations

Efficiency & Productivity

Australian agriculture is currently predicted to grow by more than $3 billion a year to become a A$100 billion industry by 2030[1]. Keeping pace, agricultural technology is one of the fastest growing industries, predicated to become one of Australia's next $100 billion industries by 2030[2]. With the increasing global population, specifically the rising middle class, the opportunity to expand agricultural sectors is significant. AgTech will be essential in assisting farmers to increase yields, productivity, and quality to service these markets while relying on fewer resources and inputs, mitigating the effects of the changing climate and an increasing risk of extreme weather.

The future of farming is rooted in the ability to achieve more profitable and sustainable agriculture through significant incentives to upgrade plant and technology for conservation and production, while also improving farm management skills, encouraging youth to enter the industry, and increasing farm returns through improved efficiency. Government investment into any AgTech to promote uptake should not be commodity specific, but rather open to all primary producers across NSW.

NSW is already beginning to utilise technologies such as blockchain, artificial intelligence, big data and the Internet of Things (IoT) to increase agricultural productivity. This potential increase for farmers in NSW will also bring opportunities for the regions that are supported by agricultural industries. As farming continues to use more digital technology, new skills and new jobs will be required to support farming systems and equipment. Simultaneously, new technologies can help rural and regional communities to stay connected and fulfilled. But AgTech isn't just changing the face of farming; it's helping save farming land for the future.

Environmental Stewardship

Innovation will be essential in order to address the ever-changing environmental concerns, while supporting the food supply of a global population of over 8 billion. The agricultural industry contributes roughly 13.5% of Australia's carbon emission in 2018[3], but advancements in technology and biotechnology can significantly help to reduce this impact. Opportunities to reduce inputs,

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[1] *"Powering Growth: Realising the potential of AgTech for Australia", KPMG, 7 September 2016, p. 3*
[2] *NSW Government, Agtech. https://invest.nsw.gov.au/sector-opportunities/agtech, accessed February 2022*
[3] *Agriculture and Food, Climate Change – Department of Primary Industries and Regional Development. https://www.agric.wa.gov.au/climate-change/how-australia-accounts-agricultural-greenhouse-gas-emissions Accessed February 2022*

increase efficiency, increase soil carbon sequestration, and reduce food wastage all contribute to the ongoing land stewardship that Australian farmers take into consideration in all operations. NSW Farmers encourages the ongoing research and development of new economic practices and technologies that will maintain and improve soil quality and productivity, including systems that sequester carbon[4].

Rural Access & Connectivity

In mid-2021, NSW Farmers conducted a member survey to understand the changes and effects of technology accessibility in regional, rural and remote areas. The key themes from this survey indicate concern about deteriorating services over recent years, delays in service repairs, lack of competition, and significant uncertainty regarding the change in mobile network technology from 3G to 4G then 5G[5]. Safety concerns due to a lack of phone service were also a strong theme, whether it be on farm where workers often carry out tasks in isolation, travelling on regional roads, or in cases of emergency such as bushfire.

It is clear that regional, rural, and remote users consider infrastructure has not having kept pace with the expectations of use of telecommunications. Improvements to rural, regional and remote telecommunications infrastructure are required to provide fit-for-purpose access to what is increasingly essential services. There are also the negative impacts on the productivity and efficiency of the farm business, and inconvenience caused by unavailable and unreliable telecommunications were significant issues. Limited, unreliable, or absent mobile and internet services have impeded primary, secondary, and tertiary studies for remote learning for farming families.

Growers and producers will require more accurate agronomic insights, forecasting and risk assessment. Farmers will need access to tools that add significant value to farming operations in the form of greater operational efficiency and financial sustainability, almost always relying on the advancement of existing telecommunication infrastructure and technology[6].

