PIRSA

Agricultural Technologies in South Australia Survey Report

SOUTH AUSTRALIA

Government of South Australia

Primary Industries and Regions SA

Agricultural Technologies in South Australia Survey Report

Information current as of July 2020

Disclaimer

All Enquiries

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Summary

The South Australian AgTech Advisory Group was formed in September 2019 to provide high level, strategic advice to the State Government on the practical application and adoption of AgTech on-farm, with AgTech encompassing sensors and imagery for monitoring assets, software for farm management and precision agriculture, smart farm equipment and genetic selection.

As part of its process to develop an AgTech strategic plan, the Group initiated a survey in March 2020 to better understand the barriers and opportunities for the development and adoption of agricultural technologies in South Australia.

Over 600 primary producers, agricultural advisors, researchers and technology providers/suppliers completed the survey, with a high degree of consistency in their responses.

The barriers and enablers for greater AgTech adoption can be summarised as follows:

- *The value proposition is not always clear:*
  - Return on Investment (RoI) is not always well defined or attractive: the benefits of changing and adopting are not clear or there is not enough incentive.
  - Technologies are not always sufficiently fit for purpose: development of AgTech is most effective when there is early engagement and collaboration with producers.
  - Greater connectivity is required between researchers, AgTech developers / entrepreneurs and primary producers to ensure that AgTech development follows user-centric design principles and is grounded in the realities of South Australian farming.
  - AgTech capital expense can be prohibitive.
- *Difficulties understanding the usefulness of new technologies on-farm:*
  - Producers can be unaware of the technologies available: the rapid pace of the AgTech industry can cause confusion and frustration.
  - Knowledge and persuasion are essential pre-cursors to any decision to adopt or reject AgTech: primary producers highlighted the importance of trusted, independent intermediaries in the adoption of new technology.
  - The majority of farmers want to see others using the product, preferably those they know and trust and who are equally conservative (i.e. not early adopters).
- *New technology products can be difficult to deploy on-farm:*
  - Products need to be easy to use, seamless, integrated and compatible
  - Poor network connectivity limits uptake, particularly in regional areas
  - Farmers want ongoing and readily available support and training for AgTech adoption.

Introduction

To better understand the opportunities and barriers to the development and adoption of technologies that benefit South Australian agriculture, the South Australian AgTech Advisory Group initiated a survey in March 2020 seeking response from all quarters of the AgTech supply chain.

For the purpose of the survey, AgTech was categorised as:

- **Sensors** - hardware, software and connectivity systems specifically designed to monitor agricultural assets and related environmental conditions through the collection, analysis, and delivery of data.
- **Software for farm management, precision agriculture and product traceability** - software packages, data management, and analytics tools for highly integrated and calculated approaches to farm management and product tracing. These products are typically designed as enterprise suites with user-friendly mobile capabilities.
- **Imagery** - software and hardware systems for monitoring agricultural assets and acquiring important visual and multispectral data for insights into farm operations. Imagery typically refers to aerial monitoring systems that use drone or satellite platforms.
- **Smart farm equipment** - equipment for farming operations with integrative capabilities for whole platforms. It includes most robotic technologies. Innovations in this category typically combine a range of different technologies to perform complex farming tasks more effectively, efficiently or autonomously than through traditional farming methods.
- **Genomics** - technology and science related to the evaluation and improvement of the genetic value of plants and animals.

The survey was the first step in creating an AgTech strategy for South Australia to encourage greater uptake of technology on-farm to increase productivity and profitability.

Survey methodology

The survey was designed to improve our understanding of the present level of development and adoption of AgTech in South Australia, and to uncover the barriers and enablers to development and adoption of quality AgTech that is grounded in the realities of South Australian farming.

Responses were sought from:

- Primary producers
- Agricultural advisors
- Researchers
- Technology providers, suppliers and commercialisation partners.

Respondents were asked to rate the importance of specified issues and opportunities, as well as provide comments.

The survey was distributed broadly to:

- Primary producers
- Industry associations and representative bodies
- Agricultural advisors
- Research and Development Corporations
- Government (local and state)
- Research organisations
- Technology companies and associations
- Commercialisation partners.

Survey Results

Six hundred and one responses were received:

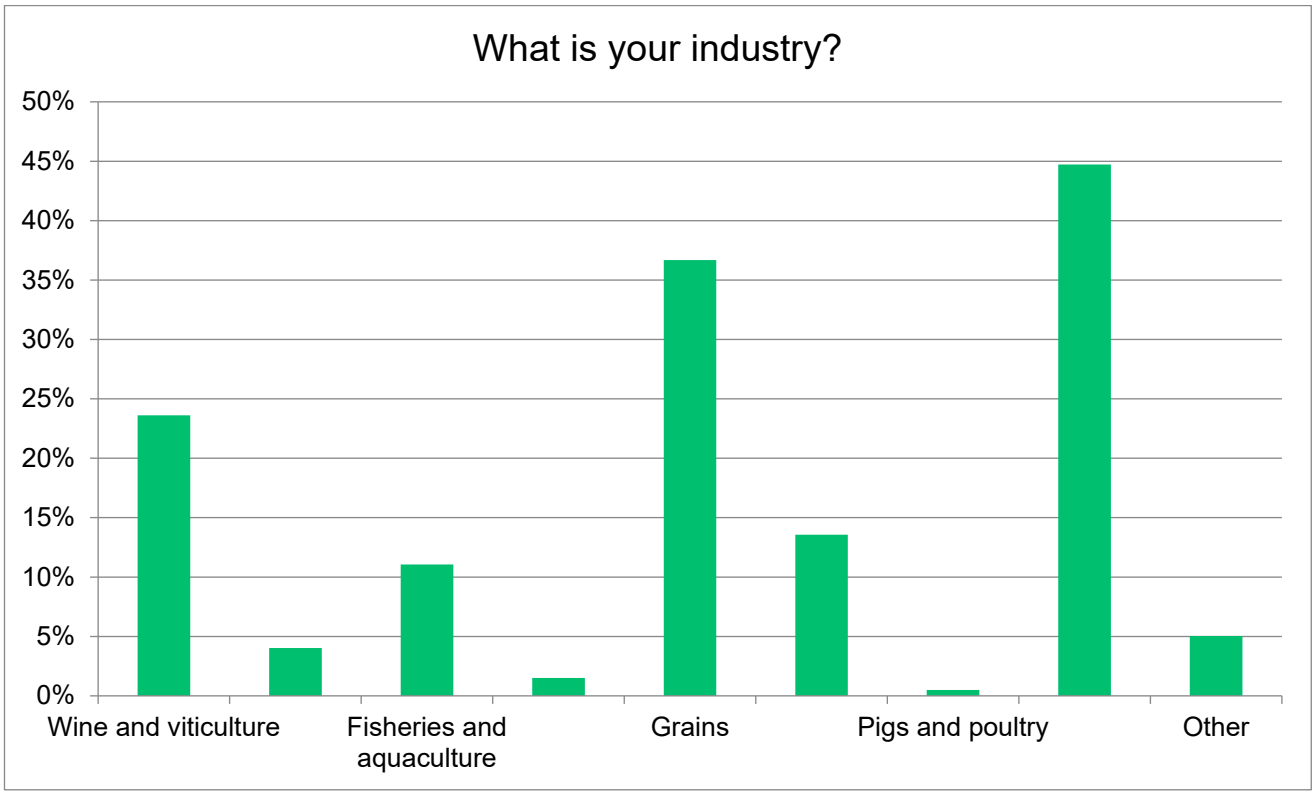
- 267 from Primary producers
- 94 from Agricultural advisers
- 126 from Researchers
- 114 from Technology providers, suppliers and commercialisation partners.

Responses from Primary Producers

Location of enterprises

The vast majority of respondent primary producers were located in South Australia (98.5%) (192 responses).

