

Agriculture— A \$100b sector by 2030?



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Agri culture —

A \$100b sector
by 2030?

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Foreword

Agriculture is Australia's fastest growing sector and second only to mining in terms of its importance to the national economy – contributing more than \$63 billion or 2.3% to Australia's GDP in 2016-17.

In 2017, the National Farmers' Federation (NFF) announced a bold vision for the industry to achieve \$100 billion in farm gate output by 2030. The vision and target was designed to kickstart a national dialogue on the support needed to ensure Australian agriculture reaches its full potential.

We know that technology development and adoption will continue to be a key accelerator of sector growth. Other opportunities may be industry specific or cross-sectoral and exist in areas such as market access, human talent and skills, flexible capital sources, accelerating productivity, premium branding and digital connectivity.

Delivered over two phases, this work set out to evaluate the current growth trajectory of Australia's agriculture, fishing and forestry industries and then identify where the growth opportunities are going to come from. Analysis from the first phase of the project found that the current growth trajectory will likely reach \$84.3 billion by 2030.

The second phase of work, which is the focus of this report, identified factors that will likely propel agriculture above the forecasted base growth trajectory of \$84.3 billion by 2030. Those factors are shown to be economy-wide, industry specific and involve fundamental considerations of economic growth—competition, innovation, resource allocation, supply chain efficiencies, product development and utilisation.

There is strong acknowledgement through this report that while there are many opportunities for accelerated sector growth, there are also significant downside risks that need to be overcome to maintain the current rate of growth.

This work is consistent with a number of other strategies, including the NFF Roadmap to 2030, in catalysing action to accelerate agriculture toward the \$100 billion target. I acknowledge the contribution of the other Rural Research and Development Corporation partners* involved in this project for their foresight in working collectively to understand the role of the Research and Development Corporations in striving towards the shared goal.

This report has been produced by ACIL Allen Consulting under AgriFutures™ National Rural Issues Program. It is an addition to AgriFutures Australia's diverse range of over 2000 research publications and it forms part of our National Challenges and Opportunities arena, which aims to identify and nurture research and innovation opportunities that are synergistic across rural sectors.

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John Harvey
Managing Director
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*This project was developed by AgriFutures Australia in partnership with Cotton Research and Development Corporation, Fisheries Research and Development Corporation, Australian Wool Innovation, Wine Australia, Dairy Australia, Grains Research and Development Corporation, Australian Pork Limited and Sugar Research Australia.

“Detailing the size of the opportunities for the sector, what change is required and any potential barriers to adoption is key to making smarter and more informed investment decisions.”



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Executive Summary

In 2017, the National Farmers' Federation announced a vision for Australian agriculture to exceed a farm gate value of \$100 billion by 2030. AgriFutures Australia commissioned ACIL Allen to:

- **Establish a baseline projection which estimated a farm-gate value of \$84.3 billion by 2030, \$15.7 billion below the target.**
- **Investigate what opportunities and barriers impact agriculture's ability to exceed the target and deliver enduring profitability.**

Understanding the \$100 billion vision

The \$100 billion target was created to provide focus and establish national dialogue on how to grow the sector. The target is ambitious, requiring a growth rate of 3% annually, double the current trend. The target is directional for how Australia can increase productivity and better prices in the face of ongoing climate and market volatility. Success is greater enduring and sustainable profitability rather than pursuing farm-gate value at any cost, or claiming credit from favourable conditions.

Progress toward the target requires alignment and execution of strategies that contribute to improved enduring profitability. The strategies need to be sufficiently flexible to facilitate adaptation across the industries that make up agriculture and over time as the need, and circumstances allow.

Drivers and risks on which strategies can be built

Four drivers and four risks have been identified based on nationwide consultation across industries and analysis. The drivers and risks were chosen on the basis they can

provide an enduring platform on which strategies can be supported, built and implemented. They are adaptable and not exclusive.

Drivers →

Technology and data – getting more from adoption

Off-farm R&D – creating value up the supply chain

Off-farm infrastructure – efficiency & capital attraction

Markets – accelerating access and development

Risks →

Climate and water – adapting farming & infrastructure

Biosecurity – sharing responsibility to sustain integrity

Regulation – sustained reform for efficiency & integrity

Consumers – meeting/exceeding changing preference

Moving towards action

The report provides an approach for conceptualising the opportunities and risks, against the backdrop of uncertainty, facing agriculture. The approach presents a range of possible strategies/investments for delivering enduring profitability by the sector. For these strategies/investments to be implementation ready' it will be necessary:

- To address the immediate opportunities and risks with a targeted program of investments
- For industry and government to co-invest in the design of strategies/investments that meet the requirements of each industry and agriculture as they emerge. These strategies/investments may not be the same as those recommended and could include

industry-wide investments. If the risks become severe it is anticipated that the costs of developing these strategies/investments will be insignificant compared to the costs of implementing structural adjustment policies and industry support mechanisms that are either insufficient or overly engineered.

- To build the institutional framework which will provide clarity for the roles and responsibilities of parties to the vision and to provide a platform for coordination, and investment.
- To build the analytical and research capabilities of institutions required to monitor the economic, social and environmental costs and benefits associated with prosecuting the \$100 billion vision.

Agriculture is one of Australia's great success stories, with a long-term contribution to GDP of between 3% and 4%.¹ More recently, agriculture has been a significant source of economic growth, and the fastest growing of all industries at 16.3% (following a significant upturn in crop production and favourable exchange rate conditions during calendar year 2017).² Agriculture experienced export growth of 20.5% in 2017. It also experienced employment growth of 4.6% which outperforms many other sectors, such as manufacturing, mining and financial services with employment growth of -1.2%, - 2.4% and - 0.7% respectively.³

The recent declarations of drought in large areas of NSW and Queensland will challenge this growth in 2018 and the years which follow, however agriculture remains optimistic about its position within the domestic and international economies.

“Australian farmers remain internationally competitive through efficiencies and productivity growth. The growth in the farm sector has increased steadily from 1974-75 to 2016-17, consistently outperforming other sectors.”

National Farmers' Federation (NFF), 2017.⁴

In 2017, the NFF announced a bold vision for agriculture to exceed \$100 billion in farm-gate output by 2030. The vision was designed to kickstart a national dialogue about the support agriculture needs to reach its full potential. Launched by the Australian Government, with the release of a discussion paper titled 'Talking 2030', the vision identified seven growth themes to propel agriculture towards a \$100 billion sector by 2030. These include: understanding the future customer; supercharging supply chains; growing sustainability; unlocking new technology; and attracting people and capital to agriculture.

This vision is underpinned by agriculture's long-held objective to ensure it is productive, profitable, competitive and sustainable.

This objective has been a consistent theme since 1989 with the introduction of the Primary Industries Research and Development Act, 1989 (PIRD Act) which, among other things, made provision for the funding and administration of a national primary industries research and development (R&D) system.

Within this context, both the Australian Academy of Science (the Academy) and the Council of Rural Research and Development Corporations (CRRDC) have developed their own visions of Australia's rural research, development and innovation system. These visions provide considerations that are important in analysing Australia's ability to deliver a \$100 billion sector over the next two decades—and flag the important question of whether it will prove sensible to seek to do so.

Appendix A provides a high-level summary of Talking 2030, the Academy's and CRRDC's long-term visions and the NFF's '2030 Roadmap' (refer to **Box 1.1**).

¹<https://www.nff.org.au/farm-facts.html> ²ABARES estimate. Department of Agriculture and Water Resources 2017, *Agricultural Commodities, September quarter 2017*, ABARES, Canberra. ³Office of the Chief Economist, 2018, *Flexibility and growth – industry insights, Quarter 1, March, 2018*. ⁴Widespread drought in 2006–07 was estimated to have decreased economic growth across Australia by around 0.75 percentage points (Penm & Glyde 2007).



“The growth in the farm sector has increased steadily from 1974-75 to 2016-17, consistently outperforming other sectors.”

Box 1.1 → Pillars of the National Farmers' Federation 2030 Roadmap

The 2030 Industry Roadmap was developed by the National Farmers' Federation in conjunction with key industry stakeholders. Consultation was facilitated and occurred with leaders across the agricultural value chain including researchers, farmers, agribusinesses, educators, the community and government.

Pillars of the Roadmap

The Roadmap includes five pillars which details aspirations, actions, impacts and a metric to achieving the \$100 billion vision. The aspirations are summarised below:

Pillar 1
Customers and the value chain

focuses on connections with agriculture by Australians and the global market. Aspirations for this driver are:

- Deep engagement with customers and to build trust and transparency
- Providing a competitive connection to global markets, and delivering clear market signals to guide paddock-to-plate investment
- Developing Australia to have world-leading market access and the capacity to maximise the economic benefits.

Pillar 2
Growing sustainably

involves environmentally-friendly practices and recognising that farmers are stewards of Australia's landmass. The aspirations by 2030 for this driver include:

- Farmers continuing to embrace sustainable farming methods that drive productivity and profitability
- Embracing a carbon neutral approach allowing for Australian agriculture to have a competitive advantage and productivity gains
- Developing a smart water policy that improves the waterways allowing for farmers to be more productive

- Stemming the loss of productive farm land, improving the health of landscapes and brokering lasting co-existence arrangements with other landholders
- Halving food waste and reducing the number of Australian's facing food insecurity.

The central vision of the Roadmap is: to exceed \$100 billion in farm gate output by 2030. The Roadmap calls for a staged approach starting with cultural change, followed by formalising collaboration and then moving to consolidation to maximise resource efficiency (where appropriate).

→ **\$100bn**
in farm gate output by 2030

Pillar 3
Unlocking innovation

focuses on facilitating innovation in Australia through advances in science and technology by:

- Working to translate public and private research and development into tools and services, thereby giving Australia agriculture a competitive edge
- Digitising the agricultural value chain and sharing the benefits fairly among participants
- Reducing the reliance on fossil fuels, in favour of biofuels and renewable sources of electricity that are affordable and reliable.

Pillar 4
Capable people and Vibrant communities

involves attracting and developing people and regional communities by:

- Providing an attractive and clear career pathway to attract workers and develop their skills, with tailored streams for new entrants through to seasoned professionals
- Robust and sustainable mechanisms to access labour from Australia and around the world
- Creating strong, regional communities that have world-class education and health facilities, culture and entertainment, and a diverse economy
- Embracing a culture of safety in agriculture and reducing workplace injuries and eliminating on-farm fatalities.

Pillar 5
Capital and risk management

focuses on sophisticated approaches to governance, risk management and planning for the future by:

- Embracing new governance models to help farm businesses better plan, manage risk and increase profit
- Demonstrating returns and a supportive policy environment to attract investors into Australia's agricultural businesses
- Implementing innovative tools to reduce the inherent risks of farming, whilst having consistent and well administered government risk management policies.

In late 2017, AgriFutures Australia commissioned ACIL Allen Consulting (ACIL Allen) to provide an independent economic, policy and strategic assessment of the \$100 billion vision in two phases.

Phase 1 produced a baseline projection to determine what the

farm-gate value of agriculture will be in 2030. Using economic forecasting techniques, the assessment identified a base-case farm-gate value of \$84.3 billion by 2030.

Table 1.1 and Figure 1.1 provide the results of the projections that underpin the base-case, broken down by major commodity group.

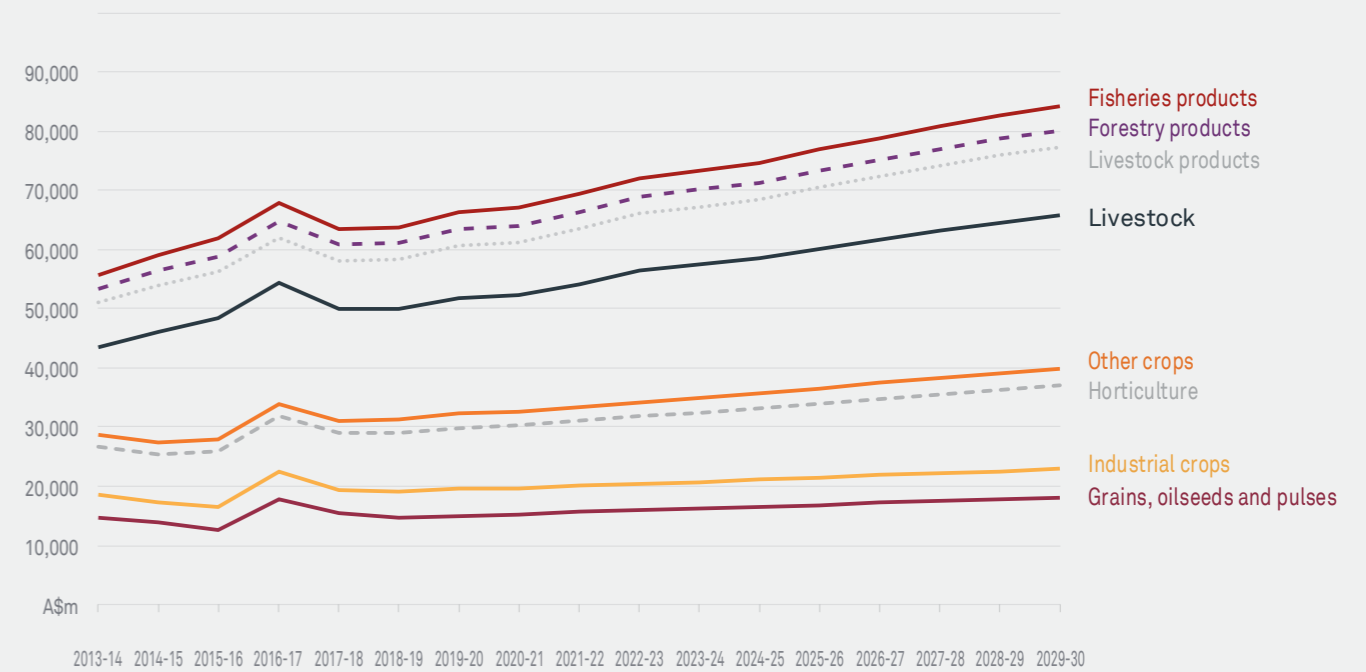
Table 1.1
Unadjusted projected farm-gate value of agriculture by sector

| Sector | 2016-17 | 2029-30 | Change 2016-17 to 2029-30 | |
|----------------------------|---------------|---------------|---------------------------|-------------|
| | A\$ millions | A\$ millions | A\$ millions | % |
| Grains, oil, seeds, pulses | 17,781 | 18,181 | 400 | 2.2 |
| Industrial crops | 4,791 | 4,800 | 9 | 0.2 |
| Horticulture | 9,762 | 14,592 | 4,830 | 33.1 |
| Other crops | 1,660 | 2,403 | 743 | 30.9 |
| Livestock | 20,330 | 25,901 | 5,571 | 21.5 |
| Livestock products | 8,008 | 11,799 | 3,791 | 32.1 |
| Forestry products | 2,539 | 2,362 | -177 | -7.5 |
| Fishery products | 2,910 | 4,238 | 1,329 | 31.3 |
| TOTAL | 67,779 | 84,274 | 16,495 | 19.6 |

Source: ACIL Allen Consulting, 2018

- Australian agriculture has grown significantly in recent times.
- Favourable trading conditions have helped lift topline growth while drought remains a key constraint.
- The \$100 billion farm gate value by 2030 target was set to create focus and a stronger national dialogue on how growth can be sustained and accelerated.
- Agriculture is made up of many industries which have much in common and many differences.
- Balancing individual incentive with collective action is critical in making progress towards the \$100 billion target.
- Agriculture will need to grow at 3% annually on average to reach the \$100 billion target – this is more than twice the current rate.
- This report considers the key opportunities and barriers to realising the additional \$15.7 billion required to achieve the target.

Figure 1.1
Agriculture growth trajectory to 2030 (unadjusted)



Source: ACIL Allen Consulting, 2018

The results highlight a \$15.7 billion short-fall against the vision. Reaching this base-case level implies an average rate of growth in farm value of approximately 1.7% from 2016-17. The \$100 billion value by 2030, while less than 20% higher, would require an average growth rate of 3% across the period. This requirement to almost double the average growth rate over an extended term, emphasises the extent of challenge in realising the NFF's vision.

Phase 2 (or this report) considers the opportunities and barriers which impact agriculture's ability to deliver enduring profit. Considering whether agriculture can achieve the \$100 billion vision is important because there are real risks, as well as potential gains, in designing strategies to reach the target. Understanding issues related to the opportunities and risks is important in guiding an assessment of the feasibility and sense in moving forward with a vision for agriculture by 2030.

Interpreting the \$100 billion vision for agriculture

NFF has set a vision of Australian agriculture to reach or exceed \$100 billion by 2030. As previously noted, this represents substantially stronger average growth rates over the next 11 years than is suggested by 'business as usual' modelling using historical forecasting techniques. It is also heavily dependent on the external circumstances of the next decade; there is likely to be natural volatility in prices and seasonal conditions that will impact agriculture.

A plausible combination of high international prices and a weakening exchange rate by 2030 could make a \$100 billion outcome for agriculture highly likely—even if the farm-level 'business as usual' assumptions that supported the trend estimate of \$84.3 billion are upheld. Equally, a slump in agricultural prices and a rising Australian dollar could put the \$100 billion vision well out of reach.