[4] NSW Farmers Policy 07EC – Carbon. "That the Association acknowledge the challenges presented by climate change and lobby the State & Federal Governments to:
a. Apply the responsibility for addressing these challenges equitably across all sectors of the community and across all industries;
b. Recognise and reward the contribution agriculture makes and has already made to reducing Australia's greenhouse emissions;
c. Establish true economic incentives to farmers for establishing carbon sinks that recognise the long term cyclical nature of agriculture;
d. Investigate the potential of soil and other agricultural carbon sinks;
e. Investigate programs and policies that increase the capacity for regional communities to adapt to climate change, including increased flexibility in patterns of land use and funding for development of new farm technologies;
f. Support technological advances that reduce atmospheric carbon;
g. Upgrade public fire mitigation so as to reduce net carbon emission from wildfire; and h. Include farm sector representatives in all current and future advisory processes and high level industry panels on climate change"
[5] NSW Farmers Regional Telecommunications Review, 2021
[6] NSW Farmers Policy 9WDC Oct – Telecommunications "Western Division Council call for priority for data and voice delivery including effective use of existing technology and infrastructure."

2. Barriers to the take up and use of agricultural and mining technologies and innovations

Engagement and awareness

Agtech products, unlike many other areas of tech innovation, require a significant amount of engagement with users to ensure the products will be fit for use in regional and agricultural settings. Working with AgTech start-ups and corporations in the early stages of development ensures the value to farmers is built into the products and therefore an easier pathway to market. Producers, however, are often unaware of the opportunity to engage with developers or do not have the capacity to take on additional work. Trials may include testing new technology, installing new software's, utilizing land, debugging issues and analysing data with developers who may not have the same agriculture background knowledge.

It is the onus of the developers to seek out and engage with producers to trial new products, but the resources needed to do so, or to assist in the trials may not always be available. Capacity to think outside of the current and conventional model is still a barrier for many regions. It may be the case that many see this industry more as of "hype" than substance.

Digital Literacy & Training

Integrating new technologies into production systems and operations require a different skill set than those traditionally associated with agricultural industries. The digital literacy skills can include the ability to operate digital systems (computers, microprocessors etc.), the ability to manage and process data effectively and then utilise it in decision making.

Many producers do not have the adequate range of skills within their workforce to make the use of new technologies effective on farm. Although there are options to purchase the skills through service providers, this creates additional cost barriers for smaller operations. The training requirements for some technologies is also quite rigorous and time consuming for producers once they are in full operation. As a new generation of producers enter the market, this barrier may begin to reduce naturally as digital literacy increases. However, advanced use of data and technology in business models will continue to require additional training and upskilling. It is essential that government provide real increased funding for rural schools to increase access to modern technology and telecommunication in education[7].

[7] *NSW Farmers Policy 99AC – Education. "That the Association seek that, in order to ensure that rural families have access to high quality education, the NSW Government provides:*
a. real increased funding for rural schools;

As more farmers begin integrating different systems and technologies onto their property, the issue of integration will increase bringing along complex questions regarding farm data and the right to repair. Data collection and storage, ownership, privacy and data quality will become of more concern to more producers as they begin to work with a growing number of agtech providers.

Cost to Producers

Although the direct cost of technology has been decreasing, the complexity of products and supporting systems are becoming more intensive to install on farm. Additionally, the dollar figure may not be the concern for many producers but rather the value offered in relation to the price. Many producers still report little benefit and low levels of technological adoption[8]. There is still an ongoing unclear return on investment due to the entrepreneur's inability to clearly articulate or demonstrate the value of their technology to the user.

Producers are often being asked to purchase new products with limited functionality and support the development of the technology to be fit for use. Although this engagement may result in better tech products, it limits the ability for many farmers to be first adopters as they can not support the price of both the product and the time invested in development. Raising famers' awareness of existing digital technologies that offer quality, accessible and affordable communications and data on farm can help to increase access to quality and affordable telecoms.

Infrastructure & Connectivity

Mobile connectivity issues are increasingly challenging farmers as they look to embrace technology for business decisions and productivity improvements. Farmers face poor cellular mobile connectivity and a lack of appropriate information about alternatives, such as satellite, microwave and other data-based platforms.