Primary producers identified the industry to which they belonged (199 responses):



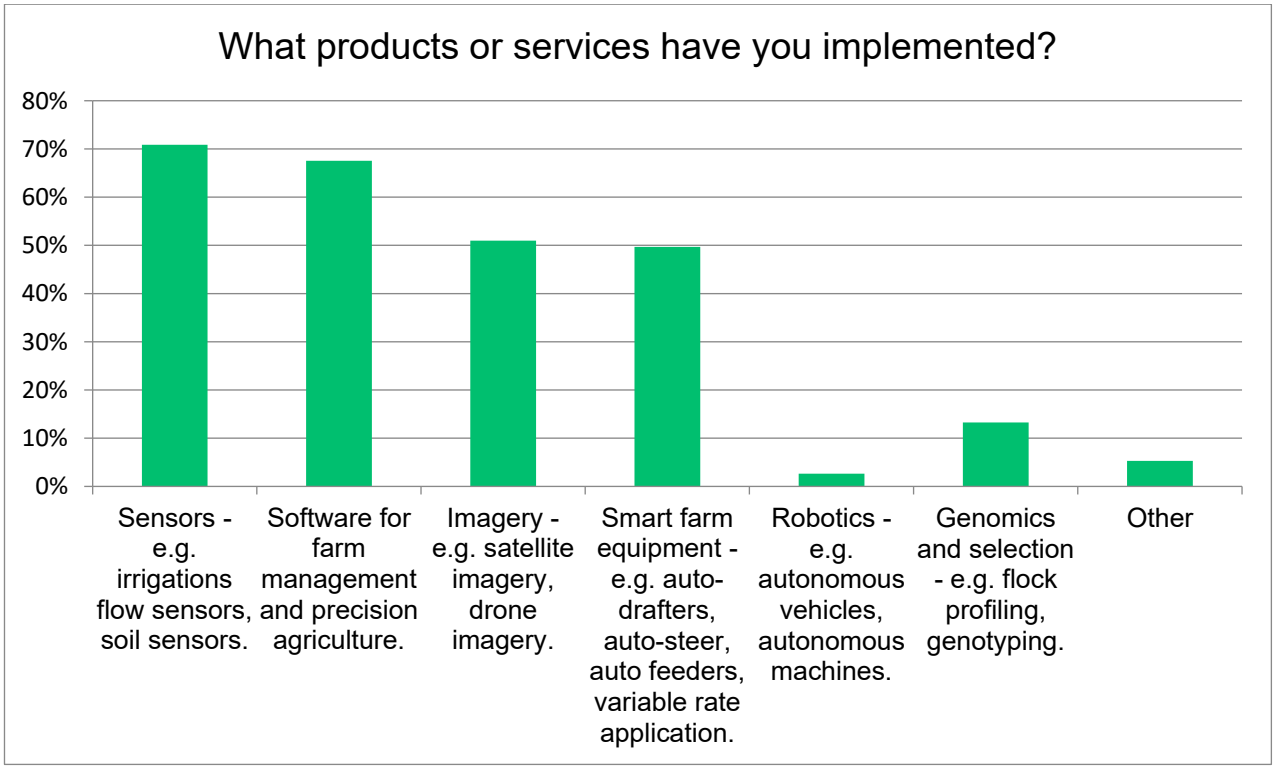
'Other' included:

- Native forestry
- Biochar
- Olive oil production
- Insects for feed
- Goats and mohair
- Kangaroo
- Lucerne seed and fodder.

Current use of AgTech by Primary Producers

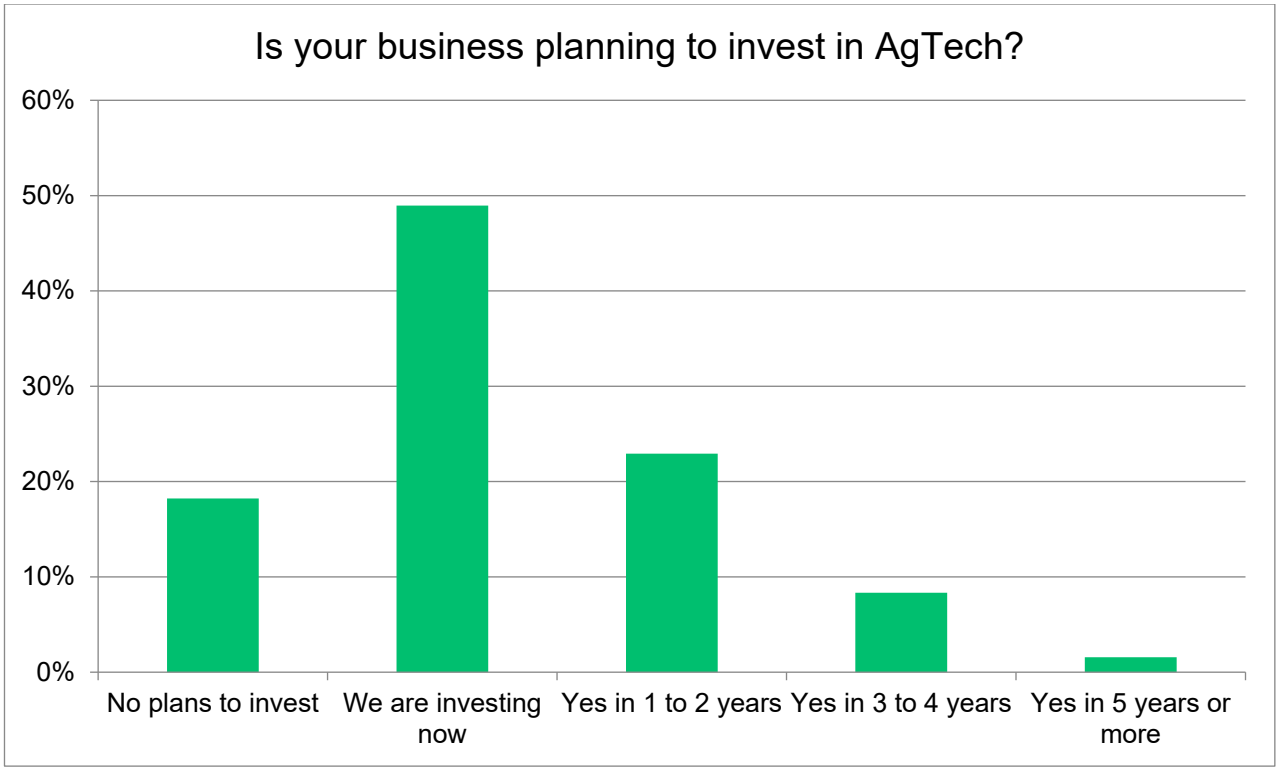
Seventy three percent of primary producers are currently using AgTech on-farm (198 responses).

Of those using AgTech, sensors and software for farm management and precision agriculture are the most widely adopted (151 responses):



Investment intentions

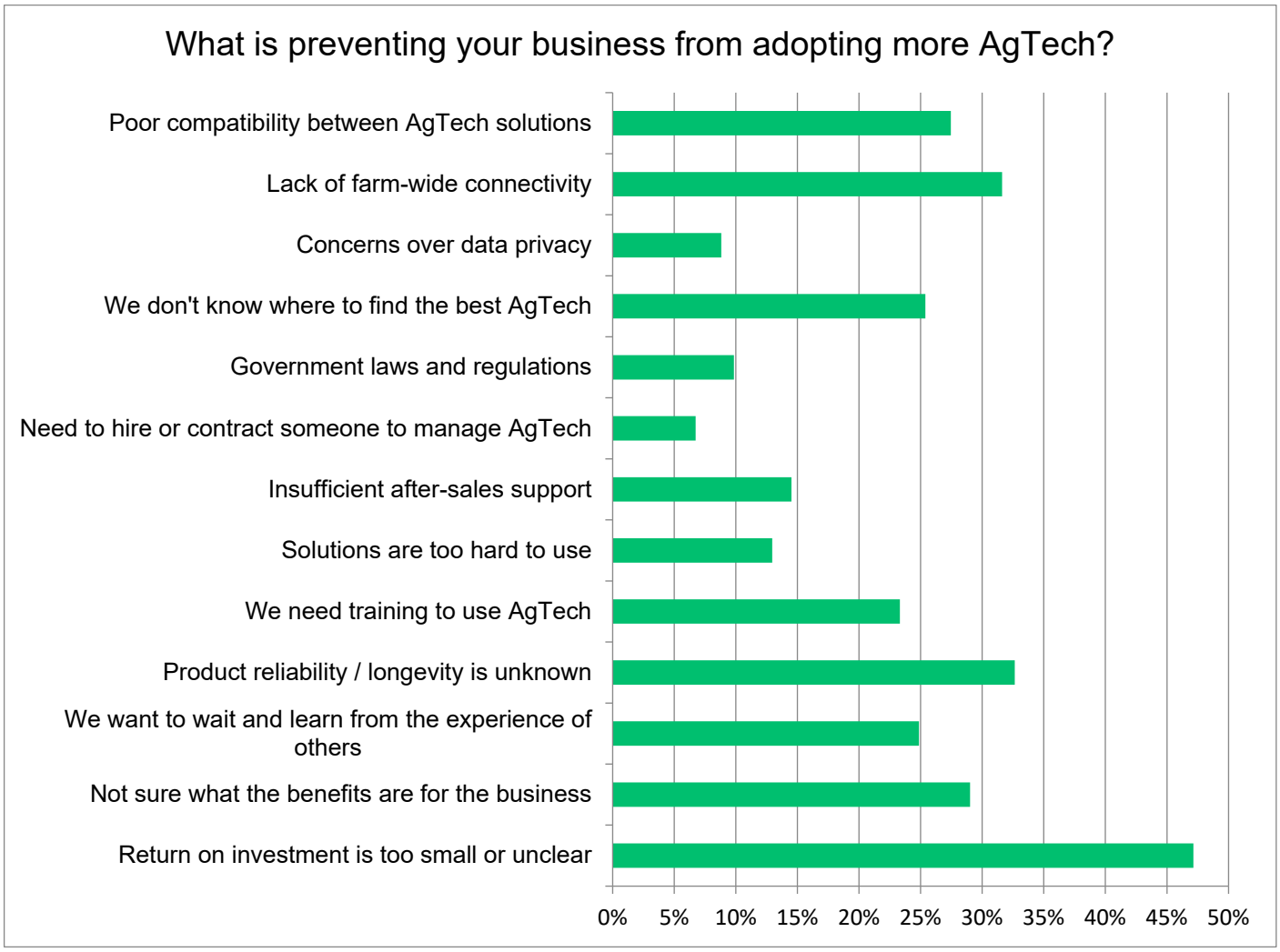
Almost half the state's producers are investing right now in AgTech, while close to 20% have no plans to invest and the remainder are planning on investing in the future (192 responses):



Barriers to adoption by Primary Producers

From the perspective of producers themselves, South Australian primary producers are not adopting more AgTech because (193 responses):

- The Return on Investment (RoI) is too small or unclear
- The product reliability / longevity is insufficiently known
- Farm-wide connectivity is lacking
- Compatibility between AgTech solutions is poor
- They don't know where to find the best AgTech
- They prefer to wait and learn from the experience of others
- Training is often required to utilise AgTech effectively.