Within this context, ACIL Allen has used specific assumptions about the way the vision should be interpreted. In our view, the assumptions below are in line with the NFF's overarching intent of the vision.

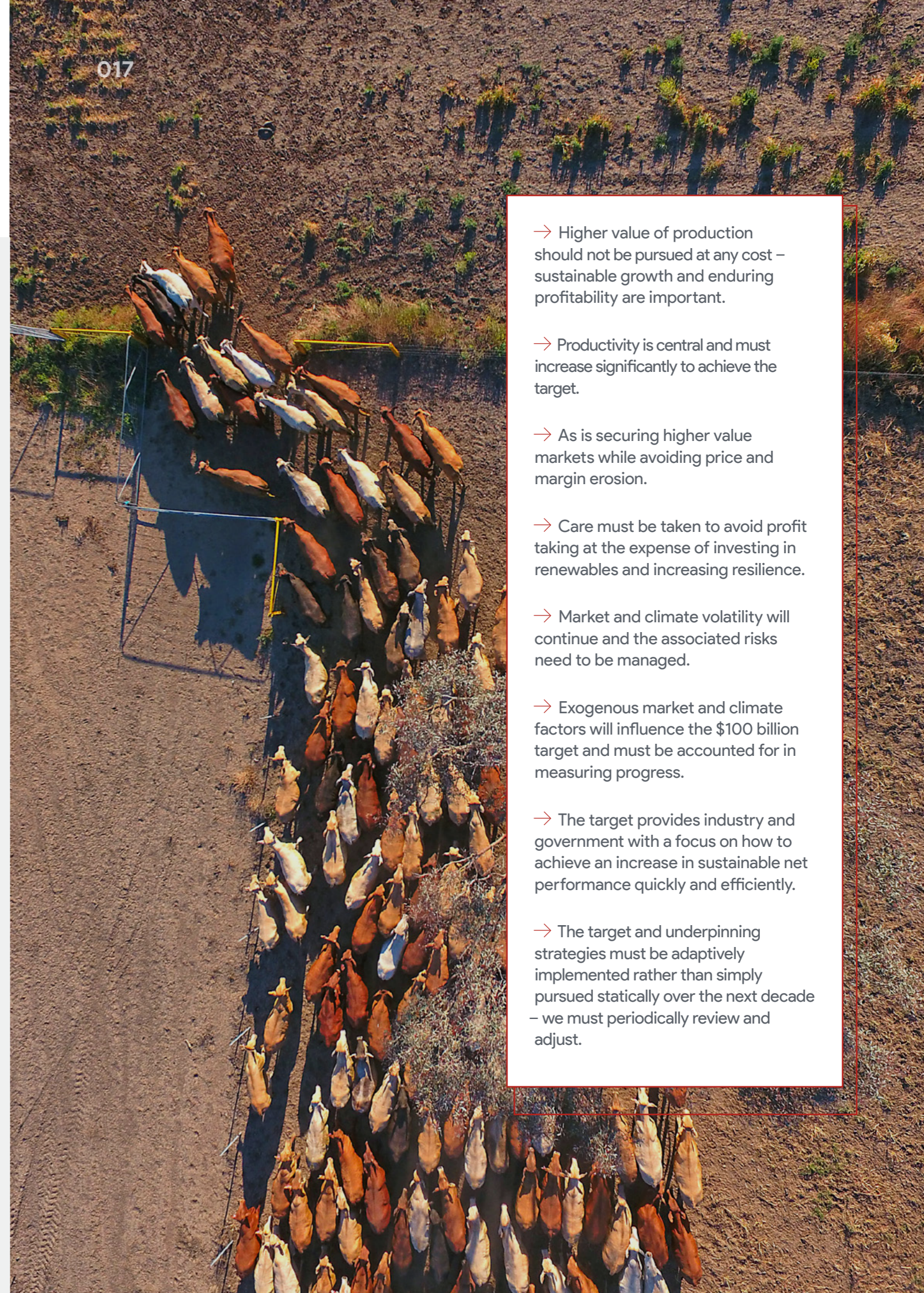
First, the \$100 billion vision is interpreted as something that it is reasonable to expect if the 'average' trend assumptions in external conditions (normal international prices, long-term trends in exchange rates, etc) and climate conditions hold until 2030. It is also reasonable to expect Australian agriculture to take advantage of profitable opportunities (while ensuring sustainability) between now and 2030. In other words, the fundamental structure of Australian agriculture could be moved to a point where a \$100 billion (plus) outcome is likely to occur in an average year if sound strategy is developed and implemented by, and for, agriculture.

Second, the \$100 billion vision is not interpreted as a target in itself, but rather as a realistic interpretation of the outcome that could be achieved if agriculture builds sustainable net performance quickly and efficiently. This vision can then be used as a valuable, readily understood focus for industry and government planning, to ensure that high value opportunities are not missed and strategies at the farm, sector and government levels do justice to the opportunities as they arise. The vision can also be used to develop strategies for managing the major risks to agriculture when they emerge or change.

Third, ACIL Allen assumes that the strategy process will be highly adaptive—constantly monitoring opportunities, risks, progress and outcomes—and that the figure of \$100 billion will not be retained if the emerging information suggests it is no longer appropriate. If the analysis starts to suggest that moving to a structure for agriculture which would, on average, deliver production value of \$90 billion, rather than \$100 billion, with this implying higher net incomes or stronger and more sustainable future net incomes, then the vision should of course be adapted.

Against the backdrop of these assumptions, ACIL Allen has sought to probe the plausibility and sense in planning for the vision by 2030. Does the base-case, and its trend value estimate of \$84.3 billion, seriously under-estimate the profitable opportunities that now exist for Australian agriculture? Or that could plausibly be created? What are likely to be the drivers if stronger performance can be delivered? And what can be concluded about the balance between cost reductions and production value increases that should lie at the heart of the strategy?

- Higher value of production should not be pursued at any cost – sustainable growth and enduring profitability are important.
- Productivity is central and must increase significantly to achieve the target.
- As is securing higher value markets while avoiding price and margin erosion.
- Care must be taken to avoid profit taking at the expense of investing in renewables and increasing resilience.
- Market and climate volatility will continue and the associated risks need to be managed.
- Exogenous market and climate factors will influence the \$100 billion target and must be accounted for in measuring progress.
- The target provides industry and government with a focus on how to achieve an increase in sustainable net performance quickly and efficiently.
- The target and underpinning strategies must be adaptively implemented rather than simply pursued statically over the next decade – we must periodically review and adjust.



Framework for analysing the \$100 billion vision

The questions posed in **Section 1.1 Interpreting the \$100 billion vision for agriculture** are critical to understanding the future outcomes of Australian agriculture. Yet their answers are highly complex and contingent on many market, environmental and other factors that will play out over the next decade. The following chapters of this report provide a framework for understanding these factors and platform for a national policy debate about the appropriate role of industry and government in improving the net performance of Australian agriculture. The framework is used to manage the sheer number of potential outcomes that could occur for agriculture in the coming decade and deal with the future complexity and uncertainty of the sector.

→ Force field analysis provides an enduring, flexible framework which can integrate issues across agriculture in an understandable way.

The framework was developed and applied using a combination of desktop analysis and stakeholder consultation. A desktop review of key government policy documents and industry reports informed the framework's development. The review identified that there are many complex factors which will drive, as well as impede, net farm performance over the long-term. These factors were assembled (with underpinning evidence) into a form of typology (and then presented in a Discussion Paper for use during consultations) as shown in **Table 1.2**.

Consultations with Rural Research and Development Corporations (RCD), industry bodies, the Australian Government and other organisations who are stakeholders to the vision were then used to test and refine the framework.

Appendix A provides for a list of stakeholders consulted as part of the process and shows the industry sectors which participated in the discussions.

Stakeholders were asked to identify the most important opportunities and constraints facing their industry sectors, and why they were important. Consultations were also used to identify individual data sets and documentation that could be used as underpinning evidence in this report.

The various factors identified during consultations were then analysed against the framework, using a filtering approach to arrive at a small number of "drivers" of net farm performance and "risks" to this performance being delivered.

Figure 1.2 overleaf demonstrates the framework in action. It outlines the factors (i.e. the opportunities for industry and government-led enablers to support enduring profitability in the agricultural sector for 2030 and beyond, and the constraints) and plots them against the components of a supply chain that are fundamental to all sectors within agriculture. Figure 1.2 shows there are enablers and defensive considerations common to all agricultural supply chains. These factors are then prioritised as high potential factors, as illustrated by the asterisk (*) in the Figure. Those factors with an asterisk are analysed in more detail in the sections which follow.

→ Four key drivers and four key risks were identified upon which strategies to achieve the \$100 billion target by 2030 can be designed and implemented.

Table 1.2 Discussion paper issues and relationship to this report

| Issues explored in the discussion paper | High priority | Lower priority | Comments from stakeholder workshops | Drivers and defensive strategies in this report |
|---|---------------|----------------|--|--|
| Social license and the narrative | ✓ | | Important issue | Driver 4: Market access and development |
| Market access | ✓ | | Important issue | Driver 4: Market access and development |
| Collaboration | | ✓ | Difficult to achieve | |
| New business and funding models | | ✓ | Lower priority | |
| Value added products | ✓ | | Investment in the research in this sector is important | Driver 2: Off-farm R&D |
| New technology | ✓ | | Multitude of technology—but it needs to be adopted | Driver 1: Adoption of technology and data use |
| Institutional support | | ✓ | No change needed | |
| Water availability, access and use | ✓ | | Important issue | Risk 1: Climate change and water availability |
| Climate change | ✓ | | Important issue | Risk 1: Climate change and water availability |
| Biosecurity | ✓ | | Important issue | Risk 2: Inadequate biosecurity |
| Land use competition | | ✓ | Lower priority | |
| High cost of inputs | | ✓ | External factor | |
| Domestic market retail price competitiveness | | ✓ | External factor | |
| Price volatility | | ✓ | External factor | |
| Price takers | | ✓ | External factor | |
| Protectionist policies overseas | | ✓ | External factor | |
| Consumer and social preferences | ✓ | | Important issue | Risk 4: Changing consumer preferences and expectations |
| Regulation | ✓ | | Important issue | Risk 3: Unresponsive regulation |
| Skills and capability | | ✓ | Lower priority | |
| Infrastructure (not included in discussion paper) | ✓ | | Important issue | Driver 3: Off-farm Infrastructure |

Source: ACIL Allen consulting, 2018

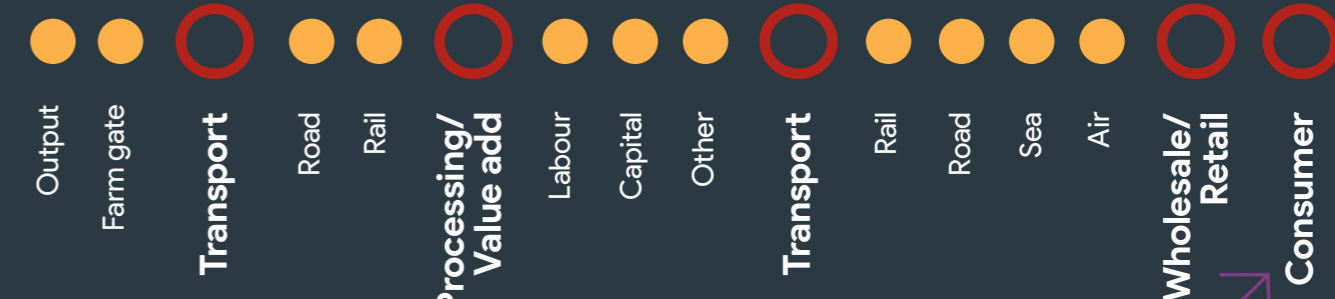
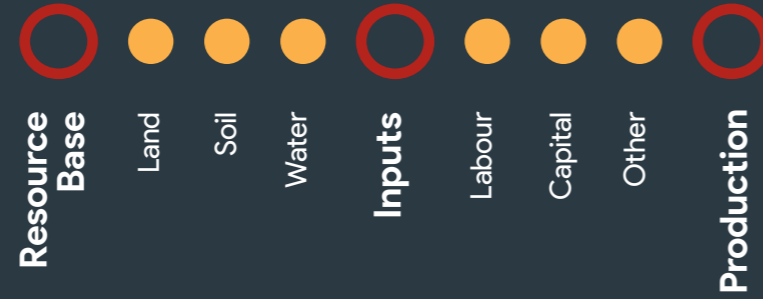
Figure 1.2 Framework used to analyse the \$100 billion vision

Defensive Considerations



Water availability & use
Climate change*
Competing land use
Regulation*

Biosecurity*
Skills/capability
Input costs
Infrastructure
Scale/size
Prices & exchange rates
Competition*



Domestic market

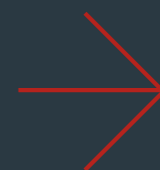
Export market

Industry Led Opportunities



Adopting existing technology and better
use of available data/information #

Off-farm investment #
Collaboration
Market development #



Government Enablers



Access to resources
New institutional
structures & systems

Off-farm infrastructure #
Market access #



Priorities:
* High potential offensive strategies
High potential defensive strategies

Source: ACIL Allen Consulting, 2018



Arguments progressed in this report

The remaining sections of this report prosecute the arguments and assumptions outlined in **Section 1**.

- **Section 2** analyses the factors that are crucial to achieving longer-term growth in the net performance of Australian agriculture. The chapter argues there are four drivers of growth that work towards the vision without losing focus on the longer term. These drivers should form the basis upon which any offensively-minded strategies for growth are developed in the future.
- **Section 3** considers the factors which are critical in 'holding the line' associated with agriculture's growth over the next decade. This chapter argues that there are defensive factors which must be managed by industry and government to ensure agriculture achieves business as usual levels growth by 2030.
- **Section 4** presents the conclusions to ACIL Allen's report. It suggests there are important yet residual levels of uncertainty that must be managed in order to deliver net farm performance over time. The chapter argues for this uncertainty to be managed by industry and government using adaptive approaches.
- **Appendix A** identifies the stakeholder representatives who were consulted for this report.
- **Appendix B** presents a high-level analysis of the drivers and impediments to each agricultural industry analysed in this report.

Opportunities are typically defined as unrealised potential which can be captured through the strategies and investments of industries and governments. Opportunity to improve the net performance of agriculture lies not in fixing what is already there—although that may well help and should be done—but in achieving the big gains that come from doing things which are different. Growth will be found by doing something new and (potentially) in taking risks that deliver benefits to agriculture.

Opportunities are the ‘offensive’ considerations that Australian agriculture must embrace to achieve its long-term economic goals. This chapter identifies four drivers that are fundamental to the future performance of agriculture and its ability to realise the \$100 billion vision. The drivers are critical in the eyes of the stakeholders for achieving economic outcomes that have not been previously delivered. Each driver, and how it works to create enduring profitability, is discussed below.

Driver 1: Technology adoption and national level data, getting more from innovation and (digital) data

Driver 1 encourages industry and government to consider strategies and investments which make better use of the knowledge generated by Australia’s R&D system, as well as the data generated by agricultural activity.

Since the 1980s, Australia has invested heavily in R&D and delivered many discoveries that have improved the productive capacity of agriculture. However, only a small proportion of this R&D has ever been adopted; the rest lies dormant ready for activation.

→ Australia’s rural R&D system is already contributing significantly towards sustainable growth – we need higher adoption and better use of data to increase the rate of sustainable growth.

Driver 1a: Making better use of technology

There are many technologies and considerable data that lie in wait ready for activation. Effective use of these technologies and data will improve agriculture’s productive capacity through better farming processes and systems, and decreased labour and other input costs. In fact, the development and diffusion of technology is frequently lauded as the reason behind Australia’s long-run economic growth and productivity gains.⁵

The agriculture technology sector has experienced rapid growth in the last ten years, following the release of smart phone technology, increased access to mobile broadband and data services, and the reduction in the cost of battery powered energy sources for technologies.

However, for all the technology developed or released, anecdotally there has been limited adoption. There are many factors that suggest why this is the case.

For example, some producers grapple with the digital agricultural marketplace and are concerned about risk and investment without a guaranteed return. A proportion of producers and supply chain stakeholders have low levels of digital literacy and knowledge. Others are limited by the lack of telecommunications connectivity and are not able to make best use of available technology or the data that underpins that technology.

→ Cost effective and accessible data infrastructure and systems are becoming increasingly important.

Moreover, the Australian Council of Learned Academies has argued that there are barriers (common to all sectors) that exist that limit the uptake of technology. Table 2.1 reports the technology adoption lever that can be used by industry and government to restrict and/or encourage uptake of technology. Adapting the table to agriculture helps to identify those barriers and/or opportunities to target and facilitate a more enabling environment for technology adoption.

→ Barriers to adoption are known but are we making enough progress on removing them?

Table 2.1
Barriers and drivers of technology adoption in agriculture

| Technology adoption lever | Barrier | Opportunity |
|---------------------------------------|---------|-------------|
| Cost and finance | ✓ | |
| Policy and legislation | ✓ | ✓ |
| Consumer preference and public policy | ✓ | ✓ |
| Infrastructure | ✓ | |
| Privacy concerns | ✓ | |
| Resource use | | ✓ |
| Investment in R&D | ✓ | ✓ |
| Skills and capability | ✓ | |
| Governance and stability | | ✓ |

Source: Adapted from *The Global Technology Revolution 2020: Trends, drivers, barriers, and social implications*. Washington dc: aaas forum on science and technology policy: session on “building science, technology, and innovation capacity in developing countries”, (2007).