Unreliable and intermittent telecommunications are preventing take up of new agricultural technologies such as the *Internet of Things* to increase farm productivity and profitability. Concerns about negative impacts on the productivity and efficiency of the farm business, and inconvenience caused by unavailable and unreliable telecommunications are significant issues. NSW Farmers have called for the priority for data and voice delivery including effective use of existing technology and infrastructure. These barriers also include a lack of viable models of installation, support and maintenance.

b. access to modern telecommunication and computer technologies in all rural schools;
c. access to specialist services as required for rural students;
d. flexibility in staffing and enrolment guidelines for small rural schools;
f. effective means of consultation and involvement of local communities in managing the school;
g. a commitment that the formula under which teachers and teaching spaces are allocated be reviewed in consultation with small rural communities and that the formula be changed to address the needs of small rural school."

[8] Nolet, Sarah & Mao, Cass, Challenges and opportunities for effective value proposition design in Australian agtech, AgriFutures National Rural Issues 2018

Measure to support the use of agricultural and mining technologies and innovations.

Research & Development

It is essential to create incentives for multinational agricultural corporations to establish major R&D operations in Australia. This would stimulate diversification of AgTech segments of focus and leverage Australia's public R&D sector in agricultural sciences through collaboration with industry, to build commercialisation capability. Government departments such as the Department of Primary Industries must continue to support and fund R&D projects that utilise technology for the betterment of productivity[9]. The Association has previously called on the Federal Government to provide a targeted RD&E and grants program for renewable technology in regional Australia.

Sector Supporters

In 2021, the NSW Government committed $48 million to an expanded Farms of the Future program. DPI leads the Farms of the Future program, working with five regional precincts and focused on red meat, grains, horticultural and tree crop producers.

Farms of the Future will deliver on-farm connectivity and encourage farmers to adopt ag tech to boost productivity and improve resource management, including water efficiency and drought preparedness. Independent digital technology advisory services delivered by NSW Farmers Digital Technology officers outside the Farms of the Future regional precents will also delivery targeted information campaigns and regional roadshows to raise awareness of the options for "on-farm" technology.

These existing organisations within the agricultural landscape are already positioned to increase both their support for producers in their adoption of new technology, and the entrepreneurs developing new agtech products. Regional Development Centres, grower groups, state farming organisations, university and extension organisations, government organisations and service providers are all able to support of the development of the agtech sector. The inclusion of these bodies also increases their presence in regional communities and additional pathways for those looking to enter agricultural industries in Australia. These agencies can be considered a first line of defence in the face of barriers to adoption.

[9] *NSW Farmers Policy 98AC – Research, Development and Extension (RD&E) "That the Association:*
a. seek increased Federal Government support for primary industry-related research and development;
b. call for the retention of Government dollar for dollar matching of industry levy funding for Research and Development"

Attracting Investors

Governments can influence and create incentives for sophisticated investors from overseas to open offices in Australia, particularly venture capital firms with domain experience in AgTech[10]. This would stimulate an increase in Series A and later-stage investment flow in the sector as well as transfer domain-specific expertise to the Australian investment community. The association supports retention of current research stations, research projects and extension services and a funding commitment to new technology research for public good[11].

Up-Skilling and Training

There are currently a variety of educational and training programs available across NSW through the universities, TAFE and RTO's for students to access agriculture-specific career paths. Reviewing the existing opportunities for students who have entered agriculture programs to access technological and data-based courses is limited. NSW Farmers supports ongoing measures to increase business services in the regions including but not limited to information technology and farm skills training[12]. Ensuring that existing producers have the opportunity to increase their knowledge in these areas, as well as including these pathways in the training for new entries into the industry will establish a baseline of literacy that reduces barriers for adoption.