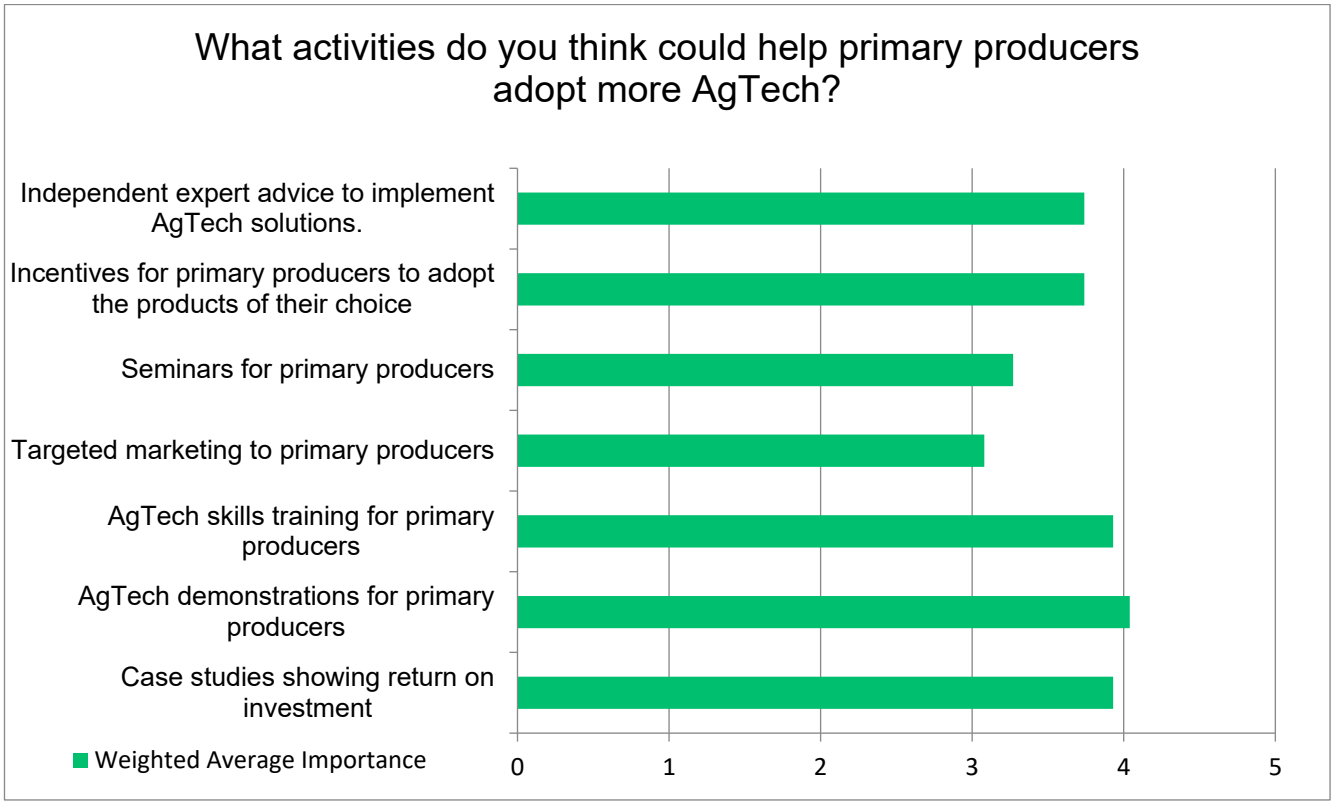


In addition to the above responses, producers also identified the (sometimes) high cost to implement AgTech and financial constraints as significant barriers to uptake.

Enablers of adoption for Primary Producers

Activities perceived by primary producers as likely to help them adopt more AgTech were (193 responses):

- AgTech demonstrations
- Case studies showing Return on Investment (RoI)
- AgTech skills training
- Independent expert advice to implement AgTech solutions
- Incentives for primary producers to adopt the products of their choice.



AgTech solutions for Primary Producers

When asked what the top issues were they would like to resolve with AgTech on their property, primary producers desired (170 responses):

Cross-industry

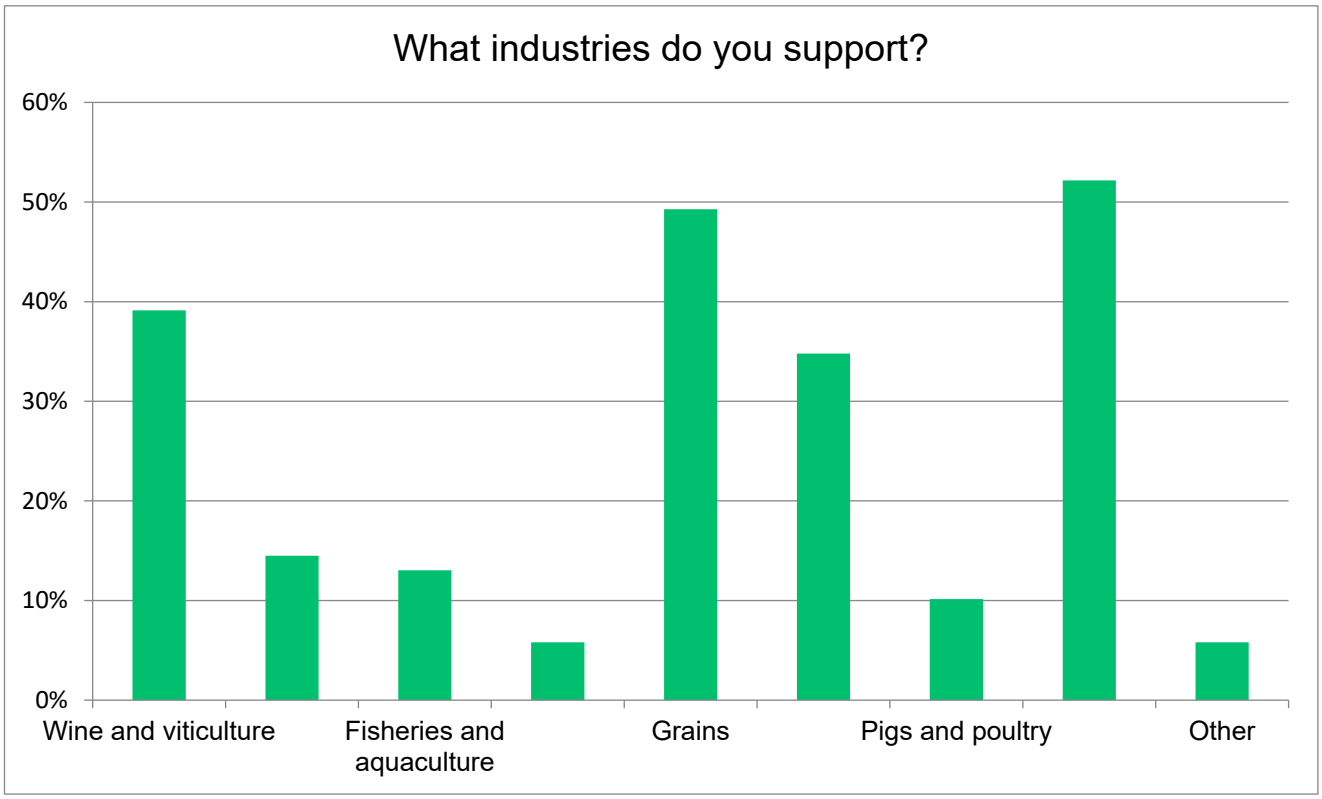
- Farm management
  - Help with decision making
  - Advancement of knowledge
  - Integrated farm-wide data management platform
- Greater productivity
  - Finding and improving low performing areas on-farm
- Efficiency
  - More efficient use of inputs
  - Efficiency of all resources (particularly time and money)
  - Improved profitability
    - Reducing costs and/or increasing income
- Return on Investment (ROI)
  - Increased ROI
  - Clear ROI to 'sell' concept to senior management
  - Ability to make more money
  - What equipment can be used effectively on-farm and what are the likely returns?
- Reduced labour inputs via automation of labour intensive tasks
  - Vehicle automation
    - Getting workers off tractors and providing higher value work
  - Enable hiring to focus on the highly variable sections of the business that, at present, are best addressed by a human
- Electronic sales and marketing
- Weather modelling and forecasting

- Quality improvement
- Grading
- Prepare for the next (unknown) threat
- Improved genetics / breeding
    - Ability to grow GM crops and use GM technology
    - Genetic markers
- Environmental monitoring
- Assist regenerative agriculture
- Property variation
    - Mapping and identifying sources of variability
- Precision agriculture
    - Better use / more accurate machinery operation
- Reporting and record keeping
- Compliance with WH&S requirements
- Confined space adaption
- Product costing and recording of product lifecycle
- Staff management
    - Job scheduling
- Supply chain improvement
- More sustainable farming systems

See Appendix 1 for complete list, including AgTech solutions for plant based production systems, fisheries & aquaculture, animal based production systems.