⁵ Robert C Williamson, Michelle Nic Raghnaill, Kirsty Douglas and Dana Sanchez, *Technology and Australia’s future: New technologies and their role in Australia’s security, cultural, democratic, social and economic systems*, Australian Council of Learned Academies, September 2015, www.acola.org.au.

Despite these limitations there are significant opportunities in overcoming them. To unlock the potential of technology producers need a strong value proposition to adopt digital technologies at a rate not previously seen in Australia.

“Farmers need to see a clear value proposition to digital technologies before they will adopt, whether point solutions or platforms.”

Nolet, S., 2018, Seeds of success: advancing digital agriculture from point source to platforms, United States Studies Centre, Sydney University

Producers also need inspirational leadership, guidance, professional development and learning, favourable policy and regulatory environments and financial support from the industry, research sector, technology markets and governments to encourage them to adopt more technology in the future.

→ **Australia needs a better system of learning and innovation both in government and industry – preferably in partnership.**

Current situation

There is currently considerable policy and investment activity aimed at improving agricultural technology adoption. The Australian Government has several initiatives in place to focus on advancement and diffusion of technology.

The Government’s ‘Farming Smarter’ initiative specifically focuses on improving access to advanced technologies and practices, and the skilled workers required to implement them.⁷ The initiative led to the design of Government priorities, many of which directly relate to the focus of this driver, as shown below:⁸

- Advance technology, to enhance innovation of products, processes and practices across the food and fibre supply chains through technologies such as robotics, digitisation, big data, genetics and precision agriculture.
- To improve understanding and evidence of pest and disease pathways to help direct biosecurity resources to their best uses, minimising biosecurity threats and improving market access for primary producers.
- To manage soil health, improve water use efficiency and certainty of supply, sustainably develop new production areas and improve resilience to climate events and impacts.
- Improve adoption of R&D, focusing on flexible delivery of extension services that meet primary producers’ needs and recognising the growing role of private service delivery.

The initiative also led to the creation of the Rural R&D for Profit program to fund “collaborative research projects to deliver cutting edge technologies, applied research and on-farm adoption”. The Program aims to enhance farm-gate returns by improving productivity and encouraging profitability.⁹

⁶ Robert C Williamson, Michelle Nic Raghnaill, Kirsty Douglas and Dana Sanchez, *Technology and Australia's future: New technologies and their role in Australia's security, cultural, democratic, social and economic systems*, Australian Council of Learned Academies, September 2015, www.acola.org.au. ⁷ DAWR, ‘Agricultural Competitiveness White Paper: at a glance 2015’ available at: <http://agwhitepaper.agriculture.gov.au/white-paper/white-paper-at-a-glance> ⁸ See: <http://www.agriculture.gov.au/ag-farm-food/innovation/priorities> ⁹ See: <http://www.agriculture.gov.au/ag-farm-food/innovation/rural-research-development-for-profit>

Now in Round 4, the Program has been effective in encouraging rural research and development corporations (RDCs) to work together as RDCs must partner with one or more researchers, research agencies, other RDCs, funding bodies, and/or businesses in submitting applications. Several projects have focused specifically on the question of adoption of technology over the last four rounds.

One specific project under the Rural R&D for Profit Program “Consolidating Targeted and Practical Extension for Australian Farmers and Fishers” developed a set of principles¹⁰ and strategic actions to consolidate extension to minimise fragmentation in the Australian agricultural extension system, and improve the efficiency of extension delivery.¹¹ The aim was to increase adoption of R&D and encourage productivity and profitability across the sector.

The set of principles developed in that project were designed to encourage adoption of technology in an uncertain and changing environment, are still highly relevant today. While these initiatives are positive, consideration should be given to if and how these principles are being followed and if there is more work that can be done to increase the adoption of existing technologies.

The primary challenge in moving forward is the maturity of the current system. This means Australia must simultaneously continue to retain the demonstrable benefits being created by the system while overcoming the fragmentation and rigidity of the arrangements that have evolved.¹²

The Agricultural Innovation report released by the Commonwealth Minister for Agriculture and Water Resources in March 2019 outlines a vision and road map based on stronger collaboration to achieve this.¹³

→ **The current system is mature and creates benefits but needs to increase collaboration to contribute the required rate of gain to agriculture and the nation.**

¹⁰ The principles focused on: leadership and priority setting; resourcing; capability; engagement; collaboration and coordination; professionalism; and innovation. ¹¹ RIRDC, 2016, *Consolidating Targeted and Practical Extension for Australian Farmers and Fishers, Final Report, Rural R&D for Profit Programme*. ¹² <https://www.innovationaus.com/2019/03/Rural-RD-is-a-hot-mess> ¹³ <http://www.agriculture.gov.au/SiteCollectionDocuments/agriculture-food/innovation/summary-report-agricultural-innovation.PDF> ¹⁴ <http://www.agriculture.gov.au/SiteCollectionDocuments/agriculture-food/innovation/summary-report-agricultural-innovation.PDF>

Future benefits of unlocking the driver

There are considerable economic benefits that come from the adoption of technology, and in fact delaying or restricting the uptake of technology can cause lag effects which slows the progress of a nation:

“Adoption lags account for at least 25% of cross-country per capita income differences. In short, the longer the lag in technology adoption for any given nation, the lower the per capita income.”

Nobel, C. 2012, How Technology Adoption Affects Global Economies, Working Knowledge (July 2012), Harvard Business School.

Box 2.1 provides a case example of the net benefits that technology can bring to the livestock sector in Australia. It outlines the details of a 2018 report published by Meat and Livestock Australia (MLA) which focused on the growth potential of adopting agricultural technology in the red meat and livestock sector.

This is just one of many case studies that could have been selected to demonstrate the potential of greater technology adoption; other examples are likely to demonstrate the same point. There is impactful technology available that has been tested and validated—its relatively cost efficient and has numerous tangible and intangible benefits to a sector and the wider economy.

The R&D investment of the last thirty years or so has been made, the costs are sunk, and there are likely similar stories that could be told across many agricultural sectors—realising these benefits can improve outcomes for farmers, increase the productivity and profitability of an industry and benefit Australia as a whole.

→ **Greater focus on adoption for both immediate and longer-term benefits by producers, industry and government must increase.**

Box 2.1 → **Case study — Growth potential of adopting agtech in the meat and livestock sector**

During 2018, Meat and Livestock Australia published a report on “Demonstrating the value of animal location and behaviour data in the red meat value chain”. The report estimated the benefits to the livestock industry from new technology to remotely monitor the location behaviour and state of cattle and sheep for Australian graziers.

A survey was designed to focus on the value of the technology to users and data was collected by indepth interviews with livestock producers. Survey and interview questions were set up to estimate the value of the benefit, through articulating the estimated annual cost savings, annual revenue gains and the potential revenue saving in containing or preventing a catastrophic event (e.g. a serious disease outbreak).

These questions were asked across a number of potential applications of the technology and its associated data. A sample of cattle and sheep producers were selected from different zones in Australia – the pastoral zone (beef cattle) and the high rainfall/sheep wheat zone (for beef and sheep). Two scenarios were considered – use of the technology for the whole of herd/flock and use with a ‘sentinel’ animal within the herd/flock. This generated different cost profiles.

Producers reported a range of potential applications and benefits. A small number of applications had a large value but most of the financial benefit comes from the cumulative impact of a number of applications with smaller revenue gains and cost savings. Areas where significant economic impact are likely but further research is required to estimate monetary value includes biosecurity and animal welfare/social license issues. Further there are many other benefits like “peace of mind” for farmers which are not financial benefits and therefore cannot be easily quantified but should not be discounted.

Producers ranked the possible applications of this technology across all farm zones and all livestock, some of the highest ranking applications included water related behaviour and animal

welfare. Other applications considered important by producers, to name a few, include: stock theft; mustering efficiency; issues relating to pregnancy and birth; and disease detection.

By scaling up the benefits across the beef and sheep industries Australia-wide the national economic impact, if the technology were adopted by farmers, was estimated to be as much as \$1.3 billion across the Australian sheep and cattle industries over 10 years.

The modelling also took adoption into account by assessing several adoption profiles and different cost structures for the technology as well as consideration of the available telecommunications infrastructure in producing upper and lower bounds of adoption under different scenarios. The minimum accumulated benefits across the cattle and sheep industries over 10 years are estimated to be less than half the estimated maximum, at \$480 million.



The R&D investment over the last thirty years or so has been made, the costs are sunk, and there are likely similar stories that could be told across many agricultural industries—realising these benefits can improve outcomes for farmers, increase the productivity and profitability of an industry and benefit Australia as a whole.



Driver 1b: Using existing data across the supply chain

The second dimension of Driver 1 involves the use of data collected (or potentially collected) across the supply chain. There is considerable data and information which has been measured and collected by various industry and government bodies across the supply chain, that if collated responsibly (i.e. accordance with privacy and other regulations) and then analysed, could enable further efficiencies and/or suggest new areas for research or introduction of new approaches or systems. Open-access data can also facilitate the uptake of new technologies that require this information.¹⁴

→ (Open) data is a key driver for growth.

Current situation

A recent joint RDC and Australian Government research project, 'Accelerating Precision Agriculture to Decision Agriculture' (P2D), defined digital agriculture as "both the collection and analysis of data to improve both on-farm and off-farm decision making, leading to better business outcomes". The P2D project also flagged the importance of ensuring Australian farmers benefit from digital agriculture despite noting the challenges of using the data to increase farm profitability.¹⁵

The P2D project estimated that the gains from digital agriculture may increase the gross value of Australian agricultural production, including forestry, fisheries, and aquaculture, by \$20.3 billion.¹⁶ The P2D project assumed complete uptake of digital agriculture across the industry and excluded any costs associated with the adoption of digital technologies. A breakdown of percentage increases in gross value of production per sector is reported in **Table 2.2**.

Table 2.2
Estimated potential increase in Gross Value of production to the sector from fully implemented digital agriculture

| Industry | Gross Value of Production (% increase from 2014-15) |
|---------------------------|---|
| Cotton | 28% |
| Dairy | 15% ¹⁷ |
| Eggs | 25% |
| Fisheries | 44% |
| Forest and wood products | 37% |
| Horticulture ^a | 40% |
| Grains | 51% |
| Live export | 4% |
| Meat | 18%* |

*Note: The base year used for baseline data was 2014-15. This is not directly comparable with ACIL Allen's estimates which focus on a baseline year of 2016-17. ^a Leafy greens, brassicas, and carrots only * Average of sheepmeat, beef, chicken meat and red meat processing (rounded). Source: Leonard, E. (Ed), Rainbow, R. (Ed), Trindall, J. (Ed), Baker, I., Barry, S., Darragh, L., Darnell, R., George, A., Heath, R., Jakku, E., Laurie, A., Lamb, D., Llewellyn, R., Perrett, E., Sanderson, J., Skinner, A., Stollery, T., Wiseman, L., Wood, G. and Zhang, A. (2017). Accelerating Precision Agriculture To Decision Agriculture: Enabling Digital Agriculture In Australia. Cotton Research And Development Corporation, Australia.*

¹⁴ Robert C Williamson, Michelle Nic Raghnaill, Kirsty Douglas and Dana Sanchez, *Technology and Australia's future: New technologies and their role in Australia's security, cultural, democratic, social and economic systems*, Australian Council of Learned Academies, September 2015, www.acola.org.au.¹⁵ Leonard, E. (Ed), Rainbow, R. (Ed), Trindall, J. (Ed), Baker, I., Barry, S., Darragh, L., Darnell, R., George, A., Heath, R., Jakku, E., Laurie, A., Lamb, D., Llewellyn, R., Perrett, E., Sanderson, J., Skinner, A., Stollery, T., Wiseman, L., Wood, G. and Zhang, A. (2017). *Accelerating precision agriculture to decision agriculture: Enabling digital agriculture in Australia*. Cotton Research and Development Corporation, Australia. ¹⁶ Heath, R., 2018, *An analysis of the potential of digital agriculture for the Australian economy*, *Farm Policy Journal*, 15(1), Autumn 2018.

Although recent evidence has been collected and the case made of the potential benefits,¹⁸ without an assessment of the costs it is impossible to determine the enduring profitability and net benefits for Australian society.

Future benefits of unlocking this driver

There are clear profitability gains that can be achieved through data collection and analytics in areas where there is uncertainty in yield and complex production systems. Evidence from other sectors (such as pharmaceuticals, mining and chemicals with high processing variability) shows that data and analysis can provide detailed diagnostics to correct for variable process flaws saving both time and money.¹⁹

In the agricultural industry, multi-peril crop insurance (MPCI) is one example of many where better use of data could enable better and more efficient on-farm risk management for farmers which improves long term business sustainability. MPCI allows the business to better cope with periods of drought and/or other natural perils than they would otherwise, and potentially reduces the need or dependence on government assistance.

However, the nature of agricultural production and the lack of disaggregated farm business data, linked with geophysical and meteorological data, means that it is difficult to deliver insurance products that are affordable and relevant to farm business risk. There are also significant barriers to entry for commercial providers of MPCI, such as asymmetric information, adverse selection and moral hazard.

By reducing asymmetric information through data sharing programs and assisting farmers with MPCI premiums (e.g. stamp duty waivers or reduced up-front costs) market failure can be minimised and may provide the appropriate market conditions to allow competition and a reduced reliance on government assistance leading to enduring profitability.

Other examples also show the power of this driver. For instance, increased access to local area temperature and rainfall data could provide farmers with instantaneous or historical information about climatic conditions that are critical to their planting and harvesting decisions. Such data, if made available at the right time in a season, could make a significant difference to the net performance of farmers within and across regions and/or seasons.

→ Greater data can assist with development of new insurance markets and risk sharing arrangements.

→ Data at finer scale provides information for stronger local management and adaptation.

→ Data delivers benefits where there is uncertainty, complexity and when diagnosis and measurement can drive efficiency.

¹⁷ Leonard, E. (Ed), Rainbow, R. (Ed), Trindall, J. (Ed), Baker, I., Barry, S., Darragh, L., Darnell, R., George, A., Heath, R., Jakku, E., Laurie, A., Lamb, D., Llewellyn, R., Perrett, E., Sanderson, J., Skinner, A., Stollery, T., Wiseman, L., Wood, G. and Zhang, A. (2017). *Accelerating precision agriculture to decision agriculture: Enabling digital agriculture in Australia*. Cotton Research and Development Corporation, Australia. ¹⁸ Leonard, E. (Ed), Rainbow, R. (Ed), Trindall, J. (Ed), Baker, I., Barry, S., Darragh, L., Darnell, R., George, A., Heath, R., Jakku, E., Laurie, A., Lamb, D., Llewellyn, R., Perrett, E., Sanderson, J., Skinner, A., Stollery, T., Wiseman, L., Wood, G. and Zhang, A. (2017). *Accelerating precision agriculture to decision agriculture: Enabling digital agriculture in Australia*. Cotton Research and Development Corporation, Australia. ¹⁹ Eric Auschitzky, Markus Hammer, and Agesan Rajagopaul, 2014, *How big data can improve manufacturing*, *McKinsey*. Available at: <https://www.mckinsey.com/business-functions/operations/our-insights/how-big-data-can-improve-manufacturing>

Driver 2: Investing in off-farm R&D – creating value up the chain

Developing new uses for products helps to diversify the agricultural sector and allows the sector to better withstand uncertainty and a changing environment. Value add is a significant contributor to the agriculture and food industry. Whilst some sectors may benefit more than others from increased investment in off-farm R&D, the long-term benefits to farmers, the agricultural industry and Australian society, will likely outweigh the costs of these investments.

Current situation

Food and beverage product manufacturing is the largest single subsector within Australia's manufacturing sector contributing over \$102 billion in turnover and accounting for nearly one third of Australia's turnover from manufacturing.²⁰ However, turnover was down 2.5% from 2017 and the sector is facing declines in real Industry Value Added (IVA), productivity and capital investment.²¹

→ Value adding is critical to realising the \$100 billion target by 2030.

→ The rural R&D sector has a strong farm-gate focus.

→ Value adding food and fibre R&D is distributed across a range of public policies and commercial interests.

Unlike agriculture, there is no dedicated R&D sector to fund improvements in processing productivity. Traditionally Australia's agricultural R&D effort has focused on delivering benefits on-farm. However, focusing on the processing sector adds value to Australian agricultural goods which drives profitability. Investment in R&D that improves productivity in downstream processing has net benefits for the agriculture sector, regional communities and Australia as a whole.

Future benefits of unlocking this driver

Difficulties lie in farmers being able to capture the value from downstream processing which occurs through changes in the distribution of value in the supply chain. However, examples of where this is possible include direct marketing, vertical integration, producer alliances and cooperatives are often directed toward capturing more of the end-use value of farm production.

Within this context, stakeholder consultations identified there is significant opportunity to expand the remit of R&D into off-farm aspects of agriculture. In particular, stakeholders have identified there is a need to move into areas of R&D that examine the processing and product-level dimensions of many agricultural supply chains.