Recommendations:

- *Increased focus on industry specific R&D projects through government or university programs to ensure the Australian agriculture sector is innovative, resilient, and prosperous into the future.*
- *Dedicated government funding for extension and support services designed to upskill producers in:*
    - *Their digital literacy, business modelling and data analysis*
    - *Their awareness of available agtech products and engagement with developing products*
    - *Troubleshooting, maintenance, and integration*
- *Engaging a team of local Digital Technology officers, through the NSW DPI Future of Farms program to increase farmer knowledge, skills and confidence to adopt new digital technology solutions tailored to their needs.*
- *Creating attractive opportunities for foreign and domestic investment into agtech development to stimulate the sectors growth.*
- *Establishing AgTech, data, technology, and other related course options for agricultural students, as well as for existing producers to upskill in these areas.*

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[10] *Australian Agtech: Opportunities and challenges as seen from a US venture capital perspective. United States Studies Centre, University of Sydney 2018*

[11] *NSW Farmers Policy 13AC – Agricultural Research Funding "That the Association support retention of current research stations, research projects, extension services and a funding commitment to new technology research for public good functions."*

[12] *NSW Farmers Policy 01AC – Business Services "That the Association develop feasibility studies into the top three business services supported by the members' survey, namely:*
a. legal services
b. information technology
c. farm skills training."

3. The impact of technologies and innovations on the past, current and future agriculture, and mining workforce

AgTech such as automation, GPS guidance, yield mapping, sensors and remote imaging were considered to be cutting edge just a few years ago. Australian farmers have always embraced technology as part of agriculture, allowing for the innovation and growth of the industry that we have seen over time. However, Australia does have a relatively immature presence in the agtech ecosystem globally, specifically when compared to competitor markets such as North America and the UK.

In the recent past, technologies were exclusively available to large corporate farming operations due to the high cost of adoption. Agribusiness, biotechnology and equipment companies with significant R&D budgets were the first and only users of agtech in Australia. As the industry continues to mature, it is also attracting new participants in non-traditional forms such as entrepreneurs, venture capitalists, investors and developers bringing with them different skillsets, networks and expertise. As this shift occurs, it also opens new pathways for technological development across the supply chain. This investment into agtech firms, large and small, will bring with it the capital needed to continue regional growth and establish skilled working opportunities in agricultural settings.

According to the Australian Bureau of Statistics (2013), there are approximately 135,000 farm businesses in Australia, 99% of which are Australian owned. 321,000 people are employed in agriculture (ABARES 2012 – 2013), with over 1.6 million jobs provided across the value chain. However, farmers are aging compared with the median age of the rest of the workforce[13] and there are not enough workers to replace those leaving. These concerns have been exaggerated over the past few years, losing a significant number of overseas skilled and unskilled workers due to Covid-19 and related border closures.

Technology can play a role in addressing these concerns both by making agriculture more attractive and by reducing the reliance on workforce where possible. Programs that help stimulate innovation, connectivity, communication, and career prosperity while reducing feelings of isolation can significantly increase the number of young people willing to join or stay in agricultural and regional settings. By unlocking the value of new technologies across the entire supply chain, the industry can attract those employees who have the skills and competencies to leverage them.

[13] *Farming on the verge of a workforce crisis, Deloitte Analysis. Accessed February 2022*

It will not however be only technical skills that should be hired for. The industry will still require those with generalist skills including human resources, information technology, data science, management, marketing, and trade. AgTech can automate mundane tasks, leaving more important jobs to skilled workers, or reduce the number of general labourers needed to complete high volumes of work. Automation has always played a role in increasing efficiency of the workforce, and agriculture systems will experience the same benefit.

The association places the highest priority on actively achieving more profitable and sustainable agriculture through significant incentives to update technology for conservation and production, improved farm management skills, increased returns through higher levels of efficiency, and encouraging youth to enter the agricultural sector[14]. Increasing access and uptake of AgTech is one method of ensuring a prosperous future for NSW primary producers.

[14] NSW Farmers Policy 95AC – Future of Agriculture "That on behalf of members, the highest priority of NSW Farmers' Association is to actively achieve more profitable and sustainable agriculture through:

a. significant incentives to upgrade plant and technology for conservation and production;
b. the identification and removal of adverse government and banking policy;
c. c. improved farm business management skills;
d. d. increasing farm returns by improving the efficiency of the marketing chain; and
e. e. encouraging youth in agriculture;
f. f. enlisting the active support of members and non-members at Branch and District Council levels to achieve these aims"