Responses from Agricultural Advisors

Agricultural advisors identified the industry sectors they support (69 responses):

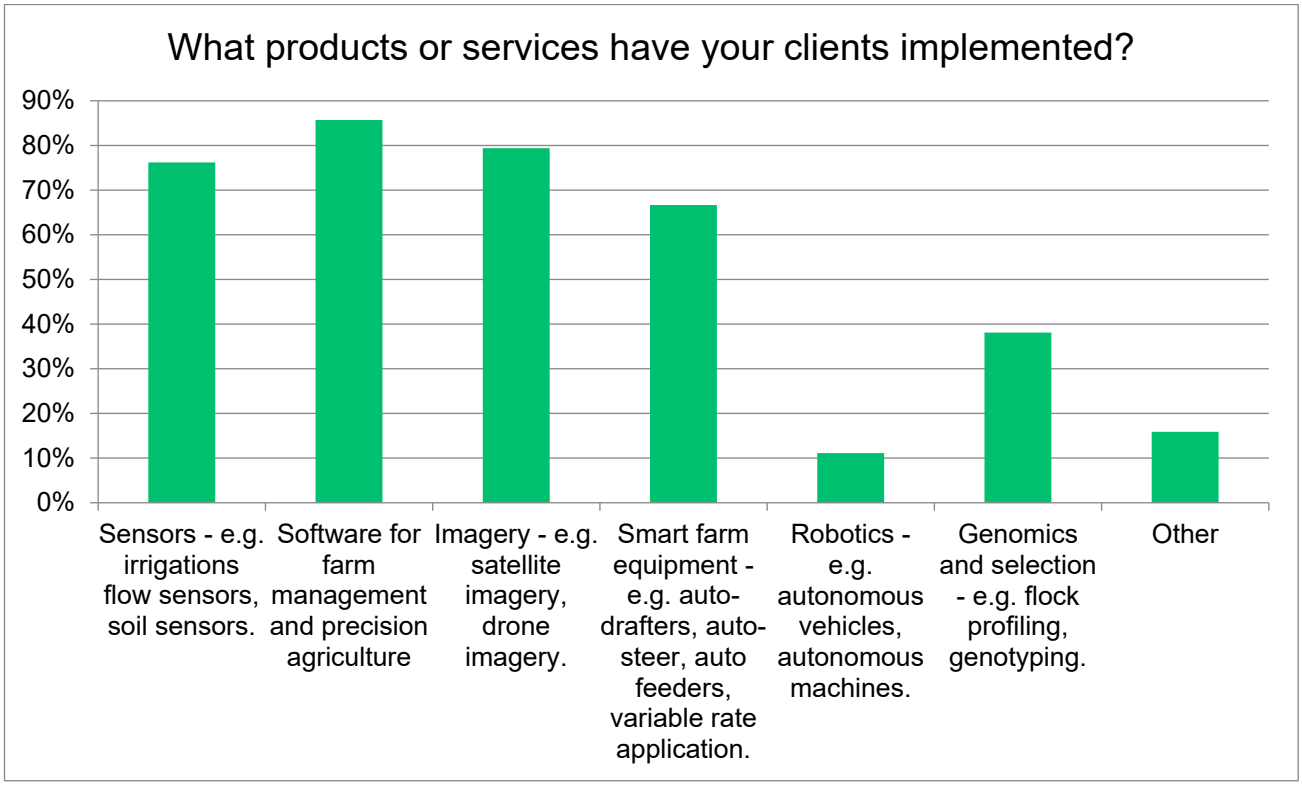


'Other' included:

- Cotton in NSW and Sugar Cane in Qld.
- Livestock industries including goat, alpaca, deer etc.
- Forestry.

Current use of AgTech on farm reported by Agricultural Advisors

The vast majority of Agricultural Advisors (91%) reported that their clients currently use AgTech (69 responses), with software for farm management, imagery, sensors and smart farm equipment the most widely adopted (as measured by the percentage of Agricultural Advisors who report that their clients are using a particular category of technology).



'Other' included:

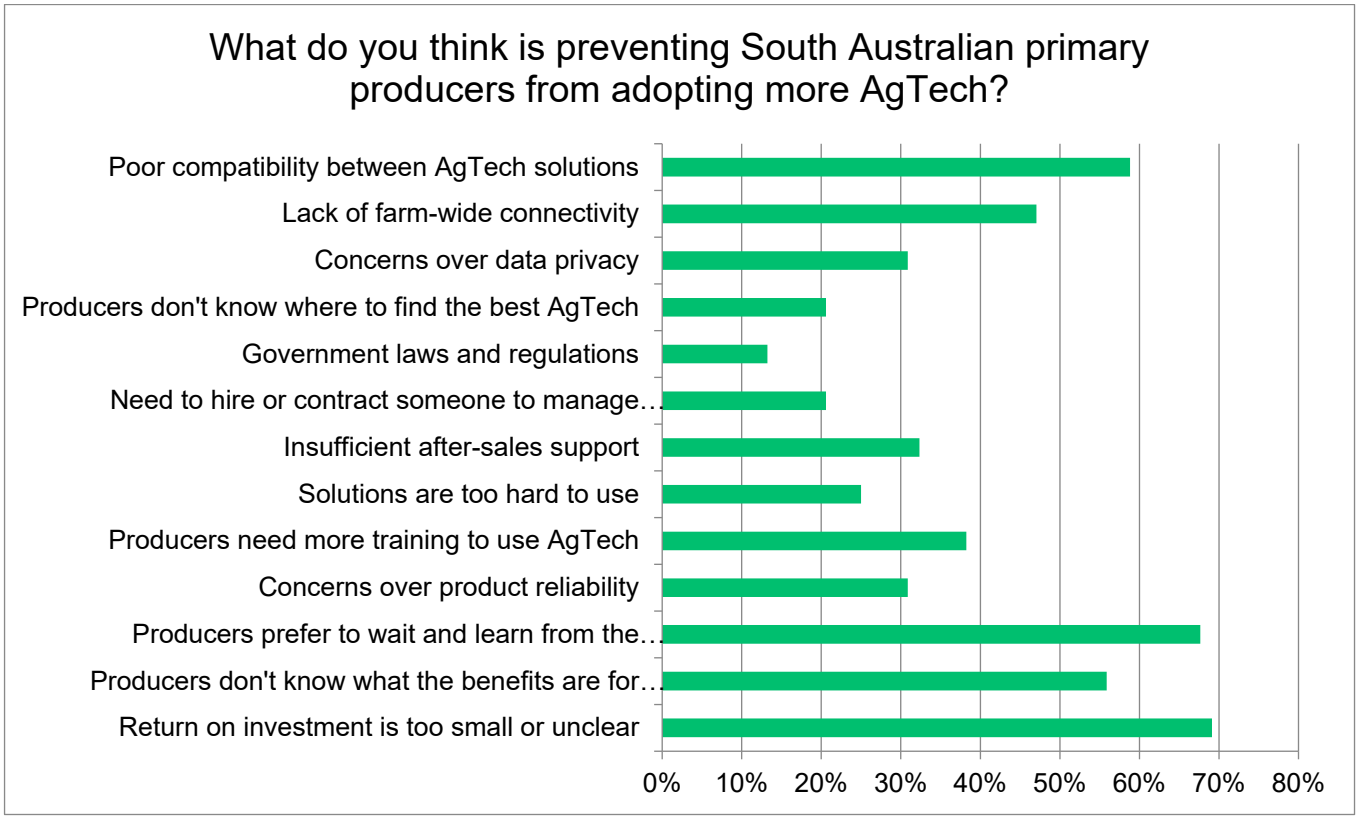
- Electronic fishery catch data collection and reporting
- Lidar
- On combine (harvester) NIR protein sensors
- One Biosecurity
- Remote cameras
- Spectral imagery fruit grading equipment
- Telecommunications.