It is acknowledged that some industries (through their RDCs) are already heavily involved in these parts of the value supply chain and have made significant investments to unlock the potential of their industries through R&D in the pre and post farm-gate environments. **Box 2.2** provides the details of a multi-industry R&D project aimed at transforming low-value agricultural products into high-value commodities through new refinery methods. The box provides one of many examples of significant investments that some industries are making in the post farm-gate R&D environment.

→ The different commercial and public structures and incentives make aligning on and off-farm R&D more challenging but still worth pursuing with equity being a key consideration.

²⁰ Australian Food and Grocery Council, 2018, *State of the Industry 2018*. Available at: <https://www.afgc.org.au/wp-content/uploads/AFGC-State-of-the-Industry-2018-Report.pdf> ²¹ Ibid. ²² Australian Food and Grocery Council, 2018, *State of the Industry 2018*. Available at: <https://www.afgc.org.au/wp-content/uploads/AFGC-State-of-the-Industry-2018-Report.pdf> ²³ Ibid.

Box 2.2 → Sugar Research Australia—Biorefinery methods for value adding

As part of Round 1 of the Rural R&D for Profit program, Sugar Research Australia together with Forest and Wood Products Australia Limited, the Cotton Research and Development Corporation, Australian Pork Limited, and the Queensland University of Technology, established a project to investigate the use of biorefinery methods to convert low value material into higher value products, including animal feed, fuels, fibre, and chemicals.

By examining how to add value to the significant low value biomass in the agricultural and forestry production systems such as cane mulch and bagasse, cotton stalks and trash material, and forestry by-product, farmers' returns can be improved beyond the value from the primary commodity crop.

This project also has further benefit to other areas of the agricultural supply chain, including improved animal feeds and alternative production of chemicals potentially reducing the cost of inputs.

Due to end in 2018, the project aims to increase the profitability of agricultural waste products by creating biorefineries which generate higher value bioproducts. Further, work by Deloitte Access Economics and Corelli Consulting, found that building regional biorefineries could create over 6,000 full time jobs and increase revenue in Queensland by \$21.5 billion by 2020.

Source: <https://elibrary.sugarresearch.com.au/bitstream/handle/11079/15545/Issue%203%20Page%204%20Milling%20Matters.pdf?sequence=1&isAllowed=y>

Driver 3: Investing in off-farm infrastructure

Investing in and/or building infrastructure will strengthen the supply chain, reduce transport costs and increase access to markets in a cost and time efficient manner. Other infrastructure (such as improved telecommunications systems or space-based infrastructure) will also act as a conduit for enabling technology and increasing communication across the supply chain.

→ Off-farm infrastructure underpins agriculture's ability to attract labour and capital as well as move produce to market at a competitive cost.

Further, as acknowledged by stakeholders, social infrastructure such as schools, health and other institutions, are also needed to support regional, rural and remote communities where agriculture is a large proportion of local business.

Current situation

In 2008, the NFF made a submission to Infrastructure Australia which focused on improvements in ground transport infrastructure including roads and rail as well as telecommunications infrastructure.²⁴ The NFF's recommendations included identifying and understanding agricultural freight flows on a national and regional basis, forecasting future freight and auditing existing infrastructure (such as the grain rail and existing road network) to ensure that future developments meet agriculture's needs.²⁵

Current large-scale public investment in ground infrastructure that supports the agriculture sector and assists national, regional economic and social development includes: the Northern Australia Beef Roads Program; Investment Road and Rail; Black Spot; Bridges Renewal; Heavy Vehicle Safety and Productivity; Roads to Recovery; Northern Australia Beef Roads; Northern Australia Roads; National Highway Upgrade; and Outback Way.²⁶

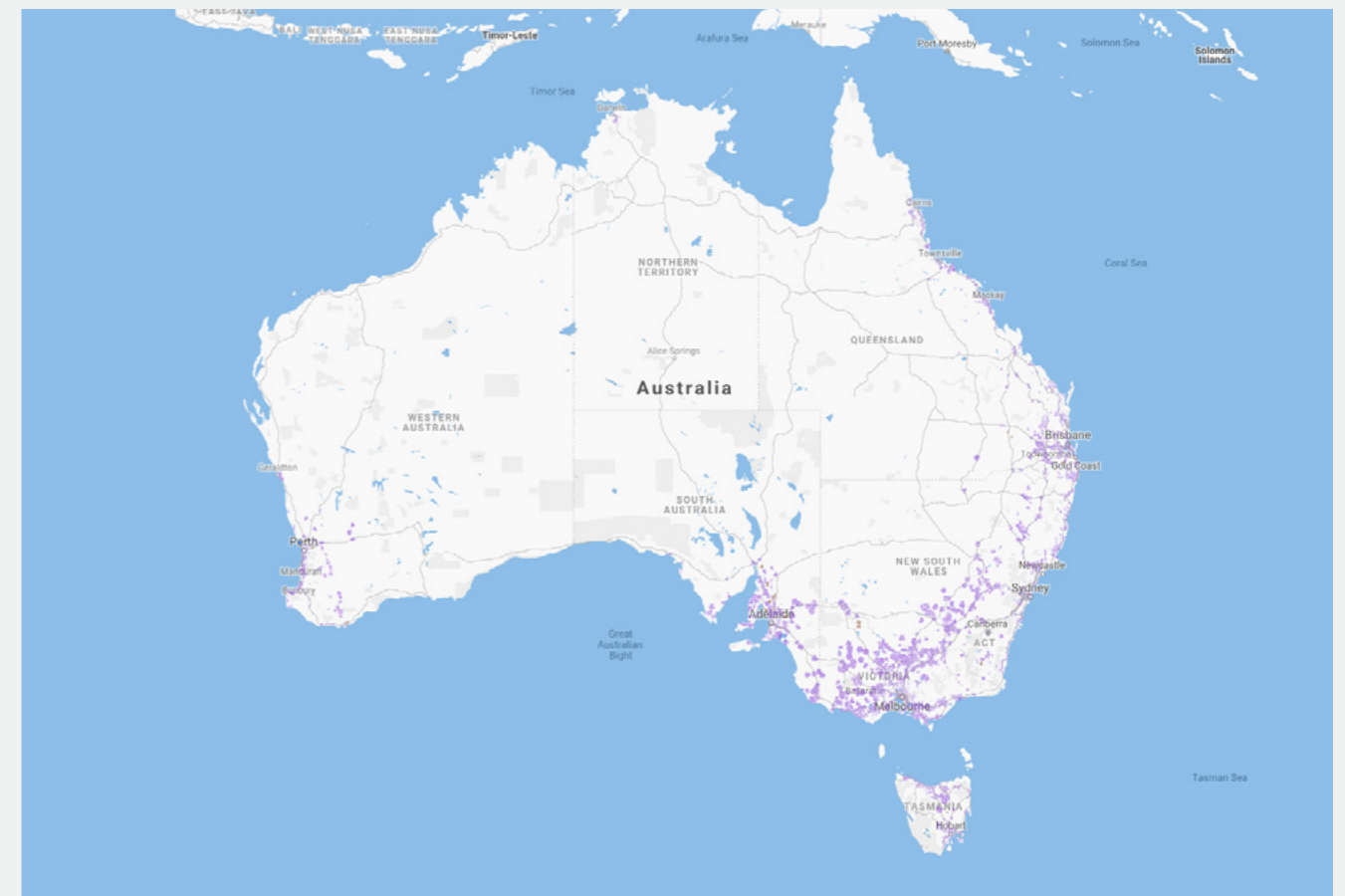
NFF also acknowledged the importance of telecommunications and regional water infrastructure in developing the agriculture sector.²⁷ Reliable access to telecommunications services, in particular, allows for better uptake of technology—much of which requires telecommunications infrastructure. The National Broadband Network (NBN) which initially commenced in 2008, is the largest infrastructure project in Australian history and includes wired and radio communication components rolled out and operated by NBN Co Limited. However, there have been a multitude of issues with the roll out of NBN many of which relate distinctly to access in rural and regional areas.

→ Understanding freight flows must underpin where to invest in infrastructure projects.

→ Many infrastructure investments will need to be justified on how they strengthen numerous industries and communities rather than agriculture alone.

²⁴ National Farmers Federation, 2008, Submission to Infrastructure Australia, October 2008. ²⁵ Ibid. https://investment.infrastructure.gov.au/infrastructure_investment/ ²⁶ https://investment.infrastructure.gov.au/infrastructure_investment/ ²⁷ The NFF's submission to Infrastructure Australia argued: "Quality, affordable (provided at prices comparable to metropolitan areas) telecommunication services now and into the future are absolutely vital for farmers and rural communities. Whether it be for business, family, social, health, education or other needs, rural Australians require – and are entitled to – access to the latest telecommunications services". ²⁸ The Joint Standing Committee on the National Broadband Network, 2018, The rollout of the NBN in rural and regional areas, November 2018. and

Figure 2.1
National Broadband Network—available residential service (August 2019)



*Purple indicates service available. Source: <https://www2.nbnco.com.au/residential/learn/rollout-map>

The Joint Standing Committee (JSC) on the National Broadband Network, recently released their second report²⁸ on NBN rural and regional areas which found that rural and regional areas are disadvantaged in terms of access to NBN or related services relative to urban areas, and that this is having a negative economic and social impact for people who live in these

communities. **Figure 2.1** demonstrates that although 80% of the population in regional and rural areas have access to services, there are vast agricultural areas of regional Western Australia, the Northern Territory and inland Queensland which have no coverage.

²⁸ The Joint Standing Committee on the National Broadband Network, 2018, The rollout of the NBN in rural and regional areas, November 2018. and ²⁹ See: <http://www.regionalaustralia.org.au/home/our-current-work/projects/social-infrastructure/>

Social infrastructure such as schools, hospitals and other institutions are also important to support communities. It delivers regional development through a range of benefits from maintaining community function to encouraging innovation and economic growth. This type of infrastructure can lower transaction costs making it easier to do business, reduce reliance on government support, increase regional productivity and output and create new jobs for the local community.²⁹ Agriculture and related services is the largest employer in rural and regional Australia, and the benefit that social infrastructure provides is a sense of community for those living in regional and rural areas which is good for society as a whole.

→ The social benefits associated with building resilient communities as well as attracting labour and capital should not be underestimated.

Future benefits of unlocking this driver

There are many benefits to investing in agriculture across the supply chain, from telecommunications to ground-based infrastructure and social infrastructure that not only improve

→ Off-farm infrastructure requires a long-term and coordinated view.

→ We need equal emphasis on increasing efficiency of existing assets as well as developing new assets. The latter will need to be developed with others to share the costs and benefits.

the profitability of farmers through reduced transport costs or the ability to implement technology, but also flow through to the broader community. However, the time required to undertake significant infrastructure development and /or maintenance should not be underestimated and should be considered as part of a coordinated and long-term strategy well into the future, and well beyond 2030.

Government support and leadership is paramount in investing in off-farm infrastructure and is critical in encouraging enduring profitability for the agriculture sector. There are opportunities for industry in conjunction with Australian, state and local governments to provide a coordinated policy and investment response to the infrastructure needs of agriculture. These opportunities will require formal and long-term commitment between agriculture and governments to ensure infrastructure investment is targeted towards the greatest need and delivers benefit that endures.

Driver 4: Market access and market development

In an increasingly uncertain global environment, ensuring access to a range of export markets is invaluable for Australian agriculture and the broader economy. Australia has a small population which limits the amount of food and agricultural products that can be consumed domestically. Australia produces well in excess of what it consumes, with about 77% of all agricultural goods produced in 2016-17 exported.³⁰

Some sectors export more than others. For example, red meat is a large exporter while horticulture is predominantly consumed domestically. The opportunity to export helps an industry to manage production and financial risk and hence mitigate against uncertainty.

Market development which can focus on either domestic or international markets is an important initiative that industry can lead. A better understanding of consumers and what drives their purchasing decisions can go a long way to assist industry with producing products that are fit for purpose and target their markets in the right way so as to maximise returns.

A strong and consistent narrative, particularly for overseas markets, will improve awareness and willingness to buy Australian. Domestically, it is about reconnecting with consumers and ensuring that production processes and products live up to expectations and fulfil social licence obligations.

Market access coupled with market development is likely to contribute significantly to enduring profitability for all agricultural industries.

→ Australian agriculture has a production surplus so exports are, and will, continue to be a core foundation of the sector.

→ Agriculture must continue to supply markets with what they demand.

→ We must secure the right (access) and way (development) to service the markets dynamically as they evolve.

Driver 4a: Improving market access

For an export focused sector, it is crucial to not only understand the demands of overseas consumers but also to establish robust links within those countries via government trade negotiations. The markets of today will not be the markets of tomorrow. Although considerable work has been done in negotiating free trade agreements and other arrangements, this work needs to continue for the long-term profitability of the sector.

Current situation

Provision of access to new markets through trade agreements or other negotiations will continue to provide opportunities for export growth. Australian Government support is crucial for the development of linkages and agreements needed to allow Australia to do business with the world.³¹

Other market access arrangements facilitated by government include agreements on non-tariff barriers such as sanitary and phytosanitary measures (SPS), governed by the World Trade Organisation (WTO).³²

The SPS agreement guides and enforces all WTO members to make appropriate decisions around a country specific appropriate level of protection against any SPS measures which may affect trade. The Australian Government sets and administers Australia's SPS measures and assists Australia's exports through maintaining and improving technical market access.³³

The Australian Government, through the Department of Agriculture, the Department of Foreign Affairs and Trade and AUSTRADE, also provide support and assistance to exporters from grant funding to negotiation support to tailored market expansion services, trade events and missions.

³⁰ See: <https://www.nff.org.au/farm-facts.html> ³¹ See: <https://dfat.gov.au/trade/agreements/Pages/trade-agreements.aspx>

³² See: <http://www.agriculture.gov.au/market-access-trade/sps> ³³ Ibid.

→ Market access requires close collaboration between industry and government to secure the agreements and assurances that allow access.

→ We have a mature system for doing so that needs to evolve in a way that ensures the required information is generated for both well established and new/emerging industries and products.

With higher regulatory burdens than some of our less developed competitors, the opportunity to leverage the assurances captured within the regulatory system could be used as a point of difference for consumers. For example, the National Livestock Identification System will enable businesses to leverage the quality or perceived safety traits in higher value markets.

→ Market development is a combination of brand, assurance and commercial incentives that work together to supply markets with consistent volume and value more competitively than others.

Future benefits of unlocking this driver

Access to markets creates net benefits—not only to farmers but to the Australian public. Through exporting to various countries, production risk and financial risk is diversified and Australia's gross domestic product increases.

Driver 4b: Market development

A clear strategy and narrative around agriculture may also go a long-way to reconnect the urban and rural environment, encourage consumer support and revitalise interest in the sector, for investors and consumers in Australia and overseas.

Part of this could be the development of industry-led quality standards and assurance systems which enable traceability and increase consumer confidence (and thus demand) in Australian agriculture and food products. This can be coupled with communicating the benefits of our regulatory systems to consumers which may help outweigh high production costs in Australia's agricultural sector.

Current situation

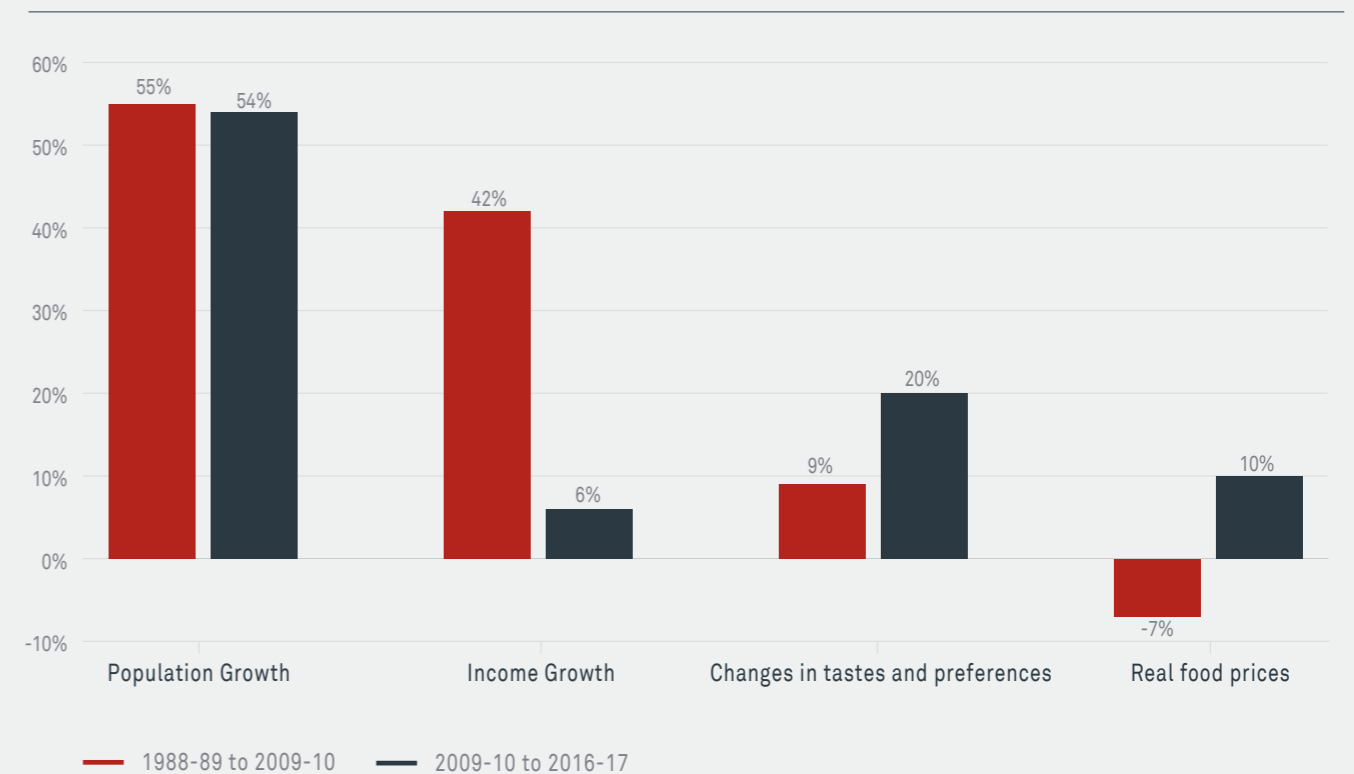
Unlike other countries such as New Zealand, Australian agriculture does not have a central premise or a homogenous brand³⁴ and is often criticised for competing with itself rather than working together to achieve bigger and better things.