Barriers to adoption on-farm reported by Agricultural Advisors

From the perspective of agricultural advisors, South Australian primary producers are not adopting more AgTech because (68 responses):

- The Return on Investment (RoI) is too small or unclear
- They prefer to wait and learn from the experience of others
- Compatibility between AgTech solutions is poor
- Farm-wide connectivity is lacking
- Primary producers need more training to use AgTech effectively
- After-sale support is lacking
- The product reliability / longevity is insufficiently known.

These barriers closely match those perceived by primary producers themselves.

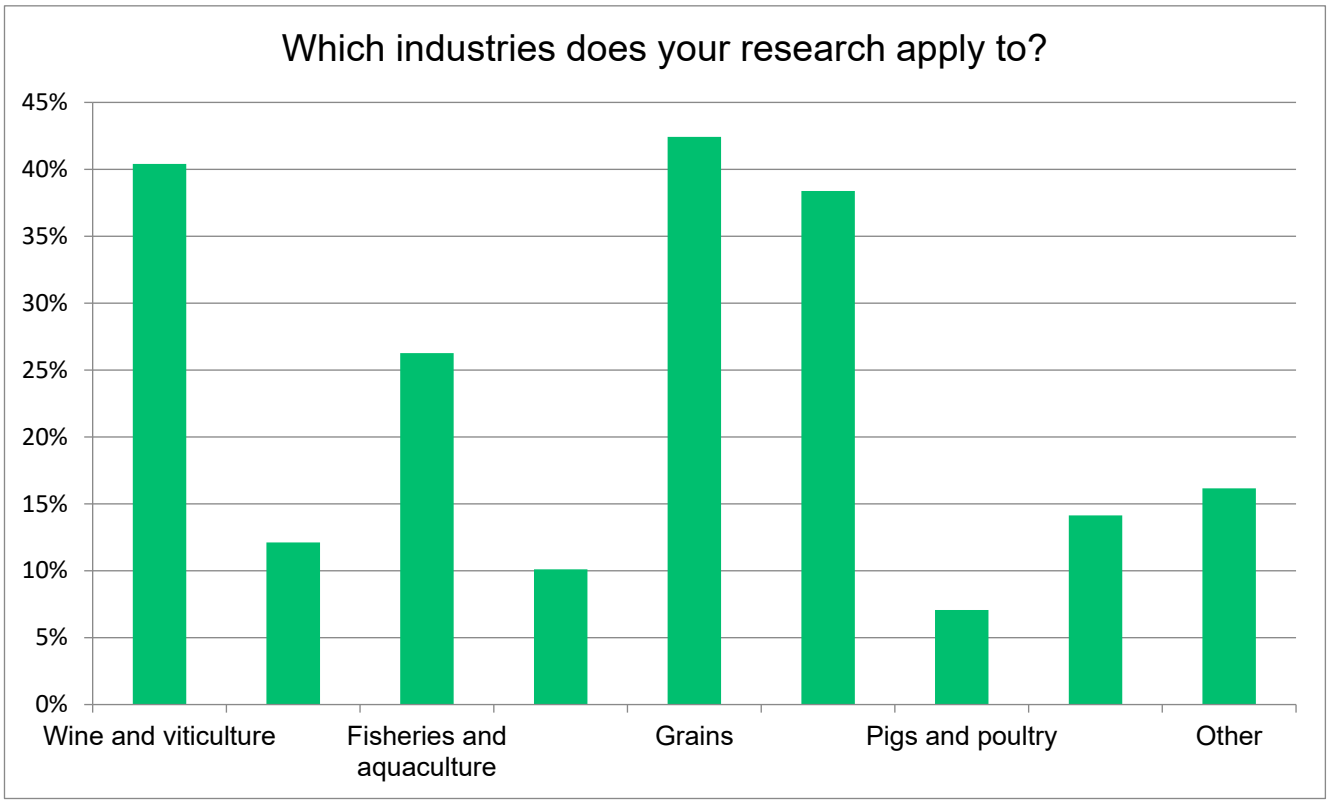


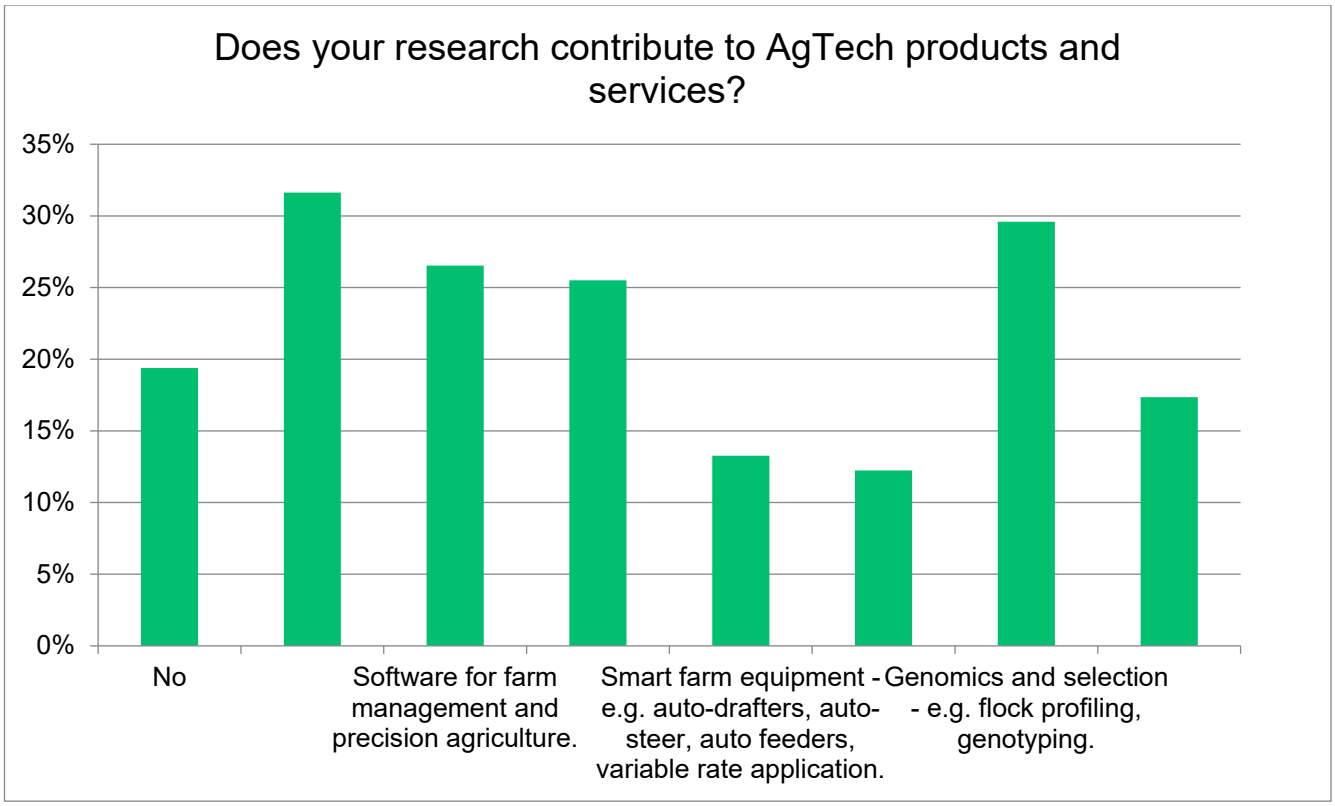
In addition to the above responses, agricultural advisors also identified the following as barriers to uptake:

- Financial constraints and the sometimes high cost to implement AgTech.
- Inability to maximise the value of data streams throughout the entire supply chain.
- Too much to choose from, which can leave primary producers overwhelmed and indecisive about which solutions to adopt.
- Insufficient linkages between systems, which can create more work and higher costs for adoption (e.g. multiple yearly subscription fees).
- Fishers do not have the funds to purchase the equipment or invest in the technology. They wouldn't know where to start to support technology in their business, i.e. AgTech is in the ‘too hard basket’.
- Insufficient demonstration sites to showcase benefits, cost, data management, support etc.
- A lot of the technology offered is not well-suited, and is either poorly targeted or solves a problem not faced by farmers.

Responses from Agricultural Researchers

Scientists' research currently applies variously to all primary production sectors and contributes products and services to all categories of AgTech (98 responses).

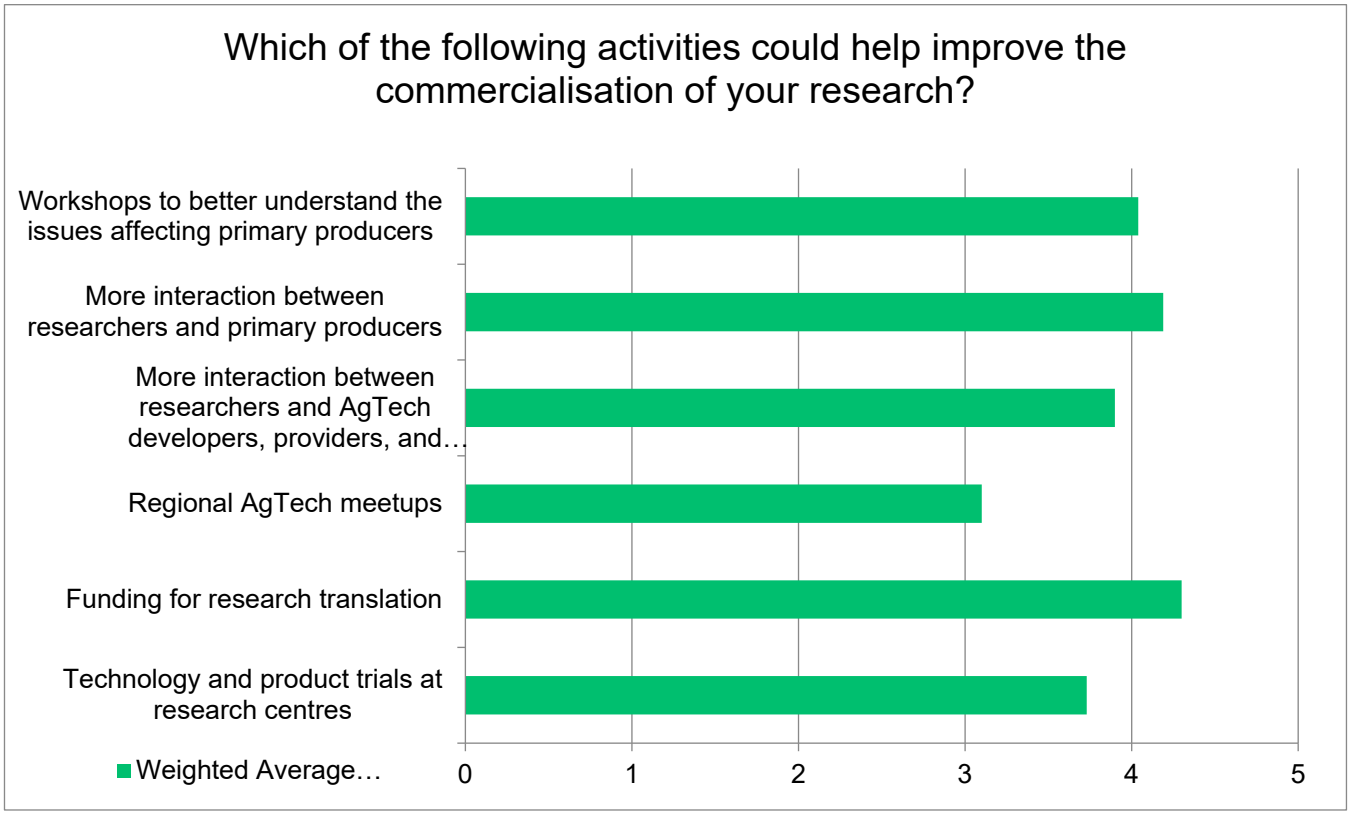




Commercialisation of research

Activities perceived by scientists as most likely to improve the commercialisation of their research were (96 responses):

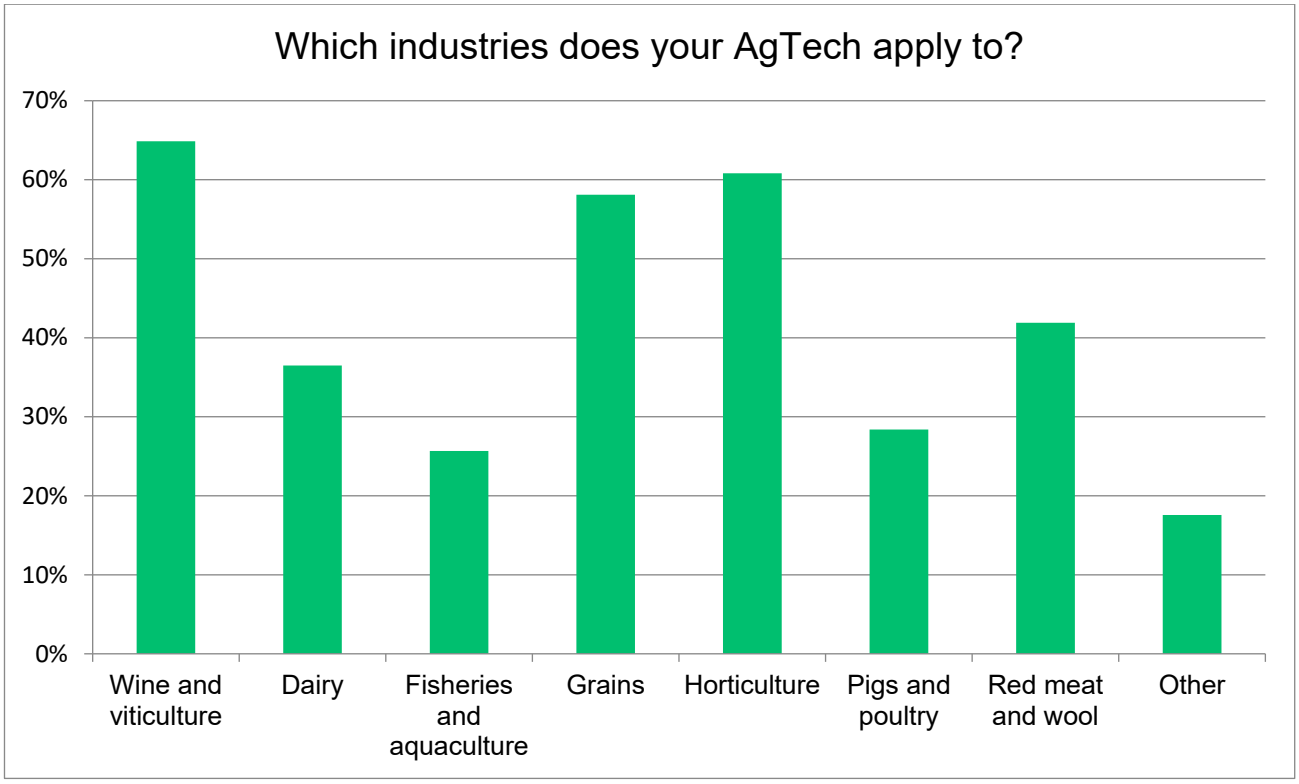
- Funding for research translation
- More interaction between researchers and primary producers
- Workshops to better understand the issues affecting primary producers
- More interaction between researchers and AgTech developers, providers, and commercialisation partners
- Technology and product trials at research centres.