Future food demand is essentially underpinned by population growth and increasing disposable incomes both in Australia as well as overseas.

ABARES reports recent trends and drivers for growth, noting that for the periods 1988-89 to 2009-10 and 2009-10 to 2016-17 food imports have increased from 8% to 15% of products consumed in Australia and there has been a distinct shift in the influence of tastes and preferences over the same time period (refer **Figure 2.2**).

³⁴ Some may say that Australia's brand is 'clean and green' – however, there has never been any formal branding on this concept – and whilst it is often mentioned – a google search of "Australia clean and green" returns mainly cleaning and cleaning product companies – the first reference to an agricultural product is at the end of the first search page with reference to 'Clean green Australian Southern Rocklobster'. From an academic perspective the last time the concept of 'clean and green' as a brand for Australian agriculture was reviewed was in 2006, with the central premise being: "green and 'clean' are not meaningfully defined and not readily verifiable"... "We argue that the decade-long image campaigns by Australian governments have led to complacency and hampered efforts to promote on-farm quality assurance (QA) and environmental management system (EMS) programs that underpin the 'clean and green' credential." Hui-Shung (Christie) Chang and Paul Kristiansen, 2006, *Selling Australia as clean and green*, *Journal of Agricultural and Resource Economics*, Volume 50, pp 103-113.

Figure 2.2
Key drivers of food demand in Australia (1988-89 to 2009-10 and 2009-10 to 2016-17)



Note: Growth estimates for the volume of food consumption per person (1.0% a year between 1988-89 and 2016-17) should be interpreted with caution and may indicate there has been some switching toward higher-priced food types. Source: ABARES

In Australia, ABARES estimates that with a 1.3% growth rate per annum in population and a 0.5% growth rate for household food expenditure per person, Australia's household food consumption expenditure is projected to increase from \$92 billion in 2016-17 to \$165 billion in 2049-50.³⁵

Although price is still the key driver of food demand, particularly for lower income households, over time consumers from higher income households have revealed a willingness to pay higher prices for quality attributes. ABARES considers, holding all else constant, that reliable food quality will further increase the willingness of consumers to pay a price premium.³⁶

³⁵ See: <http://www.agriculture.gov.au/abares/research-topics/food-demand/trends-and-issues-2018#food-demand-2018-data-visualisation> ³⁶ See: <http://www.agriculture.gov.au/abares/research-topics/food-demand/trends-and-issues-2018#food-demand-2018-data-visualisation>

With a willingness to pay a premium price comes an increased awareness of food, where it's produced and how it's produced. Consumers are more vested in their food purchasing decisions than in previous time periods.

Trends such as this are common in developed countries. They are also becoming more pronounced in less developed countries where populations are growing rapidly and disposable incomes are increasing. Certain segments of the population have a high willingness to pay for high quality food at a premium price.

This is where the concepts of narrative and social licence become important, particularly so when the cost of production continues to grow in order to achieve all the requirements that the consumer increasingly demands.

There are several big social themes that are growing in importance and have an impact on how food is produced and marketed in Australia.

These themes generally include issues around:

- Environmental sustainability (e.g. sustainable use of resources, food waste)
- Diet, nutrition and health (e.g. changes in tastes and preference away from specific products such as wine and red meat)

- Animal welfare
- Food safety and traceability.

One way to deal with these issues is to embrace them, which many industries have done (such as red meat). R&D to understand the issues that are important to consumers and what drives their purchases is important, as too is R&D on how to make production systems more sustainable, safer and improve animal welfare. Many industries are working on these types of research questions and those with marketing components are looking at ways to improve communication with their consumers and the broader community both domestically and overseas.

The current approach however, is siloed and work that's being done is on a sector rather than a whole of industry level. There are several reasons why a coordinated response could be beneficial. First, from an international perspective Australia is a very small producer of agricultural products and making noise in a crowded and competitive market place is easier the bigger you are. Second, the sheer volume of information that is easily available and accessible to consumers on a variety of issues means that even domestically, it is difficult to get clear messages out there as to what Australian agriculture is doing to address consumer concerns and issues of social licence and to promote the benefits of Australian agricultural products.

→ Market development is a combination of brand, assurance and commercial incentive that work together to supply markets with consistent volume and value more competitively than others.

→ Market development needs to keep pace with changes in consumer behaviour and markets as well as what Australian agriculture produces.

→ A richer national narrative (brand) is starting to evolve in response to greater interest and

need to integrate consumer preferences, especially around social licence (both in domestic and export markets).

→ The demand for greater information on markets and consumers is likely to increase.

→ As the narrative becomes richer, creating an architecture that sustains and builds the national narrative while allowing sufficient flexibility to allow commercial enterprises and industries to develop their own branded products will require coordination.

Recent government-led initiatives domestically include new Country of Origin Labelling (CoOL) laws which became mandatory on 1 July 2018, following a two-year transition period. This means that food products are now labelled so that consumers can be aware of whether their food is grown in Australia, produced using a proportion of Australian food or made in Australia from imported ingredients. Importantly these labels create awareness among consumers and can work as a signal to Australian consumers to encourage purchases of products made locally. It is possible to work with these mandatory labelling requirements and leverage off them to create more awareness domestically for Australian products.

The 'Australian Made' logo, can also be used for a fee on export products on a voluntary basis. The logo "makes the 'Australian connection' instantly, clearly and with authority".³⁷

Future benefits of unlocking this driver

For an industry that relies on consumers for its revenue, there is very little work done to examine what the consumer wants, what drives the consumers' decision making and what they are willing to pay for food products. This work needs to take place domestically and internationally – and is advisably best done on a sector by sector basis due to the different issues and relationships consumers have with each commodity group.

→ Value will be generated by aligning agricultural produce with a better understanding of what consumers/markets want. Intelligence can be shared but those who benefit should drive the process.

→ Claims should be backed by standards and assurances to maintain integrity of Australia's agricultural produce.

In addition, an understanding of the consumer will assist in the design and creation of a single narrative or brand for Australian agriculture. Australian agriculture can work together to develop a single brand or narrative which will create awareness and can help to increase market share relative to competitors. As part of this, consideration should be given to the value of certification schemes to complement and add credibility to the claims that could be made as opposed to a purely marketing exercise. This needs to be industry-led to ensure uptake and compliance and should be comprised of a series of existing standards where relevant (such as environmental management standards and food safety standards) rather than the creation of new ones.

“...credible evidence to substantiate such claims will be required. Therefore, the key to success is not a 'clean and green' image but a 'clean and green' credential.”

Hui-Shung (Christie) Chang and Paul Kristiansen, 2006, Selling Australia as clean and green, Journal of Agricultural and Resource Economics, Volume 50, pp 103-113.

Implications of the drivers for individual sectors

In the absence of robust quantitative data, ACIL Allen have developed a qualitative analysis of the impact that each driver will have on the ability of individual sectors to deliver increased profitability by 2030, if adopted to their fullest extent (refer to **Table 2.3**). Although this analysis is unavoidably high-level it provides an indication of sectoral differences and the likely benefits from implementation. Further sector specific details are provided in Appendix B.

There will be both similarities and considerable variability across sectors in relation to the impact of these four drivers.

³⁷ See: <https://australianmade.com.au/>

The drivers apply to Australian agriculture but the degree to which they potentially benefit individual industries varies.



Although working on all drivers would clearly benefit each sector in some way or another, some drivers such as better off-farm infrastructure or better use of data will have overarching benefits for agriculture and society as a whole. However, market access, for example, is more critical for export dominated sectors than others (or those sectors with potential for exports).

It is in the relative differences where the true story lies. By examining where the relative differences are across sectors, we can clearly see the areas where enduring profits are more likely to be created both within a driver and across each sector by 2030 and beyond. **Table 2.3** indicates that most sectors analysed in this report will benefit considerably from the adoption of drivers. Eggs, wool and to a lesser extent, cotton and dairy, are assessed as not likely to benefit considerably from the drivers discussed in this chapter as much as the other sectors analysed.

→ The drivers apply to Australian agriculture but the degree to which they potentially benefit individual industries varies.

→ Differences need to be respected and acknowledged with a view of working towards alignment as need and circumstances allow.

Table 2.3
Relative sectoral differences—potential for increased profitability if the drivers are adopted by 2030

| Sector | Driver 1 | | Driver 2 | Driver 3 | Driver 4 | |
|--------------------------|---------------------|------------|--------------|-------------------------|---------------|--------------------|
| | Adopting technology | Using data | Off-farm R&D | Off-farm infrastructure | Market access | Market development |
| Cotton | High | High | Medium | Medium | Low | High |
| Dairy | High | High | Medium | Medium | Medium | High |
| Eggs | High | Medium | Low | Low | Low | High |
| Fisheries | High | High | High | High | High | High |
| Forest and wood products | Medium | Medium | High | Low | Medium | High |
| Horticulture | High | High | High | High | High | High |
| Grains | High | High | High | High | High | High |
| Live export | High | Medium | Low | High | High | Low |
| Meat | High | High | High | High | High | High |
| Pork | High | High | High | High | High | High |
| Sugar | High | High | High | High | Medium | Low |
| Wine | High | Medium | High | Medium | Medium | High |
| Wool | High | High | High | Low | Low | High |

Source: ACIL Allen Consulting, 2018

Agriculture's ability to realise the benefits from investments in each driver will be a key determinant of growth. However, investment in the drivers alone will not guarantee sustained farm performance over the next decade. For agriculture to achieve growth it must also maintain historical levels of growth. It can do this by managing the downside risks of the industry and maintaining the status quo through time.

While this report argues that the \$85 billion baseline trend is just part of a vision statement, consideration of this trend raises interesting questions for industry and policy makers alike. How does agriculture defend the gains made in the past that are anticipated to deliver benefits in the future? What defensive considerations (or downside risks) need to be examined and mitigated? What will be the implications if these considerations are not mitigated?

This chapter identifies four dimensions which are important in maintaining the future defence position of agriculture. These dimensions (otherwise called risks) were identified during consultations with stakeholders as the priorities requiring attention.

It is important to note that each risk has both defensive and offensive dimensions (in the form of opportunities) to it. However for the purposes of this report, the risks are defined as defensive due to their primary characteristics and the role they will play in maintaining historical levels of growth.

Furthermore, we assume that as these risks are intrinsic in the day-to-day operations of agriculture, the focus here is on the potential to better manage these risks to create enduring profitability.

→ Managing risk is just as important to making progress towards the \$100 billion target as realising opportunities from drivers.

→ Risk management is part of defending the current value of agriculture.

→ Solely defending the current value of agriculture is unlikely to be sufficient.

Risk 1: Climate change and water availability

While the impact of climate change on agriculture will be spatially and temporally diverse, many regions are likely to experience the downside aspects of climate change.³⁸ The main threats to agriculture have been identified in numerous policy documents, industry-funded analysis, international reports and academic research papers.³⁹

It is not our intention to replicate this analysis, but rather to restate the case that climate change can lead to productivity declines and stock losses if it is not adequately addressed. Moreover, producers may also face additional costs of structural adjustment and/or capital adjustment and may have difficulty in securing investment for climate-dependent assets such as irrigation infrastructure, vineyards and agroforestry. Further investing in ecological assets in rural regions may also become challenging.⁴⁰

It is also worth noting that climate change may also provide considerable upside risk (or opportunities) such as the ability to grow crops that could not previously grow in a region due to frost or high/low rainfall. Further upside can be realised through adaptation strategies which, given the gradual change in climate over time, there is scope for farmers in many regions and industries to develop or implement adaptation strategies. Investments in R&D and innovation are likely to be important in assisting farmers' adaptation to climate change.⁴¹

Moreover, net farm performance can be constrained by water availability, accessibility and use requirements. Droughts, water reforms (e.g. Murray Darling Basin Plan), competing water uses from mining and urban growth, and climate change all influence water use in agriculture.

The Murray Darling Basin supports about 41% of the total gross value of Australia's agricultural production, including 46% (\$7 billion) of the gross value of national irrigated agriculture.⁴² The recent Draft Report by the Productivity Commission (2018) on the Murray Darling Basin Plan: Five-year assessment⁴³ noted that higher water prices, water trade, and other ongoing pressures for change in the agriculture sector mean that some structural change for regional communities and agricultural industries is inevitable.

Some of this downside risk can be mitigated through a better understanding of the complex interactions between water, energy costs, labour needs, nutrient use, crop agronomy, soils, salinity and the water balance; as well as improvements in infrastructure, technology, and engineering solutions, and education and training skills.⁴⁴

→ Climate change is a non-discriminating disruptor that can significantly reduce the value of agriculture.

→ Adaptation will be required and can be leveraged beyond R&D to include industries changing location, and renewal of business models and assets to strengthen resilience.

→ Water policy will remain paramount along with the integrity and flexibility of the associated markets and delivery systems.

→ Information on key interactions is needed to inform decision making and trade-offs.

³⁸ Kingwell, R., 2006, *Climate change in Australia: agricultural impacts and adaptation*, Australian Agribusiness Review, Volume 14, Paper 1. ³⁹ See: <https://www.futurefarmers.com.au/young-carbon-farmers/carbon-farming/climate-threats-to-australia-agriculture> ⁴⁰ Ibid. ⁴¹ Kingwell, R., 2006, *Climate change in Australia: agricultural impacts and adaptation*, Australian Agribusiness Review, Volume 14, Paper 1. ⁴² See: <https://www.pc.gov.au/inquiries/current/basin-plan/draft> ⁴³ Productivity Commission, 2018, *Murray-Darling Basin Plan: Five-year assessment – Draft Report*, August 2018. ⁴⁴ Primary Industries Ministerial Council, 2015, *National Water Use in Agriculture RD&E Strategy*.

Risk 2: Inadequate biosecurity

Australia's borders are large and difficult to protect. The nature of international travel and the emergence of a global society makes the transmission of pests and diseases more likely than ever before. Biosecurity is a complex problem which requires better coordination across the national and state/territory-based biosecurity policies and strategies.

In Australia, biosecurity is managed to a very high standard, with significant coordination between Commonwealth, State and Territory Governments.⁴⁵ Despite this, there always lies significant potential for biosecurity failures (that decimate or damage an industry and reduce Australia's access to markets) to emerge. By better managing biosecurity surveillance and analysis, Australia can:

- Improve outcomes for the sector through lower production costs, supporting access to overseas markets and the associated benefits for farm businesses, rural communities and the Australian economy
- Maintain domestic and international access to high quality, safe food
- Prevent biosecurity risks from affecting the environment and continuing the broad range of benefits people enjoy from our environment (including benefits for the tourism industry)
- Provide better, simpler ways to report biosecurity issues
- Enhance import and export processes.⁴⁶

→ Effective and efficient biosecurity is central to achieving the \$100 billion target by 2030.

In 2015, the Commonwealth Government announced \$200M investment in the nation's biosecurity surveillance and analysis capabilities. These investments covered a broad range of aspects which aimed to strengthen surveillance, build and elicit community support for biosecurity, grow Australia's scientific capability around biosecurity, and invest in information, data collection and analytical capabilities that support effective nation-wide management of biosecurity risks.⁴⁷ These are all worthy investments that require ongoing support and additional investment to ensure risks are effectively managed through time.

→ A shared obligation between producers and government arrangements will need to continually evolve to sustain Australia's relatively high biosecurity status.

Risk 3: Unresponsive regulation

A 2016 report by the Productivity Commission (PC) into agricultural regulation⁴⁸ notes that:

“Regulatory burden matters because it can weigh heavily on-farm businesses and undermine the agricultural sector's productivity and competitiveness.”

Productivity Commission, 2016.

Reducing regulatory burden is especially important for the agricultural sector as it is highly dependent on international trade (price takers) and is dominated by small businesses. Regulatory burden is considered to have a significant and disproportionate impact on small businesses and emergent industries that are seeking to establish their place in the market.

Stakeholders consulted also, without exception, saw unresponsive regulation as a key risk to realising the future gains of past investments.

Regulation intersects with agriculture across the supply chain (from production to transport, to processing and marketing) on many issues that are critical to agriculture's future performance. These issues cross national and state/territory regulatory functions, including biosecurity, access to agricultural and veterinary (agvet) chemicals, the environment, immigration, infrastructure and industry.