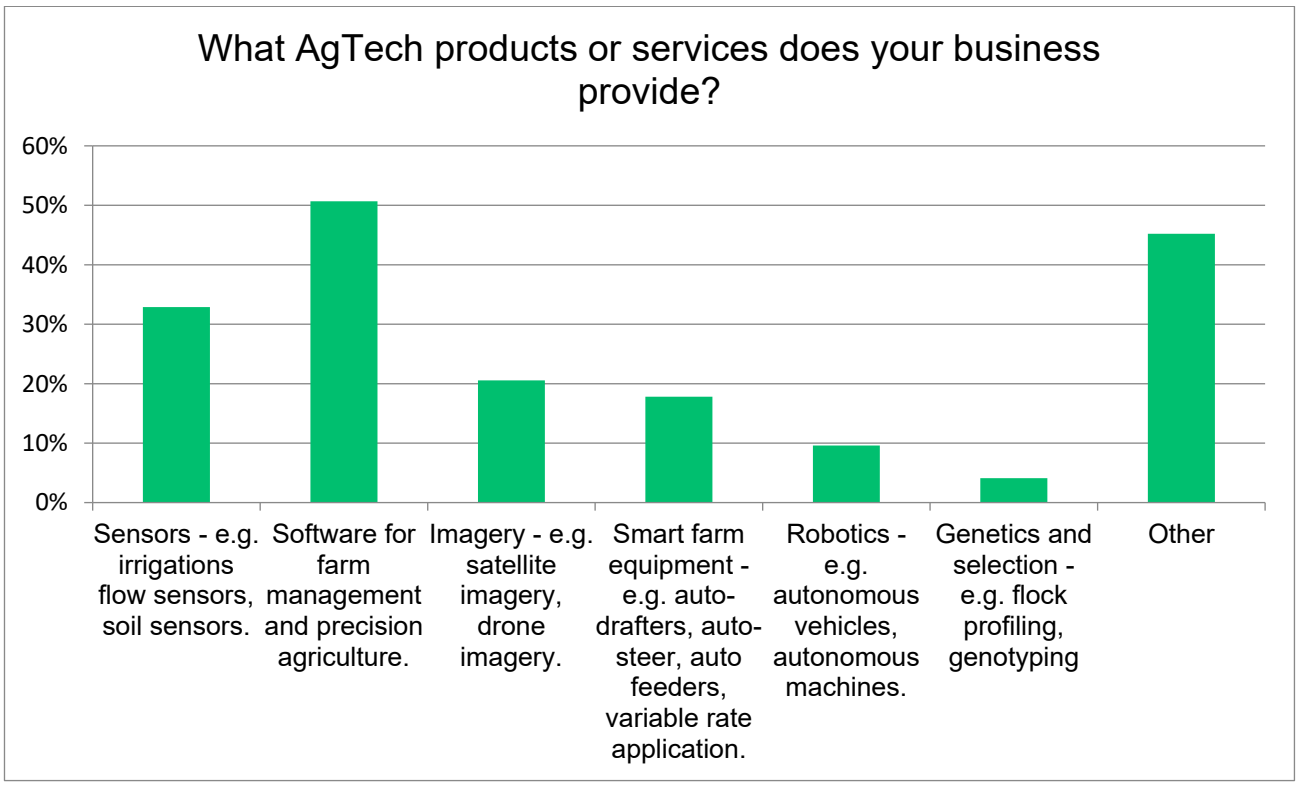


Responses from AgTech Developers and Suppliers

Ninety percent of AgTech developers identified themselves as having a presence in South Australia (73 responses).

AgTech developers and suppliers provide a range of products and services to all primary production sectors in South Australia, spanning all categories of AgTech (74 responses).

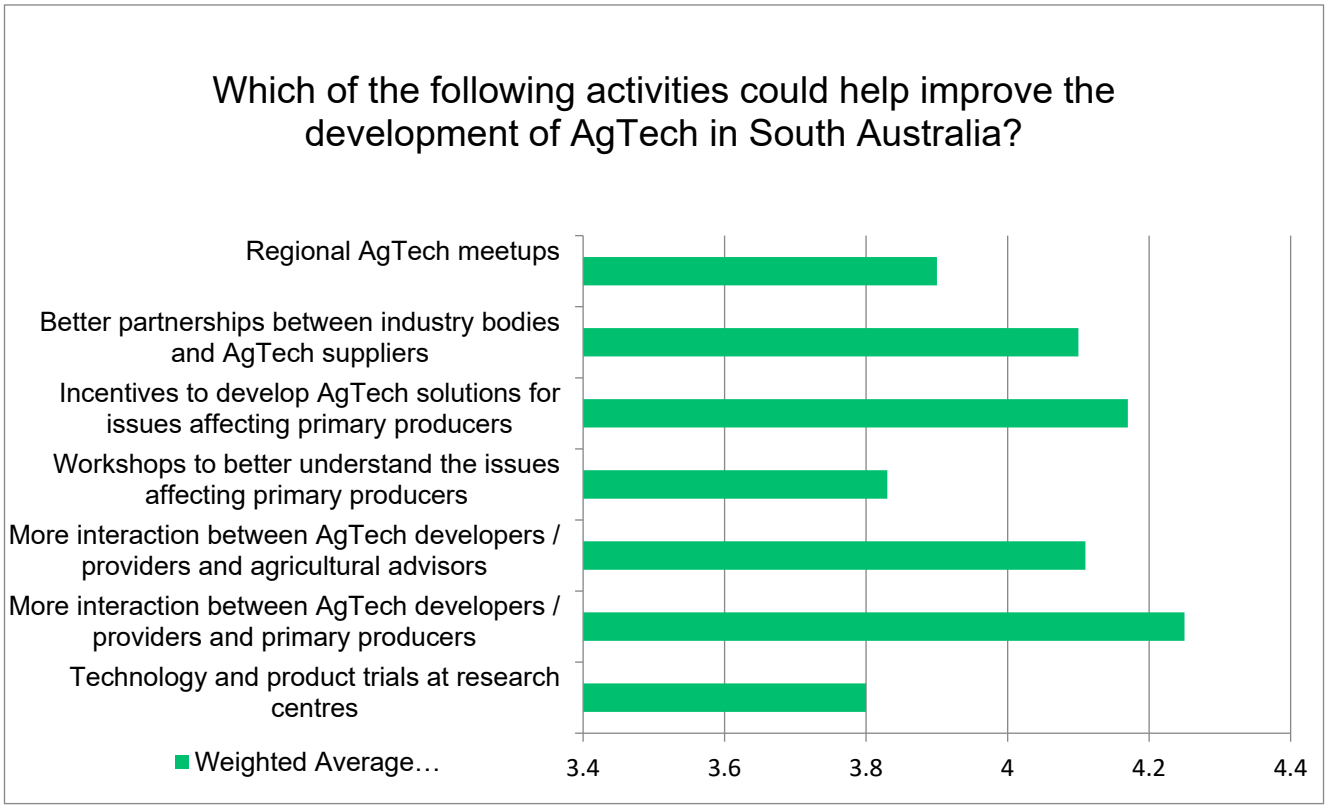




Activities to improve development of AgTech reported by AgTech developers and suppliers

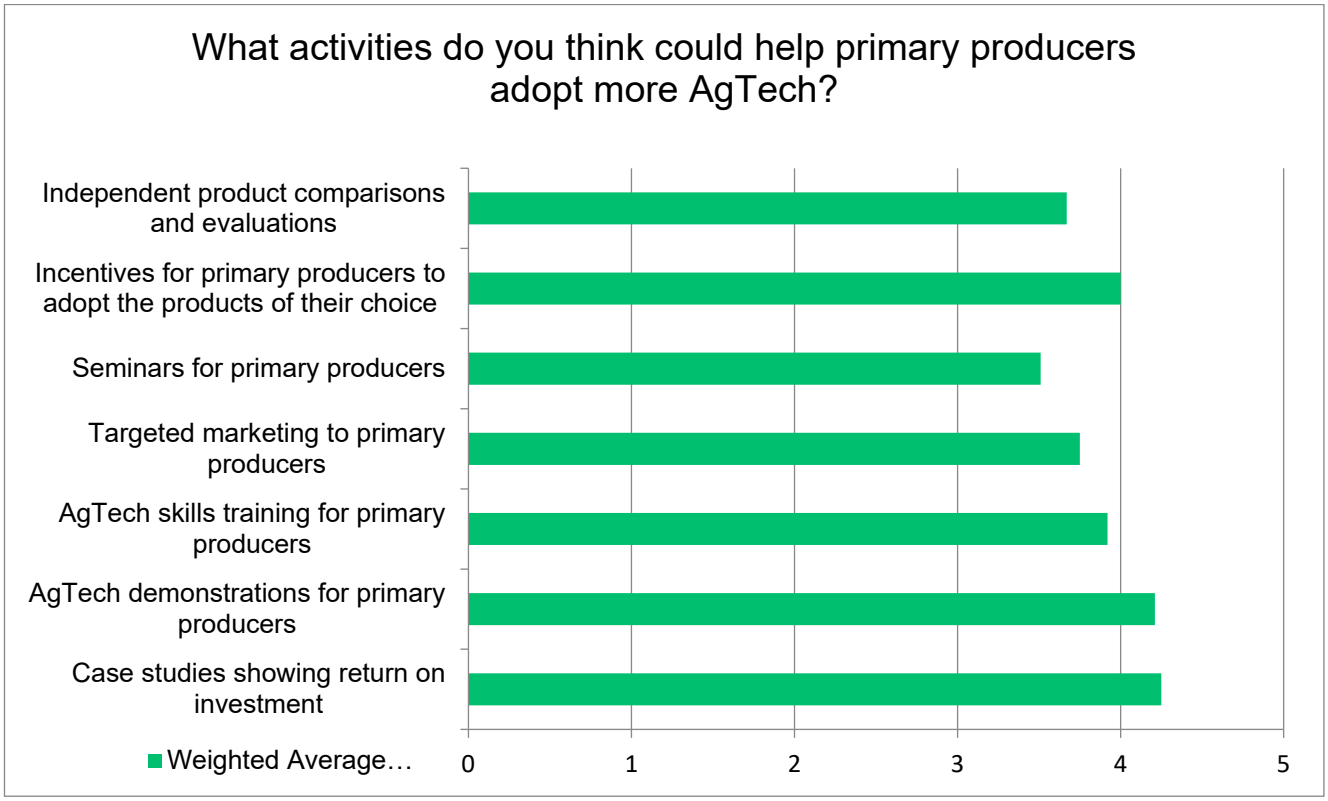
AgTech developers deemed the following activities important to improve the development of AgTech in South Australia:

- More interaction between AgTech developers / providers and primary producers
- More interaction between AgTech developers / providers and agricultural advisors
- Incentives to develop AgTech solutions for issues affecting primary producers
- Better partnerships between industry bodies and AgTech suppliers
- Regional AgTech meetups
- Workshops to better understand the issues affecting primary producers
- Technology and product trials at research centres.