Some Commonwealth regulations cut across the whole supply chain such as regulation of investment opportunities and access to capital, as well as regulations relating to competition, foreign investment, immigration, industrial relations, work health and safety, and taxation.

In addition, there is also considerable state/territory-based and local regulation in the areas of land use, planning and (in some cases) environmental protection including native vegetation regulation, as well as setting conditions for local road access by heavy vehicles and farm machinery.⁴⁹

The benefits from reducing regulatory burden for farm businesses includes increasing the proportion of time that is dedicated to productive activities. The PC makes a range of recommendations in its report, many of which, if implemented by government, would assist in enhancing the productivity of the agricultural sector.

In 2015, the Commonwealth Government identified regulation as an area of risk to the future competitiveness of agriculture. The Commonwealth argued that on average, farmers spend 20 days a year managing the burden of unresponsive or poorly designed regulation.⁵⁰

Responsive regulation assists farmers to run their business in a way which effectively balances their needs with those of society. Unnecessary or unresponsive regulation reduces farm-level productivity, deters investment, and undermines jobs and growth.

Since then the Commonwealth Government has announced several commitments aimed to reducing the burden of regulation by \$1 billion every year which have included:

- The repeal of over 10,000 unnecessary and burdensome Commonwealth regulations and over 2,700 Acts of Parliament. The Commonwealth Government estimates that this has contributed to removing over \$2.45 billion in red tape for agriculture
- The introduction of a one stop shop for environmental approvals is reducing duplication between state, territory and Commonwealth processes and resulting in swifter decision making
- Changes to the Exporter Supply Chain Assurance System, including reducing the number of audits for facilities with a good performance record, will cut almost \$1.7 million worth of red tape annually.

These reforms are only the tip of the iceberg. There are also opportunities for industry to reduce the burden on farmers from industry-imposed standards and red tape across the supply chain, such as multiple audits for the same or similar quality assurance systems.⁵¹

→ Regulation is a fundamental foundation of the integrity of Australia and Australian agriculture.

→ Regulation is also a burden through direct compliance costs, unnecessary regulatory inconsistencies between jurisdictions and industries as well as overall flexibility in responding to change.

→ Microeconomic reform of regulations is an ongoing national task that should be pursued relentlessly based on evidence to maintain integrity and reduce cost.

⁴⁵ The Agricultural Competitiveness Green Paper (2014), http://agwhitepaper.agriculture.gov.au/SiteCollectionDocuments/green_paper.pdf

⁴⁶ See: <http://www.agriculture.gov.au/biosecurity/agwhitepaper-bio-surveillance-analysis#information-and-analysis> ⁴⁷ See: <http://www.agriculture.gov.au/biosecurity/agwhitepaper-bio-surveillance-analysis#information-and-analysis> ⁴⁸ Productivity Commission 2016, Regulation of Australian Agriculture, Report no. 79, Canberra.

⁴⁹ Ibid. ⁵⁰ Agriculture Competitiveness White Paper (2015), <http://agwhitepaper.agriculture.gov.au/about> ⁵¹ Ibid.

Risk 4: Changing consumer preferences and expectations

There is little doubt that consumer preferences for, and expectations of, agriculture are changing. These changes largely result from demographic factors and exposure to other cultures through travel and the media. However, understanding these changes and their impact on future farm performance is complex.

Data on domestic consumption offers limited insight, according to ACOLA's (Australia's Council of Learned Academies) 2015 report. The report cites data which suggests that per capita red meat consumption peaked in the late 1970s and that pork and chicken meat consumption have since risen. It also cites data which suggests that consumption of seafood, fresh fruit and vegetable, and beverages such as wine and carbonated softdrinks have increased, while egg and dairy consumption has stayed relatively stable. In all likelihood, it suggests there have been more changes within each of these broad product categories than there has been between them.

According to ACOLA (2015), Australia has also experienced significant change in the way it procures and consumes food. Compared with the early 20th Century, Australians eat more meals outside their homes, more pre-prepared and convenience foods, and they purchase more of their food from a small number of very large retailers. At the same time, markets for various forms of artisan, locally grown, certified organic and/or other niche products have demonstrated growth.

Changing international consumption patterns are not necessarily mirrored directly in Australian exports in the short term due to the range of factors (from trade politics to local seasonal conditions) that might influence what is imported into a foreign market at any one time. Some of the fastest growing Australian exports over the past decade were grains, oilseeds and cereals/baking products. Overall, minimally transformed products (such as grains

and seeds) doubled. Substantially transformed products (meat and dairy) were the largest components of exports. The alcoholic beverages industry is often perceived as growing due to its export performance in China.⁵²

Asian agricultural food demand is expected to grow over the coming decades. Growth opportunities for Australia's food industry in supplying safe, premium meat, dairy, wine, vegetable and processed, branded product to China's growing middle class (estimated to be more than 300 million people) look promising. Australian producers and exporters need to better understand Chinese middle class and other markets' consumer demands.⁵³

In 2014, the Commonwealth Government noted Australian agriculture's reputation for clean, green and safe produce.⁵⁴ There is no doubt that these claims hold some truth. However, Australia's reputation has the potential to be undermined by controversies around agriculture and food trade which have the potential to disrupt markets. Pre-empting the concerns that trigger controversy, by contrast, has potential to create new market opportunities for industries.

Negative sanctions or campaigns have been initiated against Australian agriculture by a range of foreign governments, private buyers, and social or welfare organisations in the past. These sanctions and campaigns they have imposed substantial costs on Australian producers. Animal welfare issues including live animal exports and sheep mulesing have been examples of conflict which have impacted agriculture's net performance.⁵⁵

Such issues bring into question agriculture's social licence to operate. Without a resilient social licence, agriculture faces many risks which may over time reduce its ability to maintain historical levels of growth.

→ Continuing to meet and exceed consumer preferences and expectations is the cornerstone of success progressing towards the \$100 billion target by 2030.

→ Our reputation as a clean and safe source of food and fibre must be based on a clear understanding of trends and how they can be met.

→ We must have an adaptive capacity to engage with negative sanctions and campaigns to demonstrate agriculture's credentials and address concerns raised in an open and transparent manner.

Implications of the risks for individual sectors

As is the case in Chapter 2, in the absence of data this section presents a qualitative and on balance assessment based on best available information, which includes feedback from stakeholders gained during consultations for this report.

Each sector faces these risks to a varying degree—for some sectors the risks are higher than for others, some risks have mixed effects (both positive and negative). The impact of not managing each of these risks also varies across the different sectors.

For example, the risk of climate change maybe positive or negative dependent on the industry, and the impact of better risk management will be different for each sector.

Table 3.1 assesses the relative impact of each risk and the likely impact of better risk management across each sector.

The risks and the impact of the risks being effectively mitigated are medium-to-high for most industries assessed. The ability for some meat-based industries to effectively mitigate the risks of climate change and changes in consumer preferences are assessed to be low.

→ The risks apply to Australian agriculture but the degree to which they can be mitigated will vary by industry and region.

→ Differences need to be respected and acknowledged with a view of working towards alignment in time as need and circumstances allow.

⁵² ACOLA (2015), <https://acola.org.au/wp/PDF/SAF07/social%20and%20political%20context.pdf> ⁵³ ACOLA (2015), <https://acola.org.au/wp/PDF/SAF07/social%20and%20political%20context.pdf> ⁵⁴The Agricultural Competitiveness Green Paper (2014). ⁵⁵ACOLA (2015), <https://acola.org.au/wp/PDF/SAF07/social%20and%20political%20context.pdf>

Table 3.1
Relative sectoral differences—Assessment of relative risk and likely impact of improved risk management

| Sector | Climate change | | Inadequate biosecurity | | Unresponsive regulation | | Changing consumer preferences | |
|--------------------------|----------------|------------|------------------------|------------|-------------------------|------------|-------------------------------|------------|
| | Risk | Likelihood | Risk | Likelihood | Risk | Likelihood | Risk | Likelihood |
| Cotton | High | Medium | High | High | Medium | Medium | Medium | High |
| Dairy | High | Medium | Medium | High | Medium | High | High | High |
| Eggs | Medium | Medium | High | Medium | High | High | High | Medium |
| Fisheries | High | Medium | High | Medium | Medium | High | High | Medium |
| Forest and wood products | High | Medium | Medium | Medium | Medium | Medium | High | Medium |
| Horticulture | High | Medium | High | Medium | High | High | Medium | High |
| Grains | High | Medium | Medium | High | Medium | Medium | Medium | Low |
| Live export | Medium | Low | Medium | Low | High | Low | High | Low |
| Meat | High | Low | Medium | Medium | Medium | High | High | Medium |
| Pork | Medium | Low | High | Medium | Medium | High | High | Medium |
| Sugar | High | Low | High | Medium | High | Medium | High | Low |
| Wine | High | Medium | Medium | Medium | Medium | High | High | Medium |
| Wool | Medium | Low | Medium | Medium | Medium | Medium | High | Medium |

Source: Acil Allen Consulting, 2018

Continuing to meet and exceed consumer preferences and expectations is the cornerstone of success progressing towards the \$100 billion target. →



The \$100 billion vision is an important direction that many people, businesses and institutions are showing a willingness to focus on and organise themselves behind—mainly because of its simplicity and implied promise of greater sustained prosperity. With this comes scepticism about the validity of the vision as a measure of success, desire for directive detail and discomfort at the prospect of change.

The high level of uncertainty and textural differences between sectors when combined with the maturity of agriculture and its institutional landscape creates a similar challenge for how to best express the various components that will realise progress to the vision. These components must be directional rather than directive. Progress towards the vision needs to be adaptive and flexible to effectively navigate the high levels of uncertainty facing each industry and agriculture as a whole. A directive approach is prone to sloganism (i.e. zero carbon) and either a compliance or avoidance orientation by institutions as they pursue their own visions rather than \$100 billion vision.

It is in this context that the four drivers and four risks need to be considered and responses developed by individuals, institutions, sectors and governments—to what degree do they apply to me and how well am I responding?

It is the answers to these questions that will drive decisions on where our resources should be allocated and where greater coordination is required. It is important to acknowledge that where greater coordination is required, the more people that need to be involved and the weaker the (commercial) incentive, the harder the coordination will be to achieve and the longer it will take.

Two critical considerations are the allocation of our current collective resources across the drivers/risks and the question of where individual responsibility ends and collective responsibility starts? The latter is particularly pertinent to the adoption and product innovation (off-farm R&D) drivers, and climate/water, and biosecurity risks. This is because they rely on both collective and individual (farmer) action to make progress, but the allocation of responsibilities are hard to define and will change over time.

The off-farm infrastructure driver and inadequate regulation risk are areas where significant improvements are needed to make progress towards the vision. In both cases a collective response is required that extends beyond agriculture since there are interactions and trade-offs with the rest of society—which is why progress has been more difficult to date. This is also an area which extends beyond the remit of the agricultural innovation system.

An important area which requires greater focus is the alignment between the market access/development driver and consumer expectations risk. Australia has a sophisticated and mature approach to market access but businesses face ongoing challenges in acquiring enduring information on consumer expectations and then balancing our ability to demonstrate integrity and consistently promote the national brand while maintaining sales that are behind or ahead of consumer trend.

Finally, drivers and risks are a powerful motivator and organising concept, they cannot meet all expectations or offset fundamental structural changes. The trend towards larger farms with less labour is well-advanced and is likely to continue. Similarly, regions will have to adapt to the markets they serve and the climates that emerge.

→ A \$100 billion target by 2030 is aspirational and by necessity a directional vision given diversity and uncertainty.

→ The four drivers and four risks provide a framework to establish what the best individual adaptive response is and where interests overlap.

→ The adoption and product innovation drivers, and climate/water and biosecurity risks will require both individual and collective responses.

→ Realising gains from off-farm infrastructure and regulatory reform will involve a collective response beyond agriculture.

→ Greater information collection and sharing on markets and consumers is needed to develop markets and evolve the underlying integrity systems.

For these reasons, ACIL Allen recommends a strategic approach that is based on an adaptive methodology which allows for opportunities and risks to be effectively managed as they emerge. The approach could be divided into three key phases to allow for a range of options and strategies to be identified that support progress towards the \$100 billion vision. These options are merely guidance as to the possibilities for delivering net farm performance over the next decade, what is important are the phases and overall logic outlined below. The phases are characterised as the:

- Preparation phase. This phase should be undertaken during 2019. The objective of the phase is to establish the necessary requirements for industry and governments to mobilise investment options.
- Initial response phase. This phase should begin in 2020 and be completed during 2021. The objective of the phase is to initiate any early investments that are necessary to capture the benefits of each driver and manage the risks and costs associated with changes in the operating context of agriculture. The intention of this phase is to implement and maintain options that are of a high value and/or low cost to industry and government.
- Ongoing management and response phase. This phase begins in 2022 and is ongoing until agriculture's operating context stabilises or the uncertainties about its performance are known. The objective of this phase is to roll out any investments that are required to deliver growth or defend the industry from external shocks.

These phases should be punctuated by discrete, as well as ongoing, analysis of the costs and benefits associated with each investment against the risk profiles and probabilities of different scenarios eventuating. This analysis should encompass best practice approaches to cost-benefit analysis and social impact analysis as outlined by State and Federal Treasury/Finance Department evaluation guidelines.

Managing progress towards the \$100 billion vision

Ensuring progress against the vision requires both strategic and tactical considerations (as outlined on page 52). However, the degree of uncertainty about agriculture's future will make it difficult to implement fixed policy solutions that capture the opportunities and/or address the risks identified in this report. In addition, the constrained financial situation of most industries and governments does not provide scope for significant investment in a driver of growth or risk mitigation.

→ Uncertainty will continue and be best managed through an ongoing series of adaptive phases.

Preparation phase (2019)

Under this phase, industry and government should consider the range of options that will underpin a shared response to achieving the \$100 billion vision. This will involve a range of preparatory activities aimed at identifying the parameters of industry's investments and government's policy response. It will also include a range of investments aimed at developing the core capacities and capabilities of industries and governments to address future challenges posed by the disease.

→ Laying the foundations of a nationally coordinated approach is necessary – without it the focus and engagement required will not be developed.

During this phase, it may be prudent for industry and government to consider the following investments:

- Establishment (or clarification) of institutional arrangements that support the management, monitoring and response to the opportunities and/or risks as they emerge, or empowering an existing institution to take on this role. This may involve the development of a new industry/government taskforce to coordinate the planning and investment effort. It may also include clarification of the roles and responsibilities of key parties to ensure appropriate accountability for implementation.

- Investment in data collection and analytical capabilities necessary to understand the opportunities and manage the risks facing agriculture over the coming decades. This will involve establishing national data collections that help stakeholders to understand the market (domestic and international), environmental and social dimensions of agriculture, over the short-, medium- and long-term. These data collections should also be accompanied by investment in core capabilities that allow institutions to assess the costs, benefits and risks of different structural adjustment options and to implement corrective action if necessary.
- Establishment of stakeholder engagement plans for the implementation of investments. It is clear that effective engagement will ensure that stakeholders understand (and support—where practical) the investments made by industry and governments.
- Establishment of the parameters and design elements of a plan to deliver sustained farm performance over time. The plan should be conceived in a phased or staged approach to ensure consistency with the approach outlined in this report. It should also include consideration of the four drivers and risks outlined in this report as the plan's foundational elements.

Initial response phase (2020-21)

Under this phase, industry and government should consider the implementation of options identified during the preparation and planning phase. For the growth drivers this could include, but not be limited to:

- Further investment in technology adoption and data collection. Industries and governments need to establish incentives, provide information and other forms of support to accelerate the adoption of existing technologies and the better use of existing R&D. They also need high degrees of national collaboration to establish the data collection and distribution architecture that would support a national approach to open source agricultural data provision in Australia.

→ Implementation must focus on building momentum and making tangible progress within two years for both the drivers and risks.

→ A longer timeframe for the initial response increases the risk of inertia or replacement by another trend.

- Increased investment in off-farm R&D. Industries and governments could work closely together (preferably through the RDCs) to identify the core priorities of the off-farm R&D agenda and to invest in projects which cross industry boundaries but unlock the supply chain potential of multiple industries.
- Increased investment in off-farm infrastructure. Industries and governments must find innovative and novel ways to finance the infrastructure needed for each industry to get its products to market in a cost and time effective way that meets the expectations of domestic and international consumers.

- Implementation of strategies and policies which improve market access and assist with the development of key markets in Australia and overseas. This may include changes to national competition policies, new trade deals, and evidence-based investments in the marketing and promotion of Australian products overseas.

For the risks this could include, but not be limited to:

- Implementation of options designed to manage the risks of climate change and issues relating to water availability. This may include the implementation of national solutions (such as insurance schemes and instruments) as well as locally-designed options (such as changes to land use planning requirements placed on farmers).
- Implementation of strategies and options which increase Australia's biosecurity effort in the event of an outbreak of disease or a pest incursion. These strategies and options may indeed seek to provide Australia's biosecurity system with increased capacity to reallocate resources/effort to different parts of the system as the risks emerge and change over time.
- Review and implementation of initial reforms to Commonwealth, state and territory regulations. The early changes to regulations will ensure they are responsive to the needs of agriculture and those of the Australian community. More substantive regulatory issues can be managed and dealt with over time.
- Implementation of strategies which manage changes in consumer preferences for agriculture and provide the engagement mechanisms which ensure the industry's social licence to operate is maintained over the long-term.