Enablers of adoption reported by AgTech developers and suppliers

Activities perceived by AgTech developers as likely to help primary producers adopt more AgTech were similar to those perceived by producers themselves, with notable inclusion of targeted marketing to primary producers (73 responses).


What activities do you think could help primary producers adopt more AgTech?
Independent product comparisons and evaluations
Incentives for primary producers to adopt the products of their choice
Seminars for primary producers
Targeted marketing to primary producers
AgTech skills training for primary producers
AgTech demonstrations for primary producers
Case studies showing return on investment
Weighted Average…
0
1
2
3
4
5

Discussion

Overall, the Agricultural technologies in South Australia survey indicates that primary producers are often unaware that technologies exist or are being sold technology solutions that are not fit for purpose or cost-effective. In many cases the return on investment is insufficiently clear. The survey also identifies that it can be difficult to understand the usefulness of new technologies on-farm, as well as to deploy new technologies on-farm.

To overcome these barriers, primary producers are seeking AgTech demonstrations, skills training, Return on Investment (RoI) case studies, independent expert advice, and incentives to adopt technology. At present, there are limited opportunities for developers to gain a deep understanding of primary producer needs, or for independent comparison and validation of technologies, or for demonstration of quality AgTech solutions.

Key themes emerging from the survey were the imperative for:

1. **Networking & Collaboration** – Integration of the AgTech ecosystem to ensure AgTech meets the needs of primary producers and enables a high-growth, internationally competitive AgTech sector.
2. **Demonstration** - Use Independent Intermediaries and AgTech Ambassadors as trusted advisors, as well as showcasing events, case studies and demonstration sites to improve primary producers' understanding of the best AgTech solutions available.
3. **Entrepreneurial Capability** – Build AgTech entrepreneurial capability to fast track development of a globally competitive AgTech industry in SA.
4. **Skills & Education** - Equip primary producers and service providers with the knowledge and skills to identify and utilise effective AgTech solutions.
5. **Connectivity** – Identify and promote effective farm-wide network connectivity solutions to primary producers, particularly in remote areas.
6. **Compatibility** – Provide primary producers with a working understanding of AgTech offerings that are easy to use and can be readily integrated with other devices and data sources to provide a whole-of-farm solution.
7. **Government Leadership** - The SA Government can increase sector confidence by clearly enunciating the importance of AgTech and its adoption to the state, and by policy and program initiatives that support the AgTech supply chain.

Appendix 1

Issues Primary Producers would like to resolve on their property using AgTech

Cross-industry

- Farm management
    - Help with decision making
    - Advancement of knowledge
    - Integrated farm-wide data management platform
- Greater productivity
    - Finding and improving low performing areas on-farm
- Efficiency
    - More efficient use of inputs
    - Efficiency of all resources (particularly time and money)
    - Improved profitability
        - Reducing costs and/or increasing income
- Return on Investment (ROI)
    - Increased ROI
    - Clear ROI to 'sell' concept to senior management
    - Ability to make more money
    - What equipment can be used effectively on-farm and what are the likely returns?
- Reduced labour inputs via automation of labour intensive tasks
    - Vehicle automation
        - Getting workers off tractors and providing higher value work
    - Enable hiring to focus on the highly variable sections of the business that, at present, are best addressed by a human
- Electronic sales and marketing
- Weather modelling and forecasting
- Quality improvement
- Grading
- Prepare for the next (unknown) threat
- Improved genetics / breeding
    - Ability to grow GM crops and use GM technology
    - Genetic markers
- Environmental monitoring
- Assist regenerative agriculture
- Property variation
    - Mapping and identifying sources of variability
- Precision agriculture
    - Better use / more accurate machinery operation
- Reporting and record keeping
- Compliance with WH&S requirements
- Confined space adaption
- Product costing and recording of product lifecycle
- Staff management
    - Job scheduling
- Supply chain improvement

- More sustainable farming systems

Plant based production systems

- Crop monitoring and management
- Soil management
    - Understanding of how soils function
    - Soil analysis
    - Soil classification
    - soil variability measurement and management
    - Improved soil condition / fertility
        - Better soil health
    - Improved water retention
    - Non-wetting soils
    - pH
    - Salinity
- Soil moisture management
    - Water management
        - Water use efficiency
    - Irrigation management
        - Full automation of irrigation control to take advantage of forecasting and prediction data
        - Improving water use efficiency by linking sensors to irrigation scheduling
        - Automated leak detection and notification
        - Accurate water use predications
- Vineyard monitoring & management
    - Automatic grapevine Eutypa disease assessment
    - Vine canopy management
- Pest management
    - Pest surveillance and identification (weeds and insects)
    - Autonomous bird scaring
    - X-raying fruit to look for disease
    - Automation of pest management via weather forecast
    - Weed management
        - Identification of weeds and manage as most appropriate via mechanical disturbance or chemicals
        - Integrated weed / inter-row management
        - Robotics for pruning
        - Robotics for weed control in vineyards
            - Under vine weed management
        - Spraying
            - Targeted weed spraying
            - Robotic spraying
                - Weed and trace element spraying trees with drones
            - Drone spraying
            - Weed-seeker spraying
        - Non-chemical mechanical weed control
- Yield
    - Yield estimation & prediction
        - Automated grapevine yield prediction
        - Yield map accuracy
        - Continuous yield data capture
    - Improved vigour and yield

    - Harvest history
- Variable rate application
    - Variable rate lime management on acidic soils
    - Crop uniformity
- Crop nutrient management
    - Monitoring crop nutrients
        - Instant nutrient analysis
    - Optimising nutrient management on farm, particularly nitrogen.
- Tree health
    - Leaf analysis
- Improved plant growth
- Sap-flow and crop factor data
- Improved fruit packing plant design
- Cost effective approaches to growing multi-species cover crops without the need to use synthetic chemicals
- satellite imagery to monitor grass and trees

Fisheries & aquaculture

- Water quality monitoring
    - Automated water testing for oyster sites, e.g. pH, salinity
- Improved survival of oysters
- Data logging aquatic food counts and weather data, including water temperature
- Precision fishing
- Basket cleaning technology

Animal based production systems

- Stock management
    - Individual livestock management
        - Monitor behaviour and health
        - Monitor weight gain of individual animals
    - Aerial monitoring for stock, fences and water
    - Drones for monitoring and mustering stock
    - Automation of stock handling
    - Auto drafting
    - Stock tracking
    - Electronic ear tags: Eid tags
    - Better NLIS programs to manage budgets and cattle numbers
    - In-mob variability management
    - Animal health monitoring
    - Worming
    - Feed assessment
- Grazing management
    - Precision grazing system: Address uneven grazing of paddocks
    - Grazing efficiency
    - Virtual fencing
- Stock water management
    - Remote water point monitoring via telemetry
    - Remote start pumps for water
- Identification of best producing breeding stock/lines
- Reproduction
    - Sheep reproduction

- Pasture
    - Pasture monitoring: Real time pasture growth and dry matter level monitoring
    - Pasture use efficiency and pasture management
- Selective breeding and genetic improvement
    - Genetic breeding program to improve egg production
    - Improving sheep flock quality

AgTech

- Technologies
    - Machine vision
    - Drones
    - Sensors
- New & better product development
    - Verification of start-up company AgTech solutions
- Long term solutions
- Knowledge sharing between farming generations
- Interoperability
    - Linking different systems / platforms together & integration of AgTech into whole of business operations
    - Compatibility between technology - too many apps to do a handful of jobs
    - Connectivity with current software platforms
    - Single platform for data output
- Cost and affordability
    - Up-front cost
    - Need for value for money: cost effectiveness
    - Upgrade / update costs
    - Subscription cost
    - Life expectancy
    - low to no constant outgoing cost to run
    - Cost of specialist advisors
- Greater ease of use of technology
- Value-adding
    - Adding value to products
    - Adding value to collected data
- Knowledge
    - More verification of start-up companies. Stop the spin.
    - Information about the products available and their respective advantages
    - Resources to help compare and choose between options
- Education & training
    - Training in use of AgTech: Data input
    - Interpretation of data collected: Understanding results and their implications
    - Training on data manipulation to assist reporting
    - Data collection for improved decision making
    - Cyber security
- Cost effective farm-wide connectivity
    - Improved internet connectivity
    - Wi-Fi
    - Whole of property phone service: Mobile phone coverage
    - Telemetry
    - CORS network
    - Remote data access
    - Black spot reduction

- Practical, cost effective outcomes from technology use – i.e. advice or information that can be put into practice
- Data gathering and communications capability
    - Management of data
- Ease of set up & operation
    - Simplicity of use and easy to understand manuals for both software and hardware
- Reliability
    - Robustness
        - Faults, drop outs, stop working
        - Reliability of sensors in agricultural environment
    - IT support
    - After sales support
- Government
    - Government legislation prohibiting the use of virtual fencing
    - Financial incentives to adopt AgTech.

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