Ongoing management and response phase (2022 onwards)

Under this phase, industry should consider the implementation of options for both the drivers and the risks. This could include:

- Ongoing monitoring of the investments to ensure they are delivering benefits and well calibrated to the objectives and contextual factors.
- Reform, redesign or abandonment of investments that are not aligned with sector objectives or are not delivering strong rates of return.
- Gradual transfer of the investments (which are aimed at making progress towards the vision) from a model of shared responsibility to one of industry responsibility by 2030. While the investments may be co-designed initially, over time it is anticipated that industry will assume more responsibility for achieving the vision, with government only playing a support role where it makes sense to do so.

→ Adaptation must focus on determining progress and adjusting the response. How to transition to a more independent response will occur in the future.

→ The value proposition of the \$100 billion target is the focus provided to establish an enduring coordinated national approach to adaptively developing Australian agriculture.

→ Without this or another unifying vision, fragmentation and suboptimal response will constrain the potential of Australian agriculture.

Final remarks

The report has provided an approach for conceptualising the opportunities and risks, against the backdrop of uncertainty facing agriculture. As such, the approach does not provide a one-size-fits all solution to the strategies and investments needed, but a range of possible strategies/investments for delivering enduring profitability by the sector. For these strategies/investments to be 'implementation ready' it will be necessary:

- To address the immediate opportunities and risks with a targeted program of investments—as in previous sections.
- For industry and government to co-invest in the design of strategies/investments that meet the requirements of each industry and agriculture as a whole as they emerge. These strategies/investments may not be the same as those recommended above and could include industry-wide investments if the risks become severe. ACIL Allen anticipates that the costs of developing these strategies/investments will be insignificant compared to the costs of implementing structural adjustment policies and industry support mechanisms that are either insufficient or overly engineered.
- To build the institutional framework which will provide clarity for the roles and responsibilities of parties to the vision, and to provide a platform for coordination and investment.
- To build the analytical and research capabilities of institutions required to monitor the economic, social and environmental costs and benefits associated with prosecuting the \$100 billion vision.

Stakeholders consulted

Table A.1 below identifies the stakeholders consulted during the development of this report.

Table A1 Stakeholders consulted for this report

| Workshop | Name | Organisation | |
|----------------------|---------------------|--|---|
| Melbourne 22 October | Tanya Pittard | Grain Producers | |
| | Charles McElhone | Dairy Australia | |
| | Norman Repacholi | Dairy Australia | |
| | Shaun Lindhe | AusVeg | |
| | Alister Boyd | Victorian Farmers Federation | |
| Canberra 23 October | Victor Violante | Australian Forest Products Association | |
| | Anna Campbell | Red Meat Advisory Council | |
| | Andrew Spencer | Australian Pork Limited | |
| | Steve Thomas | Grains Research and Development Corporation | |
| | Justin Crosby | Grains Research and Development Corporation | |
| | Rowan McMonnies | Australian Eggs | |
| | Margo Andrae | Cattle Council of Australia | |
| | Tony Mahar | National Farmers' Federation | |
| | Mark Harvey-Sutton | National Farmers' Federation | |
| | Patrick Hone | Fisheries Research and Development Corporation | |
| Sydney 24 October | Stella Lee | Australian Meat Processor Corporation | |
| | Peter Vaughan | Nursery and Garden Industry Australia | |
| Brisbane 25 October | Robert Gray | Australian Mango Industry Association | |
| | Leigh Clement | Sugar Research Australia | |
| | Michael O'Shea | Sugar Research Australia | |
| | Brooke Edwards | Sugar Research Australia | |
| | David Rynne | Australian Sugar Milling Council | |
| | Burn Ashburner | Canegrowers | |
| | Trevor Weatherhead | Australian Honey Bee Industry Council | |
| | Andreas Clark | Wine Australia | |
| | Canberra 5 December | Nick Blong | Department of Agriculture and Water Resources |
| | | Peter Gooday | ABARES |

ACIL Allen conducted a desktop analysis to identify the drivers and inhibitors of growth across each of the primary industries, but rather than duplicate some of the shared barriers and opportunities for growth, this section attempts to focus on the priority issues for each industry and any industry specific issues.

Some factors such as price and yields are common yet unique to each sector. Figure B.1 shows the diversity of industries by price and yield variability. High price and high yield variability means potentially large gains (or losses) given current dynamics, whilst lower price variability and low yield variability would suggest areas with potential for stable growth in the current environment. Low yield and higher prices suggest an increase in yields could result in the potential for large gains (or losses).

Still other factors are entirely industry specific. These are detailed below.

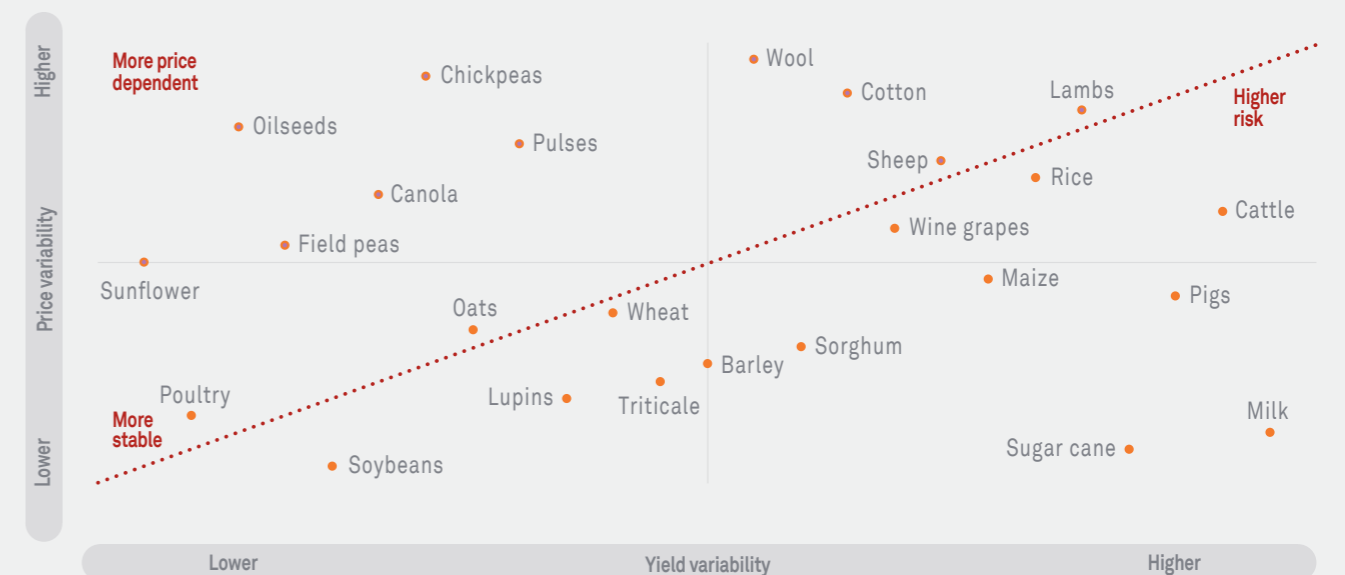
The key shared barriers and opportunities include:

- General drivers for economic growth such as population growth, macroeconomic indicators and government policy
- Natural resource challenges including water availability and climate change
- Biosecurity
- Production
- Domestic market e.g. retail price competitiveness
- Markets and trade including access, competition and macroeconomic issues (e.g. exchange rates)
- Consumer preferences and social licence issues including animal welfare and environmental concerns
- Regulatory challenges
- Skills and capability.

This review draws only on public sources of information such as strategic industry plans and investment strategies as depicted in Figure B.2.

Figure B.1

Sector specific price and yield variability (Nominal ranking)

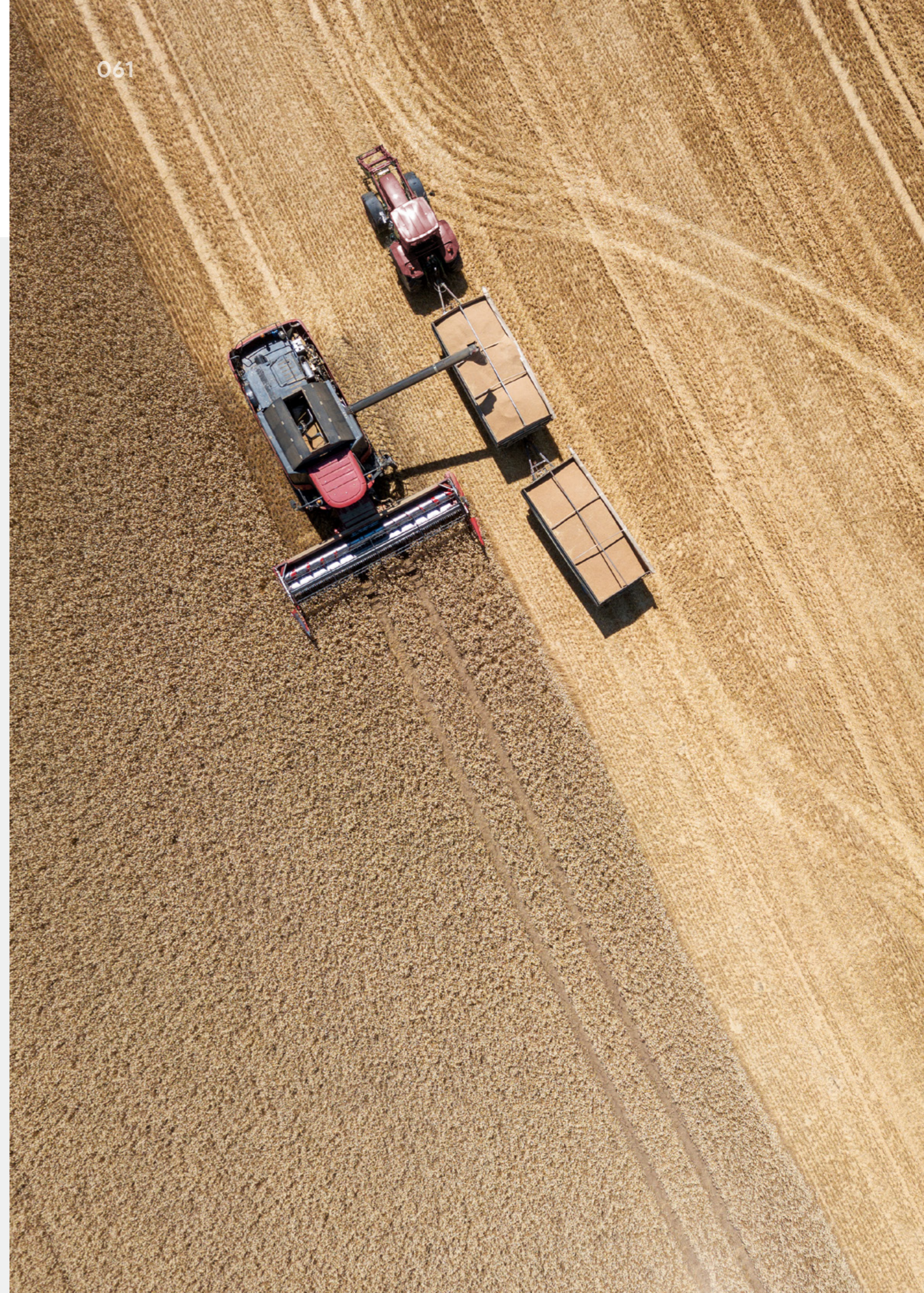


Source: ACIL Allen Consulting, 2018

Figure B.2
Snapshot of government and industry strategic plans

| State and Federal Government | Research and Development Corporation | Relevant Strategic Plans |
|---|--|---|
| Commonwealth Department of Agriculture and Water Resources | Cotton Research and Development Corporation | CRDC Strategic Plan 2018 - 23 |
| ACT Department of Agriculture and Water Resources | Dairy Australia | Dairy Australia Strategic Plan 2016/17 to 2018/19 |
| Agriculture Victoria | Australian Eggs | Australian Egg Strategic Plan 2017-21 |
| NSW Department of Primary Industries | Fisheries Research and Development Corporation | National Fishing and Aquaculture RD&E Strategy 2016 |
| | Forest & Wood Products Australia | Forest and Wood Products Strategic Plan 2016-21 |
| | Horticulture Innovation Australia Limited | Horticulture Innovation Strategic Plan 2016-18 |
| NT Department of Agriculture and Water Resources | Grains Research and Development Corporation | GRDC RD&E Plan 2018-2023 |
| QLD Department of Agriculture and Fisheries | LiveCorp | LiveCorp Strategic Plan 2016 - 20 |
| | Meat and Livestock Australia | Meat and Livestock Australia Strategic Plan 2016 - 20 |
| SA Department of Primary Industries and Regions | Australian Pork Limited | Australia Pork Limited Strategic Plan 2015 - 20 |
| TAS Department of Primary Industries, Parks, Water and Environment | Sugar Research Australia | Sugar Research Strategic Plan 2017/18 - 21/22 |
| | Wine Australia | Wine Australia for Australian Wine Strategic Plan 2015-20 |
| WA Department of Agriculture and Food | Australian Wool Innovation | Australian Wool Innovation Strategic Plan 2016/17 - 18/19 |

Source: ACIL Allen Consulting 2018 adapted from figure presented in 'Australian Wool Innovation Strategic Plan 2016/17 - 2018/19'



Cotton

Cotton is a mature sector, with highly skilled growers and service providers. It is a sector that has a reputation for technology adoption, innovation and has made significant gains in input productivity. The sector faces similar issues as all commodities, including environmental sustainability and addressing impacts of climate change. These will also be dependent on demand growth from Asian markets in the future to allow the sector to continue to grow. Social license issues exist regarding access to water and competition for resources with the environment and food.

Growth drivers⁵⁶

- Adoption of new technology and data platform e.g. genetic science, synthetic biology and uptake of digital technology and data for on-farm decisions.
- High value uses for recycled cotton and participation in the circular economy.
- New market uses and partnerships.
- Improvements in labour productivity through technology advances and reduction of low-skilled work practices.

Inhibitors to growth⁵⁴

- Competition for natural resources for food production.
- Competition from man-made fibres.
- Declining viability of rural communities.
- Increasing pressure for more sustainable production.
- Lack of succession planning.
- Variability in production due to seasonal conditions and export demand.
- Rising energy costs.
- Climate change and environmental impacts including biosecurity breaches and threats, insect resistance and water use efficiency.

Dairy

The Australian dairy sector has experienced significant adjustment since deregulation. Future growth will be dependent on continued productivity gains, underpinned by rationalisation of the number of farms and an increase in economies of scale to compete globally. Climate change, environmental sustainability and market demand from Asian markets will continue to be the main drivers. Social license issues related to animal welfare and changing consumer perceptions regarding intensive agriculture and marketing of quality benefits will challenge the sector. Conversely, management of these issues will effectively provide the sector a valuable marketing differentiation compared with less developed competitors.

Growth drivers^{57,58}

- Continued industry consolidation to less but larger scale farms. Increase in vertically integrated businesses and increased profitability.
- Purchase and lease back arrangements.
- Corporate farms / Supply chain integration.
- Intensive farming methods.
- Organic farming.
- Larger farms will be data driven, optimising production and profitability based on on-farm data feedback.
- Farm automation.
- Wide range of processing options.
- Animal genetic improvements.
- Technology for irrigation water use optimisation.
- Growth in the middle-class increasing food consumption, particularly dairy as a form of quality protein.

Eggs

Inhibitors to growth^{55,56}

- Extended low farmgate pricing driven by May 2016 downgrades and associated loan arrangements.
- Rising feed and other farm costs related to climate dependency and dependency on irrigation.
- Reduced local demand due to health / dietary concerns.
- Changing international market conditions, including slowing Asian growth and expanding low cost or subsidised competitors.
- Growth of substitute products – soy / almond milks.
- Capital availability / cost.
- Limited labour availability and lack of vocational education and training opportunities.
- Decline in government funding of sector.
- Inadequate transport and power infrastructure.

The egg production sector continues to grow in Australia with changing consumer perceptions on the health benefits of eggs and ethical concerns of treatment of hens. Consumer preferences have shifted the demand in the market to free-range and organic products which will continue into the future. Adherence to high ethical, biosecurity and animal welfare standards will present challenges into the future and also present marketable opportunities for the sector as a whole. The right to farm in peri-urban areas will become a greater concern with urban sprawl in capital cities.⁵⁹

Growth drivers⁶⁰

- Building egg awareness, demand and sales; particularly generating a positive association between eggs and health.
- Increasing egg consumption per capita.

Inhibitors to growth⁵⁸

- Eggs have been implicated in salmonella contamination in past as well as Campylobacter and E-coli. This could be better managed through increased traceability.
- Biosecurity issues e.g. impacting on reliability of free-range egg supply.
- Hen health and welfare concerns.
- Environmental concerns including waste management, bird disposal, odour and noise management.
- Capital availability / cost due to lack of market power.
- Availability of feed grains due to world-wide competition by traditional grain users and emerging biofuel industries.

⁵⁶ Cotton Research and Development Corporation (2018). 'CRDC Strategic Plan 2018-23'. Available at <https://www.crdc.com.au/publications/crdc-strategic-plan> ⁵⁷ Dairy Australia (2016). 'Dairy Australia Strategic Plan 2016-17 to 2018-19'. ⁵⁸ WestVic Dairy (2017). 'WestVic Dairy Strategic Plan 2017-2020'

⁵⁹ Australian Egg Corporation Limited (2014). Submission to the Senate Committee on Rural and Regional Affairs and Transport References Committee December 2014 The industry structures and systems governing the imposition of and disbursement of marketing, research and development levies in the agricultural sector ⁶⁰ Australian Egg Corporation Limited (2017). 'Strategic Plan 2017-21'

Fisheries

The Australian fisheries and aquaculture sectors have considerable future growth potential. Strong demand from Asia as incomes and populations rise will present opportunities to grow. Australia's reputation of clean, safe and trusted seafood products will be the foundation for growth, with significant potential to expand aquaculture production across many species. However, key inhibitors will increasingly focus on the environmental sustainability of such industries and resulting regulation. Similarly, social license issues focused on the public perception of the sustainability of aquaculture production and wild catch industries will be a threat.

Growth drivers⁶¹

- Human demand for fish protein (aquaculture) from rising incomes and demand increase from population growth.
- Australia has areas available for aquaculture expansion creating a potentially efficient source of protein.
- New technologies to detect threats and improve fisheries management and producers' decision making.
- Tourism opportunities in regional areas for aquaculture, e.g. food trails.
- New species (including algae) and farming technologies.

Inhibitors to growth

- Dependence on access to aquatic resources. However, competition from within aquatic sector, external sources and reduction in fishable zones as a result of changes in legislation.
- Food safety and traceability concerns.
- Threat from imports.
- Lack of meaningful product differentiation.
- Impact of extreme weather events and climate change.
- Increasing competition for access to coastal land and river frontage for sustainable supplies of fresh water.
- Access to capital.
- Declining habitat condition and extent.
- Changing community values.

Forest and wood products

Australia's forestry and wood production face significant challenges to grow into the future. The sustainability and environmental concerns of the public regarding the logging of forests will continue to determine the potential for the industry to grow. Competition from low cost producers, with less stringent environmental regulations will influence the sectors' international competitiveness. Furthermore, the ability for producers to maintain profitability and source investment into the future is uncertain with a profitable business model not established.

If producers can use the stringent regulation and technological advances to market a product which is more sustainably and ethically produced than the competitors, the sector has growth opportunities.

Growth drivers⁶²

- Control the quality, recyclability, reliability, utility that goes into building systems.
- Increased demand for sustainably sourced materials.
- Reduction in carbon dioxide emissions through sequestration.
- Competition from substitutes.
- Product differentiation based on provenance, legal and ethical, sustainable, utility and re-usability.
- Demonstration of sustainable forest management and supply chain security through processes such as independent certification.
- A new approach to resourcing the industry that focuses on contemporary approaches to new sources of funding and increased collaboration along the supply chain.

Inhibitors to growth⁶⁰

- Viability of the industry is dependent on managing the competing forces of access to sustainable wood products and forest preservation. This includes the types of forestry industries, whether plantation based or natural forests. Enhanced by the disconnect between industry and the urban community.
- Potentially increased growth rates for some industries and declines for others (influenced by species selection, bushfire and biosecurity plans).
- Shift to alternative products and services in a competitive global market. Concrete and metals being redesigned to compete with timber products.
- Timber investment business model is not working.
- Plantation expansions have been stalled due to establishment failures, fires and wind damage and competition for agricultural land. All have negative impact on the domestic processing sector.
- Lack of technical capacity and industry support.

⁶¹ Fisheries Research and Development Corporation (2016). 'Success through Innovation: The National Fishing and Aquaculture Research, Development and Extension Strategy'.

⁶² Forest and Wood Products Australia (2016). 'Strategic Plan 2016-21'

Horticulture

The Australian horticulture industry is in a strong position to grow significantly into the future. Increased demand for fresh vegetables, fruits, and particularly nuts into domestic and international markets will drive growth. To increase productivity and profitability, a shift from a labour intensive to a highly automated and technological advanced sector will be critical. Although issues such as availability of water, arable land and the right to farm will inhibit growth if not managed, the benefits of strong biosecurity regimes and access to Asian markets will drive growth into the future.

Horticulture shares the same impediments to growth as any agriculture sector.

Growth drivers⁶³

- Greater understanding of consumer trends and demand changes that impact on the horticulture industry. Innovation and technology advancements including automation, robotics, uniform plant architecture etc. Supply chain and industry integration and collaboration.
- Domestic demand for horticultural products as they are known to be "clean and green".

Inhibitors to growth

- Geographically dispersed and fragmented horticulture industries making it potentially difficult to achieve economies of scale.
- Urban encroachment.
- Impacts on margins at the farm-gate including increasing costs to markets.
- Climate change and biosecurity risks.
- Increasing labour cost and difficulty in attracting and retaining people into the sector.

Grains

The grains industry faces significant challenges to realise growth potential into the medium to long term. Significant competition from low cost producers in the Black Sea states, which have freight advantages into the Middle East and Asia will challenge the sector. Coupled with stagnant total factor productivity and a changing climate, the sector will need to innovate and reduce costs of production via technology adoption in the short term. Similar to other industries, the question of environmental sustainability and the potential impact farming has on the health of the Great Barrier Reef for example, could reduce the available arable land in Queensland. Furthermore, there are concerns around agrichemical safety and the regulation of the product.

Although there are significant challenges, the sector benefits from a high level of technology adoption, and businesses operating at scale. Domestic and international demand for commodity and value-added products will present opportunities for producers selling into South East-Asia and domestic markets.

Growth drivers^{64,65}

- Improve the management capability of growers to Close the Yield Gap. There is currently a national gap of 1 t/ha of attainable yield nationally. To achieve this the management capability of growers and ability to make decisions regarding adequate input rates needs to be improved.
- Opportunities to transition from a bulk commodity toward a more specialist product through the development of new niche grains, or new end uses, or improved end uses (e.g. Low gluten barley).
- Genetics, internet of things, robotics, automation, capacity, inputs (fertilisers and chemicals etc).
- Increasing demand for quality assured products.
- Size of farms provides opportunities to link consumer to producer at scale (e.g. direct sales to processors).

Live export

- Use R&D base to leverage international technology better.
- Technology to connect growers to each other and consumers.
- Australian reputation for clean quality product.
- R&D and regulatory base suits development of Australia as a R&D test hub for international technologies.

Inhibitors to growth⁶²

- Loss of technology i.e. glyphosate.
- Increasing chemical and fertiliser costs.
- Expansion of production and improvements in quality in emerging countries (Black Sea etc.).
- Ongoing international adoption of hazard-based regulation on technologies (chemistry, genetics, robotics etc.) will limit discovery and availability of new technologies.
- Ongoing demand for greater food integrity will increase costs but not necessarily price.
- Declining public sector contributions to R&D.
- Decline in rural population and impact on government policy and local service provision.
- Inefficiencies in the internal freight system impact on grower costs.

The live export sector has significant challenges to overcome to continue to grow into the future. Animal welfare and social license issues plague the industry. The primary focus to realise increased demand in the Middle East will be dependent on the community's perception of the industry's ethical, sustainable and animal welfare standards. Furthermore, with the change in consumer habits in the Middle East as a result of developing economies, the demand for live animals is uncertain.

Growth drivers⁶⁷

- Increased demand for Australian livestock exports from developing markets.
- The newly completed protocol for the live export of feeder/ slaughter cattle to China could significantly increase demand, potentially leading to higher cattle prices and supply opportunities.
- Changes in the livestock specifications for live export based on changing market requirements and supply availability.
- An increase in the number of countries and markets requiring livestock imports.
- A greater diversity of countries importing Australian livestock with a commensurate increase in the stability of demand.

⁶³ Horticulture Innovation Australia Limited (2016), 'Strategic Plan 2016 - 18' ⁶⁴Grains Research & Development Corporation (2015), 'Wheat Yield Gap Maps Show Where Gains Can Be Made'. Available at: <https://grdc.com.au/news-and-media/news-and-media-releases/misc/wheat-yield-gap-maps-show-where-gains-can-be-made> ⁶⁵Grains Research & Development Corporation (2018), '2018-23 Strategic Research, Development and Extension Plan Consultation Plan & Initial Discussion Paper'

⁶⁶ Grains Research & Development Corporation (2018), 'GRDC RD&E Plan 2018-2023 Overview' ⁶⁷ Australian Livestock Export Corporation Limited (2016), 'Strategic Plan 2016-2020'.

Live export (continued)**Inhibitors to growth**

- The continual strengthening of economies in key markets is creating a shift in purchasing trends leading to increased demand for processed meat.
- Animal welfare groups will continue to lobby against the trade and increase their focus on areas which have significant risks in the supply chain.
- Introduction by government of a 100% user pays approach for Exporter Supply Chain Assurance System and the monitoring of livestock exports would make it difficult for Australian exporters to compete globally.
- Australian competitiveness will be reduced in key markets if they change their purchasing patterns to cheaper low-cost producers such as India.
- Poor animal welfare performance by individual supply chain operators has significant whole of industry ramifications.
- Accessing new markets is subject to each government's policies and protocols.

Meat

The meat and livestock sectors continue to grow in Australia. Future growth will be dependent on the continual productivity gains by the sector, and market demand in Asia. Population and income growth will drive demand, however, the importance of animal welfare, ethical production and sustainability will position Australian beef, lamb and goat in higher quality segments compared with competitors. The sectors' ability to adapt to climate change and maintain a strong biosecurity status will remain a significant challenge.

The meat processing sector focuses on manufacturing capabilities and efficiencies, increasing market access, value and industry sustainability. Priority industry issues include social licence issues, competitiveness of the Australian processing sector, value adding, work safety, provenance and traceability.⁶⁸

Growth drivers⁶⁹

- Reputation for safety and security of supply increases competitive advantage with other producing nations.
- As new disruptive automation and measurement technologies emerge, and the digital footprint expands, there will be more ways for producers and their value chain partners to share information and adopt new practices and business models. Improved communication will increase awareness and capacity to embrace technology.
- As public adoption services diminish, there are opportunities for new adoption models to emerge and for the increased provision of services by private providers supported by industry.
- More producers will operate commercial businesses and there will be less operating for lifestyle reasons. Succession in farming businesses provides the opportunity for the influx of new ideas and innovation.
- Increased collaboration with commercial companies – including through the MLA Donor Company – has the potential to accelerate the rate of innovation across the value chain.

Poultry

Chicken is Australia's most consumed source of protein and that there is a growing trend whereby Australians are consuming more further-processed chicken products than ever before.⁷¹ Similar to the egg sector discussed above, there are concerns around food safety, animal welfare and sustainable environment development.

Growth drivers

- Improvements in productivity and efficiency of chicken meat production including through feed use.
- Investing in understanding consumer and market demands for chicken meat.

Inhibitors to growth

- Concerns around animal welfare.
- Food safety concerns related to *Campylobacter* during processing and in finished products.
- Odour management and litter disposal.

- More private investment in research will see outcomes delivered faster and innovation uptake occur more rapidly.
- The adoption of new technology and objective carcass measurement and assurance systems will see a transition from price-averaging systems to pricing based on defined quality, yield and integrity attributes.
- Ensuring production efficiencies in feedlots and farms, processing productivity and live export productivity.

Inhibitors to growth⁷⁰

- Trend towards consolidation of farm businesses resulting in more vertically integrated companies can impact on the transaction levies that fund Meat and Livestock Australia's work. Global meat supply is expected to increase, particularly beef from the US and South America.
- Discourse around the role of meat in diets. Climate variability affecting livestock producers.
- Increasingly costly transport systems to meet needs of urban, regional and remote communities.

⁶⁸ McKinna et al, 2015, Australian meat processor corporation future scan. Available at: <https://www.ampc.com.au/uploads/pdf/strategic-plans/McKinna-Future-Scan-Final-Low-Res.pdf> ⁶⁹ Meat & Livestock Australia (2016) 'Strategic Plan 2016-2020'

⁷⁰ Australian Meat Processor Corporation (2018). 'Strategic Plan 2018 -2022 and Beyond'. ⁷¹AgEconPlus Pty Ltd (2014). 'Chicken Meat Program Five Year RD&E plan 2014 – 2019'.

Pork

The Australian pork industry faces significant challenges to realise growth into the future: the import of cheap pork products and social license issues being the most important. The sector's ability to demonstrate that strong ethical, animal welfare and sustainable practices are implemented on-farm is essential to sectoral growth. The pork sector will be challenged by issues similar to other intensive livestock segments such as biosecurity, the right to farm and regulatory burdens.

Growth in the sector can be realised through successful implementation of sustainable, ethical and positive welfare practices. The removal of trade barriers with key trading partners will encourage export growth in Asia.

Growth drivers⁷²

- Growing public interest in provenance, production systems and product ranges.
- Increasing popularity of Australian pork amongst food opinion leaders.

Inhibitors to growth

- Pork used in ham and bacon in Australia is imported, and unlikely to change due to trade arrangements with the Northern Hemisphere.
- Unpredictable grain prices affecting pork industry.
- Increasing on-farm productivity should be balanced with minimising cost of production.

Sugar

The Australian Sugar sector has significant potential for growth, however, the challenges presented regarding international competitors, public perception regarding health benefits and the potential environmental impact of farm practices on the Great Barrier Reef are significant.

New technologies and farm practices are being adopted to mitigate impacts on the environment and increase productivity.

Growth drivers⁷³

- Increased collaboration aiming to leveraging multi-disciplinary and multi-institutional resources and capability, as well as accelerating the rate of innovation.
- Innovation in production processes, including use of renewable energy, waste minimisation, carbon sequestration and environmentally friendly chemical usage, 'game changing' robotics, automation, drones and sensors.
- Innovation in data analysis and decision-support technologies including 'big data', sensors and smart connected technologies.
- Improvements in sugarcane varieties through genomics and gene technology.
- Potential use as feedstocks for animal nutrition, chemicals, polymers, bioenergy and other value-add products.
- Adoption of best practice sustainable farming systems.

Inhibitors to growth

- Increasing production costs of water, energy and materials.
- Incremental gains in efficiency and low growth in Australian yield.

Wine

In 2008 the Australian wine industry was reeling from a multi-year drought with a high cost of irrigation water. In addition, the start of the global financial crisis meant an appreciation of the Australian dollar, and rapid wine export expansion by other countries significantly affected the competitiveness of Australian wine exports which continued until early this decade. In recent years exports have improved considerably, especially to China. Since 2013-14 Australian wine exports to China have grown by a compound average annual rate of 31% in volume with a value of more than \$1 billion in 2018.

Growth drivers⁷⁴

- Growth in volume of bulk wine exports to US, UK and China. Emerging markets such as UAE and South Korea.
- Growth in average value of bottled wine exports.
- Striving for Australian grape and wine excellence.
- Increasing efficiencies and innovation, particularly the use of technology to support decisions in vineyards.

Inhibitors to growth^{72,75}

- Changing consumer preferences shifting away from alcoholic beverages in general.
- Decrease in cheaper wine categories.
- In some markets the perceived quality and provenance of Australian wines affects prices.
- Competition with imports from France, Chile and Italy.
- Domestic market sales have been relatively flat.
- Wine taxation policy, e.g. changing to a volumetric tax on alcohol or increases in the Wine Equalisation Tax.

Wool

Australia is the largest wool producing country in the world and, unlike any other agricultural good, Australia dominates world wool production particularly below 20 microns. As a result, any developments in Australia have a major influence on the global wool market.

Long term prospects for Australian wool are more dependent on global economic conditions and income growth, than on the relative volume of wool production compared with the production of other textile fibres, or on the relative price of wool compared with these other fibres.⁷⁶

This suggests that demand side consumer requirements of wool consuming markets are particularly important. These requirements include quality garments and luxury garments at appropriate price points as well as products seen as being environmentally sustainable.

Growth drivers⁷⁷

- Capitalising on the properties of wool for use in growing demand areas such as active/leisure wear.
- Continued rise of China as major wool processor and manufacturer of wool products due to Australia's proximity to market.
- Chinese population growth and the development of a growing middle class in China.
- Innovations in technology.
- Improving textile processing and manufacturing techniques.

Inhibitors to growth

- Differentiation from other natural fibres and synthetics.
- Dynamic fashion trends for both men and women's fashion which is generally becoming increasingly casual.

⁷² Australian Pork Limited (2015). 'Australian Pork Limited Strategic Plan 2015-2020'. ⁷³ Sugar Research Australia (2017). 'SRA Strategic Plan 2017/18- 2021/22' Available at: https://sugarresearch.com.au/wp-content/uploads/2017/09/Strategic-Plan-2017-_FINAL.pdf

⁷⁴ Wine Australia (2015). 'Wine Australia for Australian Wine Strategic Plan 2015-2020' ⁷⁵ Winemakers' Federation of Australia (2007). 'Wine Australia: Directions to 2025. An Industry Strategy for Sustainable Success'. ⁷⁶ NSW Department of Primary Industries (2015). 'NSW Wool Industry and Future Opportunities.' ⁷⁷ Australian Wool Innovation Limited (2016). 'Strategic Plan 2016/17 to 2018/19'.



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